Civil Engineering and Development Department

Agreement No. CE 12/2015(CE) Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures – Feasibility Study

Final Report

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Job number 244613

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1 Introduction

1.1 Background

1.1.1 On 21 July 2015, Civil Engineering and Development Department (CEDD) of the Government of the Hong Kong Special Administrative Region appointed Ove Arup and Partners Hong Kong Limited to provide consultancy services for Agreement No. CE 12/2015 (CE) 'Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures – Feasibility Study' (This Study).

1.1.2 The Study Area covers the waters off Siu Ho Wan and the landside site at Siu Ho Wan as shown in **Figure 1.1**.

1.1.3 The findings of this Study do not represent that the proposed SHW development has been confirmed to be implemented as the implementation will depend on many other critical factors, such as detailed feasibility study, financial viability, social impact, detailed technical studies, policy directions, etc.

1.2 Study Objectives

1.2.1 The main objectives of this Study are discussed below:

1.2.2 For SHW Reclamation and Landside Development

(a) to assess the preliminary engineering feasibility;

(b) to determine the broad feasible extent of reclamation/development;

(c) to propose the preliminary land use themes;

1.2.3 For the Transport Infrastructures

(d) to assess the preliminary traffic and transport impacts;

(e) to recommend technically feasible schemes based on a broad-brush approach.

1.2.4 The specific objectives of the Assignment are:

(a) to conduct Preliminary Traffic and Transport Impact Assessment (TTIAs) for the Project;

(b) to conduct a Preliminary Geotechnical Appraisal (GA) including desktop study and site investigation with a view to identifying any

potentially difficult ground conditions for the Project;

(c) to recommend preliminary land use theme for both SHW Reclamation and Landside Development;

(d) to review, examine and update the BTA for SHW Reclamation completed under the ELSS Study;

(e) to prepare a separate BTA for Landside Development;

(f) to conduct site-specific field monitoring survey for CWD, study the abundance and behaviour of CWD in the waters around the potential sites of SHW and Lung Kwu Tan Reclamations and conduct preliminary review on CWD for SHW Reclamation;

(g) to review and examine the required clearance between SHW Reclamation and The Brothers Marine Park (BMP);

(h) to recommend the technically feasible schemes and the associated road and other necessary accesses for SHW Reclamation;

(i) to conduct ecological site walk survey and identify any critical issues for Landside Development from the ecological point of view;

(j) to recommend the technically feasible site formation schemes and the associated road and other necessary accesses for Landside Development;

(k) to take into account and to co-ordinate with the relevant parties of the relevant studies and possible interface projects (e.g. SHW Depot Topside Development, Topside Development at HKBCF, TCNTE, etc.) to minimise the potential implications on the interface projects; and

(l) to recommend the implementation programme and estimate the approximate cost of the project.

1.3 Scope of the Project

1.3.1 The scope of the Project mainly comprises, but not limited to:-

(a) engineering feasibility study on the nearshore reclamation and Landside Development in Siu Ho Wan, including relevant preliminary traffic and transport impact assessment, preliminary Geotechnical Appraisal, technically feasible schemes for transport infrastructures, the associated road and other necessary accesses;

(b) review, examine and update the BTA for SHW Reclamation and prepare a separate BTA for Landside Development;

(c) conduct further site-specific field monitoring for CWD, conduct preliminary review on CWD for SHW Reclamation, review and examine the required clearance between SHW Reclamation and BMP;

(d) conduct ecological site walk survey and identify any critical issues for Landside Development from the ecological point of view;

(e) take into account and co-ordinate with the relevant parties of related studies and possible interface projects to minimise the potential implications on the related studies and possible interface projects;

(f) Formulation of initial land use themes and long term land use themes based on the guiding principles established, findings of the impact assessments and constrains identified;

(g) recommend the implementation programme and estimate the approximate cost of the Project;

(h) carrying out the Study-related services as described in the Brief.

1.4 Purpose of this Report

1.4.1 This Final Report presents a detailed account on the key findings of technical assessments conducted under this Study.

1.5 Nomenclature and Abbreviations

1.5.1 The following table lists out the abbreviated titles of government bureaux, departments, offices, statutory bodies and public organizations:

Abbreviation	Full title
AAHK	Airport Authority Hong Kong
ACE	Advisory Council on the Environment
AFCD	Agriculture, Fisheries and Conservation Department
AMO	Antiquities and Monuments Office of the Leisure and Cultural Services Department
CAD	Civil Aviation Department
CEDD	Civil Engineering and Development Department
CEO	Civil Engineering Office of CEDD
CPLD	Committee on Planning and Land Development
DEVB	Development Bureau
DSD	Drainage Services Department
EACSB	Engineering and Associated Consultants Selection Board
EPD	Environmental Protection Department
ETWB	The then Environment, Transport and Works Bureau
GEO	Geotechnical Engineering Office of the CEDD
GFS	Government Flying Service
HKSARG	Hong Kong Special Administrative Region Government
HyD	Highways Department
LanDAC	Lantau Development Advisory Committee
LandsD	Lands Department
LCSD	Leisure and Cultural Services Department
LegCo	The Legislative Council
MD	Marine Department
MTRCL	Mass Transit Railway Corporation Limited
PlanD	Planning Department
RDO	Railway Development Office of HyD
TD	Transport Department
THB	Transport and Housing Bureau
TPB	Town Planning Board
TPDM	Transport Planning & Design Manual
WSD	Water Supplies Department

1.5.2 The following table lists out the meaning of abbreviation for expressions adopted in this report:

Abbreviation	Full title
AHR	Airport Height Restriction

Abbreviation	Full title
API	Aerial Photograph Interpretation
AOI	Area of Influence
ASRs	Air Sensitive Receivers
ATC	Annual Traffic Census
AVA	Air Ventilation Assessment
AQOs	Air Quality Objectives
BDTM	Base District Traffic Model
BMP	The Brothers Marine Park
BTA	Broad Technical Assessment
C&D material	Construction and Demolition Material
CEIA	Cumulative Environmental Impact Assessment for the Three Potential Nearshore Reclamation Sites in the Western Waters of Hong Kong
CV	Curriculum Vitae
CZ	Consultation Zone
CWD	Chinese White Dolphins
DEVB TC(W)	Development Bureau Technical Circular (Works)
DO	Dissolved Oxygen
DR	Director's Representative
EAR	Ecological Acoustic Recorder
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance, Cap 499
ELM	East Lantau Metropolis
ELSS	Enhancing Land Supply Strategy: Reclamation outside Victoria Harbour and Rock Cavern Development
EP	Environmental Permit issued under EIAO
ERA	Estimating using Risk Analysis defined under PAH
ETWB TC(W)	Technical Circulars (Works) issued by the then Environment, Transport and Works Bureau
EVA	Emergency Vehicular Access
FSP	Fine Suspended Particulates
GA	Geotechnical Appraisal
GASP	Geotechnical Area Studies Programme
G/IC	Government, Institution or Community
GIS	Geographic Information System
GVTCS	Goods Vehicle Trip Characteristics
HKBCF	Hong Kong Boundary Crossing Facilities Islands
HKIA	Hong Kong International Airport
HKLR	Hong Kong Link Road
HZMB	Hong Kong – Zhuhai – Macao Bridge
IMS	Integrated Management System
ISO	International Organization for Standardization
IDC	Islands District Council
LATM	Local Area Traffic Model

Abbreviation	Full title
LMPO	Land (Miscellaneous Provisions) Ordinance (Cap28)
LP	Layout Plan
LVIA	Landscape and Visual Impact Assessment
MDN	Marine Department Notice
NEF	Noise Exposure Forecast
NENT	North East New Territories
NDAs	New Development Areas
NLH	North Lantau Highway
NSRs	Noise Sensitive Receivers
NTHA	Natural Terrain Hazard Assessment
NTN	New Territories North
NWNT	Northwest New Territories
OD	Origin-destination
OZP	Outline Zoning Plan
PAH	Project Administration Handbook by the HKSAR Government
PAM	Passive Acoustic Monitoring
PHI	Potentially Hazardous Installations
PE	Public Engagement
PMP Study	Consolidated Economic Development Strategy for Lantau and Preliminary Market Positioning Study for Commercial Land Uses in Major Developments of Lantau
PR	Plot Ratio
PT	Public Transport
PWP	Public Works Programme
RCD	Rock Cavern Development
RSP	Respirable suspended particulates
QA	Quality Assurance
QRA	Quantitative Risk Assessment
SDM	Structures Design Manual
SEA	Strategic Environmental Assessment
SHW	Siu Ho Wan
SHWWTW	Siu Ho Wan Water Treatment Works
SI	Site Investigation
SIW (TCL) Station	Siu Ho Wan Railway Station along Tung Chung Line being explored by MTR *(under separate study)*
SIW (ELM) Station	Siu Ho Wan Railway Station along the proposed rail line between North Lantau to Southeast Lantau, possibly via Mui Wo for further connection to East Lantau Metropolis *(under this Study)*
SMBWTW	Silvermine Bay Water Treatment Works
SPR	Stores and Procurement Regulations
SSKA	Sham Shui Kok Anchorages

Abbreviation	Full title
SSSI	Site of Special Scientific Interest
STM	Strategic Transport Model
STT	Short Term Tenancy
STW	Sewerage Treatment Works
TBM	Tunnel Boring Machine
TCE	Tung Chung East
TCFWSR	Tung Chung Fresh Water Service Reservoir
TCL	Tung Chung Line
TCNTE	Tung Chung New Town Extension
TCS	Travel Characteristics Survey
TFS	Technical Feasibility Statement
TGLA	Temporary Govt. Land Allocation
TM – CLKL	Tuen Mun – Chek Lap Kok Link
TPEDM	Territorial Population and Employment Data Matrices
TPIS	Town Planning Information System
TPO	Town Planning Ordinance
TSP	Total Suspended Particulate
TTIAs	Traffic and Transport Impact Assessments
WBTC	Technical circulars issued by the then Works Bureau, the then Works Branch, the then Lands & Works Branch or the then Public Works Department
WCZ	Water Control Zone
WG	Working Group
WP	Working Paper
WTW	Water Treatment Works
3RS	Three-runway system

2 Potential Development Extent

2.1 General

2.1.1 The maximum potential extent of reclamation and landslide developments at SHW have been developed considering various key spatial and functional requirements and limitations. These maximum potential development extents are solely established for preliminary technical assessment at the early stage of the project for early identification of key issues, and do not represent the recommended development extent.

2.2 Reclamation

2.2.1 The various key spatial and functional requirements and limitations, or collectively called as "considerations" include:

(a) North Lantau Refuse Transfer Station;

(b) The Brothers Marine Park;

(c) Chinese white dolphin habitat;

(d) Fisheries resources, fish nursery and spawning grounds and mariculture activity;

(e) Existing Siu Ho Wan Sewage Treatment Works submarine outfall;

(f) Existing contaminated mud pits south of The Brothers;

(g) Tuen Mun-Chek Lap Kok Link southern viaduct (under construction);

(h) Potential Strategic Road Link between SHW and Southeast Lantau, possibly via Mui Wo.

(i) Existing MTR Siu Ho Wan Depot loading/unloading bay;

(j) Existing drainage outfalls; and

(k) Future Road P1

2.2.2 The maximum potential extent of SHW reclamation is approximately 82 ha (~36 ha for Stie A and ~46 ha for Site B).

2.2.3 The locations of these considerations and the maximum potential SHW reclamation extent are shown in Figure 2.1 and are discussed in the following sections.

2.2.3.1 North Lantau Refuse Transfer Station

The North Lantau Refuse Transfer Station (NLRTS) currently accepts solid wastes from Tung Chung New Town, Hong Kong International Airport, and the MTR SHW Depot. Wastes are transferred by vessels to the Western New Territories (WENT) landfill for disposal. The reclamation extent shall allow sufficient manoeuvring space for the waste transfer vessels and therefore, it sets the eastern boundary of reclamation.

2.2.3.2 The Brothers Marine Park

As compensatory measures for the loss of Chinese White Dolphin (CWD) habitat due to HKBCF reclamation, BMP was designated on 30 December 2016. The marine park is about 970 hectare, and is about 180m off from the NLRTS. Marine Park is a recognized site of conservation importance under Note 1, Annex 16 of Technical Memorandum (TM) of the EIAO. Activities that may pollute the water body and cause nuisance to the Marine Park are prohibited or controlled under the Marine Parks Ordinance and the Marine Parks and Marine Reserves Regulation. The waters in the vicinity of BMP is historically a hotspot of CWD and the area will be a key environmental sensitive area for transportation of construction materials by marine means. The southern boundary of BMP is in close proximity to SHW and imposed constraints to the reclamation extent. To maximise the reclamation extent, the distance between marine park and reclamation extent has been considered. Reference has been made for the works area between HKBCF and BMP which is 150m. This 150m works area is also adopted for SHW reclamation that delineate the minimum distance between BMP and SHW reclamation.

2.2.3.3 Chinese White Dolphin Habitat

According to the long-term CWD monitoring carried out by Agriculture, Fisheries and Conservation Department (AFCD) since 1995, the waters in the vicinity of The Brothers and Sham Shui Kok are historically important dolphin habitat, where high sighting densities associated with feeding activities were recorded. The proposed SHW Reclamation extent is proposed to avoid these previous CWD sightings in order to reduce the impact of the reclamation on the CWD habitat.

2.2.3.4 Fisheries resources, fish nursery and spawning grounds and mariculture activity

The nearest mariculture site is Ma Wan Fish Culture Zone which is about 7km from the reclamation site. During Ebb Tide, tidal current converges and release of suspended solid and toxic substances from filling may affect that area. For capture fisheries, the fishing grounds in the North Lantau waters are partially of very low (>0 & <= 50 kg/ha) and partially of moderate (200 – 400 kg/ha) fisheries production according to Port Survey conducted by AFCD in 2006. The reclamation extent shall avoid encroachment upon the important fisheries resources, fish nursery and spawning grounds and mariculture activity. Deterioration of water quality during construction phase of project may cause indirect impact on fisheries resources, fish nursery and spawning grounds and mariculture activity. The reclamation shall avoid/ minimise indirect impact on fisheries resources, fish nursery and spawning grounds and mariculture activity.

2.2.3.5 Siu Ho Wan Sewage Treatment Works Submarine Outfall

Siu Ho Wan Sewage Treatment Works (SHWSTW) is a chemically enhanced primary treatment works that handled sewerage generated from the North Lantau. The disinfected and treated effluent of SHWSTW is discharged into the area between Sham Shui Kok Anchorage No. 1 and No. 2, via a submarine outfall, into the marine waters of North Western Water Control Zone. Reclamation over the existing outfall will impose additional loading on the outfall pipe. A number of options were considered to accommodate the existing submarine outfall in the proposed reclamation. Nevertheless, there will be a drainage reserve zone along the outfall within or next to the reclamation, depending on the final reclamation arrangement at this interface, to enable maintenance of the outfall.

2.2.3.6 Contaminated Mud Pits south of The Brothers

(a) There are two Contaminated Mud Pits (CMPs) – CMP1 and CMP2 located in the south of The Brothers for the disposal of contaminated sediment. The dumping operation in both CMPs ceased already.

(b) One of the mud pit is located closer in distance to the proposed SHW reclamation.

(c) The proposed reclamation cope line is designed to approximately 80m from the edge of the mud pit, and the proposed reclamation edge is offset from the CMP to allow marine space for the sloping edge of the new seawall, and the space for undertaking possible foundation treatment works for the seawall.

2.2.3.7 Tuen Mun-Chek Lap Kok Link Southern Viaduct

TM – CLKL is a strategic road link between North West New Territories (NWNT), North Lantau and HKBCF Reclamation. The SHW Reclamation extent is proposed to be offset at minimum 200m from TM-CLKL southern viaduct to provide a buffer for noise impacts associated with the road traffic on the viaduct.

2.2.3.8 Potential Strategic Road Link between SHW and Southeast Lantau, possibly via Mui Wo

(a) The preliminary feasibility of a potential road link between SHW and Southeast Lantau, possibly via Mui Wo, for further connection to East Lantau Metropolis (ELM) was assessed based on a broad-brush approach.

(b) The SHW reclamation should provide sufficient land to house an interchange that can connect NLH and potential strategic road link between SHW and Southeast Lantau, possibly via Mui Wo (refer to **Section** 7 for more details).

(c) The proposed Siu Ho Wan Interchange provides linkage between the North Lantau Highway and the strategic road tunnel. A design speed 70km/hr with radius of curvature 175m is recommended for Siu Ho Wan Interchange. Therefore, the reclamation extent at eastern side is the minimum extent required for the planned Siu Ho Wan Interchange.

2.2.3.9 MTR Siu Ho Wan Depot Loading/Unloading Bay

There is an existing vertical-faced seawall outside the MTR Siu Ho Wan Depot for the delivery of new train coach via marine access. During the planning of SHW reclamation, the re-provision of a new vertical seawall is considered for maintaining the delivery of train coaches and rails to MTR Siu Ho Wan Depot.

2.2.3.10 Existing Drainage Outfalls

A network of engineering trunk and branch drainage system that originates from the foot of the hills to convey the surface runoff north to the sea. There are a number of trunk drainage culverts that mainly run across North Lantau Highway. Several existing outfalls will need to be extended to the reclamation edge for discharge into the sea.

2.2.3.11 Road P1

Road P1 was proposed in 2007 under the Revised Concept Plan for Lantau[1] to serve as a primary distributor connecting Tung Chung with Tai Ho, it also will form an essential transport link for the future Tung Chung New Town Extension and further development along North Lantau. Road P1 will connect to NLH via the proposed Tai Ho Interchange.

2.3 Landside Development

2.3.1 The major determining factors for the potential extent for landside development includes the Country Park, Priority Site of Enhanced Conservation in Tai Ho, PHI of SHWWTW and AHR.

2.3.2 The maximum potential extent of landside development is approximately 18 ha after considering all these factors. These major constraints and the maximum potential SHW landside development extent is presented in **Figure 2.2** and are discussed in the following sections.

2.3.2.1 Lantau North (Extension) Country Park

(a) A small portion of the study area for landside development encroaches onto Lantau North (Extension) Country Park. Under the Country Parks Ordinance (Cap. 208) protects and restricts the destruction of or interference with vegetation within a country park or special area or the doing of anything which will interfere with the soil.

(b) At this preliminary stage, an offset distance of 30m has been

[1] Revised Concept Plan for Lantau 2007
http://www.pland.gov.hk/pland_en/lantau/en/images/revised/revised_concept_plan.pdf

assumed at the crest of the study area of the landside development for construction of possible natural terrain mitigation works, drainage system re-provision, works area, etc. This implies the upper level limit for site formation of the landside development will be at about +90 to +110mPD.

2.3.2.2 Priority Site for Enhanced Conservation

(a) According to the new nature conservation policy, AFCD has formulated a list of priority sites for enhanced conservation, and Tai Ho ranks the third place in the list. Tai Ho is situated in the northern part of Lantau Island and a portion of the study area of the landside development encroaches onto the Priority Site for Enhanced Conservation. The coastal area in Tai Ho is characterised by a narrow shallow flat plain which rises sharply to Sunset Peak. The upland areas are largely composed of shrubland and grassland, in addition to riparian woodland, streams and seasonal marshes. The main Tai Ho Stream and its tributaries run from upland all the way to the lowland estuary where mangrove and mudflat are found.

(b) An offset distance of 10m has been assumed at the west of study area next to the Priority Site of Enhanced Conservation in Tai Ho for works area during construction, where natural terrain mitigation works is not envisaged. The offset distance assumed at this early stage of project for the purpose of initial proposal of development extent and shall be further reviewed in future detailed design stage.

2.3.2.3 Potential Hazardous Installation – Siu Ho Wan Water Treatment Works

(a) Siu Ho Wan Water Treatment Works (SHWWTW) is located in close proximity to the study area of Landside Development, where treated water transfer and distribution systems are carried out. A 1km radius centred on the chlorine building as Consultation Zone (CZ) for SHWWTW was set up in the Hazard Assessment Study conducted in 1992.

(b) The feasible extent for landside development excludes the SHWWTW PHI CZ in the western end, where the development potential is relatively limited. However, the site formation works will be carried out in this area if required.

(c) WSD is conducting a risk assessment on the reduction of chlorine risk associated with the SHWWTW by conversion from drum draw-off to cylinder draw-off. Subject to the findings of the risk assessment, if such conversion is found technically feasible and cost effective and finally implemented, the PHI CZ of SHWWTW could possibly be reduced.

2.3.2.4 Airport Height Restriction (AHR)

(a) The existing Airport Height Restriction (AHR) for protecting the Two-Runway System (2RS) operations of the Hong Kong International Airport (HKIA) generally ranges from +85mPD to +110mPD approximately at the study area for landside development. The AHR limits the development potential of the landside development.

(b) Upon CEDD's request and provision of information, Civil Aviation Department (CAD) has conducted a study to review the existing AHR under the 2RS operations of HKIA for the potential development sites (PDSs) for the landside development at North Lantau identified by CEDD, one of which was near Siu Ho Wan at similar location to the area covered in this study.

(c) Airport Authority Hong Kong is also conducting a study on the Preliminary Airspace Protection Plan for the future operations of the Three Runway System (3RS) of HKIA. This study is yet to be finalised.

(d) The development potential of the landside development should be further reviewed when the findings of the above-mentioned studies are made available.

3 Initial Land Use Themes

3.1 Initial Land Use Themes

3.1.1 Based on the assumed maximum potential reclamation and landside development extents, three initial land use themes were formulated for broad comparison. The three initial land use themes are:

(a) Theme 1 "Optimized Residential"

(b) Theme 2 "Mix of Residential and Education"

(c) Theme 3 "Enhanced Tourism and Education".

3.1.2 Theme 1 focuses on providing a higher density residential community to ease the territorial housing demand; Theme 2 caters for both the territorial housing demand and educations, while Theme 3 focuses on tourism-related developments and the provision of tertiary level educations. Details of the three themes are presented below.

3.1.2.1 Theme 1 "Optimized Residential"

(a) The "Optimized Residential" theme focuses on providing a medium-high density residential community in addressing territory housing need and complementing with the residential development atop the SHW MTR Depot; while specifically catering for the special site context of SHW and providing a sensible amount of commercial and other employment generating uses to support the local population. Neighbouring the TCNT and its extension, SHW could be developed for offering labour support to the HKIA. This theme would provide about 11,574 flats for 31,354 projected populations with around 218,400 m^2 GFA for commercial and high-value logistics uses (**Figures 3.1** and **3.2**). Land use budget and development parameters for this theme are shown in Tables 3.1 and 3.2.

(b) Positioning and the plan / section for Initial Land Use Theme 1 are presented in **Figure 3.1** and **Figure 3.2.**

(c) Land use budget and development parameters for Initial Land Use Theme 1 are shown in **Table 3.1** to **Table 3.2**.

3.1.2.2 Theme 2 "Mix of Residential and Education"

(a) With the theme of "Mix of Residential and Education", SHW could caters for both the territorial housing demand and offer educational space including professional learning facilities for different pillar industries. The proposed education and training services will echo the planning direction of the "Northern Lantau Corridor" as suggested in the Sustainable Lantau Blueprint and foster SHW's position as a "Quality Living cum Knowledge Zone". This theme's proposal would generate a generous amount of education / training opportunities with the provision of about 1,474 flats and 429,800m^2 GFA for commercial and education uses (**Figures 3.3** and **Figure 3.4**). Land use budget and development parameters for this theme are shown in **Tables 3.3** and **Table 3.4**.

3.1.2.3 Theme 3 "Enhanced Tourism and Training"

(a) To take advantage of the existing and planned tourism developments in Lantau and to capture SHW's strategic location with HKIA and HKBCF in its close proximity, the theme of "Enhanced Tourism and Education" has a focus on educational as well as tourism-related developments. Considerable amount of land is reserved for educational and hotel uses to facilitate the provision of educational and professional training services to both local and international students. In particular, these hotel facilities would have synergy with the educational facilities, where overseas students, lecturers and speakers could have short stays at the hotel facilities while attending classes such as executive MBA part-time classes. At the same time, these hotel facilities would also enrich the tourism package of Lantau by upskilling the labour force of the hospitality industry and provide more hotel facilities for visitors who desire to spend their night(s) within Lantau, after arriving through the HKIA and HKBCF. These hotel facilities could provide a training venue similar to Hotel ICON in Tsim Sha Tsui, which serves as a teaching and research hotel for the School of Hotel & Tourism Management of The Hong Kong Polytechnic University. Local and overseas visitors could also enjoy the F&B and hotel services provided by these hotel facilities. This theme will focus on the economic development for Lantau. About 7,340 jobs and 656,600m^2 GFA for commercial, hotel and education uses would be provided under this theme (Figures 3.5 and **Figure**

3.6). Land use budget and development parameters for this theme are shown in **Table 3.5** and **Table 3.6**.

3.2 Guiding Principles

3.2.1 The performance of each Initial Land Use Themes had been reviewed and qualitatively compared based on a set of guiding principles discussed below. These guiding principles had been adopted as overarching principles for the formulation and evaluation of the three Initial Land Use Themes.

3.2.1.1 Enhance Land Supply for Territorial and Local Developments

(b) Land resources are scarce in Hong Kong, and the Government has set a housing target to meet with the strong demand for housing units. In view of this, residential land use should be should be addressed to enhance land supply for the territorial housing demand.

(c) In addition, the neighbouring population centres of SHW Depot Topside Development, Tung Chung New Town and its extension and the North West New Territories (with the implementation of TM-CLKL) generate a huge demand for local employment opportunities. Taking North Lantau as a whole, land uses which will achieve synergy with the surrounding developments and generate the appropriate employment types for the population in Tung Chung and the North West New Territories should also be considered.

3.2.1.2 Conserve Natural Resources and Minimise Impacts on the Ecology

(a) SHW and its surroundings have a wide variety of natural landscapes of high environmental significance/ ecological value. The developments at SHW should pay due respect to the present ecological assets and facilitate their conservation. Encroachment onto ecologically sensitive areas should be avoided and mitigation measures should be identified to achieve environmental sustainability and protect the natural habitats.

3.2.1.3 Integrate with the Surrounding Developments in Siu Ho Wan and North Lantau to Achieve Synergy, in particular within the North Lantau Development Corridor

(a) To capitalise on the locational advantage of SHW, opportunities should be explored to develop commercial land uses in SHW to generate local employment. There are also opportunities for recreational, tourism and educational developments to achieve synergy with the existing and planned tourist attractions, recreational and educational facilities in Lantau. With the significant ecological value in areas in proximity, Siu Ho Wan could become the potential eco-tourism hotspot presenting the enhanced ecology with the minimum impact to the environment.

3.2.1.4 Improve Accessibility and Strengthen the Linkages to the Residential/Job Clusters in Urban Core and Adjacent Residential/Job Clusters

(a) To attract employment generating uses such as commercial and tourism uses, it is essential to provide transportation linkages to the urban core and the adjacent communities. A new railway station in Siu Ho Wan on the Tung Chung Line (TCL) is being explored by MTRCL to provide train services for the population of the future MTR Depot topside development, among others. The additional developments in the Present Study may possibly be served by the proposed new railway station. Comprehensive pedestrian system and cycle track linkage will be provided for pleasant and easily accessible environment within SHW and connecting the North Lantau.

3.2.1.5 Create Attractive and Continuous Waterfront for Public Enjoyment

(a) Given SHW's waterfront location, integration of the shoreline along North Lantau, in particular with the planned waterfront promenade in Tung Chung East should be considered. Waterfront developments should also respect the mountain backdrop of Lantau to create a pleasant experience for the users at the waterfront promenade.

3.2.1.6 Enable Cost-Effective Solution, Smooth Implementation and Holistic Developments, in particular for Transport Infrastructure

(a) Transport infrastructure linking SHW to the existing / planned transport network and the proposed strategic network to Southeast Lantau, possibly via Mui Wo, should be provided in the most cost-effective manner without jeopardising the development potential

at SHW. This provides opportunity to focus more development in SHW other than additional massive transport infrastructure.

3.2.1.7 Minimum Environmental Impacts

(a) With a close proximity of HKIA, SHWWTW and NLH, SHW is enclosed by the area of aircraft flight paths, PHI CZ and setback for preventing noise nuisance from NLH. The development parameter, land use disposition and mitigation measures should be carefully considered. Compatible urban design in particular for the proposed development on the landside should also be considered as the Study Area is adjacent to Tai Ho Wan.

3.3 Broad Evaluation for Initial Land Use Themes

3.3.1 Under each guiding principle, a set of evaluation criteria that elaborate upon how the guiding principle can be addressed and realized had been proposed, which had been used to assess the degree to which the Initial Land Use Themes have achieved the targets set out by the evaluation principles.

3.3.2 The extent in realizing the targets set in the evaluation criteria were broadly examined through a qualitative approach in which the strengths and weaknesses of each of the themes were compared relatively. The evaluation criteria and the results of broad evaluation are listed below.

3.3.2.1 Enhance Land Supply for Territorial and Local Developments

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To explore the potential of the available land for housing development	(a) Optimization of housing supply to meet with the territorial housing needs
To capitalise on the locational advantages to facilitate strategic economic developments	(b) Provision of strategic economic activities to achieve synergy with the existing/future developments in Lantau
	(c) Provision of tourism/recreational facilities (i.e. hotel, resort, etc.) to compliment and enrich the diversity of tourism and leisure facilities in Lantau

(a) For this evaluation criterion, Theme 1 Optimized Residential

performs the best in terms of amount of housing provided. With 21.9 ha of land planned for residential uses and resident sites of PR4 and PR5, a total of 11,574 flats are provided for a population of 31,354. Theme 2 also address the territorial housing need in a smaller scale with only 9.8 ha of land planned for residential uses, and with residential sites of PR1.5 and PR2, only 1,474 flats are provided for a population of 3,920. Quality living choices are emphasized for Theme 2 and foster SHW as a "Quality Living cum Knowledge Zone". Theme 3 does not feature any residential uses, and thus while optimizing does not necessarily denote as many flats as possible, it is considered both Theme 1 and 2 perform the best for this criterion as though Theme 2 does not provide as many flats, it provides an alternate and more luxurious living choice for the territory as a whole.

(b) Provision of strategic economic activities to achieve synergy with the existing/future developments in Lantau

In terms of providing strategic economic activities, Theme 2 capitalizes on the proposed land assets and is designed to increase value for the wider Lantau community. With the provision of lower density residential development and educational facilities, this theme echos the planning direction of "North Lantau Corridor" and foster SHW as a "Quality Living cum Knowledge Zone", synergizing with the current vision for Lantau as a whole. Meanwhile, logistics uses of 19 ha are proposed under Theme 1, which also strategically provides an alternate type of economic activity to the SHW area and can potentially synergize with the current operations and future expansion of the nearby airport. The hotel/ resort uses under Theme 3 correlate and synergize with the development of Lantau for tourism and recreational uses as well. Therefore, it is considered that Theme 2 and Theme 3 perform better under this criterion.

(c) Provision of tourism/recreational facilities (i.e. hotel, resort, etc.) to compliment and enrich the diversity of tourism and leisure facilities in Lantau

For this evaluation criterion, Theme 3 Enhanced Tourism and Training features hotel/ resort uses. Meanwhile, Theme 1 and 2 do not feature any facilities that would enrich the diversity of tourism facilities in Lantau, though it can be viewed that with more

educational facilities in the area for Theme 2, there would also be a larger amount of recreational facilities associated with the future institutions that can be potentially opened for the general use of the public besides the future students. As such, Theme 2 also diversifies the provision of tourism/ recreational facilities in Lantau and performs the best along with Theme 3.

3.3.2.2 Conserve Natural Resources and Minimise Impacts on the Ecology

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To minimise disturbance to ecology, fisheries resources and enhance ecological conservation	(a) Avoid encroachment onto Country Park
	(b) Avoid encroachment onto SSSI
	(c) Avoid encroachment onto CWD's habitat
	(d) Avoid adverse impact on fisheries resources, important spawning and nursery grounds and mariculture activity
	(e) Avoid encroachment onto the BMP with certain work area allowed between the reclamation site and BMP
	(f) Provision of ecological enhancement initiatives

(a) Avoid encroachment onto Country Park

All three themes avoid encroachment onto the Lantau North (Extension) Country Park with the provision of a 30m buffer distance and thus perform equally well.

(b) Avoid encroachment onto SSSI

All three themes avoid encroachment onto the nearest SSSI, i.e. Tai Ho Stream SSSI with a separation distance of approximate 1km, and thus perform equally well.

(c) Avoid encroachment onto CWD's habitat

The reclamation extent for the three themes are the same and has allowed certain buffer to distance to the BMP, where it is of critical CWD habitat, therefore the 3 themes perform equally well.

(d) Avoid adverse impact on fisheries resources, important spawning and nursery grounds and mariculture activity

All three themes avoid encroachment onto important spawning and nursery grounds in the North Lantau waters, therefore the 3 themes perform equally well. Incorporation of features with eco-shoreline functions on the future seawall, fisheries resources such as commercial fisheries species will be benefited. Though non-dredged method is proposed in the construction of seawall and reclamation, water deterioration during the construction of the project may cause indirect impacts on fisheries resources, important spawning and nursery grounds and mariculture activity. Good site practices and mitigation measures such as the deployment of silt curtain is recommended to prevent increasing Suspended Solid to affect adjacent waters, as well as avoid adverse impact on fisheries resources, important spawning and nursery grounds and mariculture activity.

(e) Avoid encroachment onto the BMP between the reclamation site and BMP

All three themes avoid encroachment onto the BMP with the provision of a 150m buffer distance and this perform equally well. Deployment of silt curtain as well as other means of good site practices during construction stage, and provision of proper sewage system during operational stage, should be implemented to avoid discharge of water pollutants directly to BMP.

(f) Provision of ecological enhancement initiatives

No particular ecological enhancement initiatives are proposed under the three Themes at this stage, however Theme 2 does emphasize educational facilities which could possibly utilized for eco-education centres while Theme 3 has the potential for eco-tourism uses. These proposals do have a higher chance and rationale for providing ecological enhancement initiatives as compared to Theme 1, and thus perform better.

3.3.2.3 Integrate with the Surrounding Developments in Siu Ho Wan and North

Lantau to Achieve Synergy, in particular within the North Lantau Development Corridor

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To provide complementary developments in line with other developments in North Lantau	(a) Development of cross-boundary economic activities
	(b) Development of high value logistics uses *
	(c) Provision of tourism/ eco-tourism and/ or recreational uses
	(d) To achieve synergy with the developments in Lantau
To provide local business and employment opportunities	(e) Generation of high value added employment opportunities
	(f) Provision of regional commercial development
	(g) Provision of local commercial services
	(h) Provision of education uses

** High-value logistics uses can be pharmaceuticals, art storage, etc. that require special facilities to handle.*

(a) Development of cross-boundary economic activities

In terms of the provision of cross-boundary economic activities, the development of high-value logistics uses has been proposed to capitalize on proximity to the airport and HKBCF with the international and regional gateway and strategic transport infrastructure to support logistics industry in Hong Kong. Meanwhile Theme 2 features educational facilities that could focus on attracting participants, students, experts and talents from all around the world, especially the mainland. Theme 3 also provides hotel/ resorts uses that could attract visitors from both within and outside the territory, along with educational uses with benefits as mentioned prior. In this case, all three themes seek to develop cross-boundary economic activities and are considered to perform equally well under this criterion.

(b) Development of high value logistics uses

Only Theme 1 features the provision of land for high value logistics at the eastern reclamation area, while there are no plans at all for logistics uses in both Theme 2 and 3. As such, Theme 1 performs the best under this criterion.

(c) Provision of tourism/ eco-tourism and/ or recreational uses

For this evaluation criterion, Theme 3 Enhanced Tourism and Training performs the best with 12.7 ha of land planned for hotel/ resort uses. With PR3, this equates to a GFA of 266,700 sqm. Theme 1 and 2 do not feature any facilities that would enrich the diversity of tourism facilities in Lantau, though it can be viewed that recreational facilities associated with the future educational institutions of Theme 2 can be potentially opened for the general use of the public besides the future students. Nonetheless, Theme 3 also features some educational facilities and with all things considering, it is assessed that Theme 3 performs the best under this criterion based on the amount of land provided for tourism/ recreational uses.

(d) To achieve synergy with the developments in Lantau

With the heightening of Lantau's strategic position as an international and regional gateway, several large pieces of land on Lantau have considerable potential for strategic economic use as well as the potential topside residential development of the SHW, Theme 2 is identified to be more suitable for fostering the economic development in line with the strategic positioning in North Lantau. It provides high-quality office clusters, comprehensive business supporting services to create synergy with the development of the Lantau Island and PRD Region as well as the opportunities from the new strategic transport infrastructure. This will facilitate Lantau to become a major strategic platform for pillar industries in Hong Kong and provide substantial employment opportunities. Thus, Theme 2 performs the best under this criterion.

(e) Generation of high value added employment opportunities

In terms of generation of high value added employment opportunities, Theme 1 proposes around 300 high-value added jobs such as for pharmaceuticals, art, etc. at the planned logistics

site. Meanwhile, most of the 940 and 704 jobs under the proposed educational facilities of Theme 2 and Theme 3 are considered as high valued added employment opportunities as well. In terms of the amount of high value added employment opportunities provided within each of the three themes, Theme 2 has the most and thus performs the best under this criterion.

(f) Provision of regional commercial development

In terms of the volume of regional commercial development, Theme 3 performs the best due to the provision of hotels/ resorts, which would draw a larger scale of workers and provides services for the territory and even the surrounding regions as a whole, as compared to only the SHW area and North Lantau Corridor. Theme 2 which features specialized educational uses and jobs which can also possibly generate commercial development in regional scale. For Theme 1, commercial services are envisaged to serve the local populations. Theme 2 and 3 performs better in this criteria.

(g) Provision of local commercial services

Theme 1 has a total area of 6.6 ha planned for commercial uses, which would produce about 7,230 jobs. Compared to Theme 3 which features more regional commercial uses and jobs of hotels/ resorts, and Theme 2 which features more specialized educational uses and jobs, Theme 1 has the highest provision of commercial services and jobs for the local populations along the North Lantau Corridor, which includes the existing/ future populations in SHW and nearby Tung Chung. Therefore, Theme 1 performs the best in terms of providing local commercial services and jobs.

(h) Provision of education uses

Theme 2 focuses on providing a "Quality Living cum Knowledge Zone", with around 17.9 ha of land designated for educational uses. With PR3, This equates to a GFA of 375,900 sqm and a student population of around 18,795. Meanwhile, educational uses are also provided in Theme 3, but only 13.4 ha of land is provided for such use which equates to 281,400 sqm and a student population of 14,070. No educational uses are proposed for Theme 1. With more educational facilities provided compared to the other

themes, Theme 2 performs the best for this criterion.

3.3.2.4 Improve Accessibility and Strengthen the Linkages to the Residential/Job Clusters in Urban Core and Adjacent Residential/Job Clusters

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To improve accessibility and strengthen the linkages to the urban areas and adjacent residential/job clusters	(a) Provision of railway transit for residents and workers
	(b) Provision of new road connections to other parts of North Lantau
	(c) Provision of pedestrian linkage to adjacent areas and cycling facilities

(a) Provision of railway transit for residents and workers / Impact on Existing Tung Chung Line

(i) The potential SHW railway station being explored by MTRCL has been considered for all the themes, and provides a railway access for the population in the development area.

(ii) The existing Tung Chung Line is working at high loading. Amongst the three themes, it is identified that Theme 2 is the least critical case in terms of the effect on existing Tung Chung Line as Theme 2 has the smallest population/employment and contributes the least patronage generation to the existing Tung Chung Line.

(b) Provision of new road connections to other parts of North Lantau / Traffic impact on existing road in North Lantau

(i) Road P1 (Section between Tai Ho and Sunny Bay) has been considered under all three themes. This will provide an alternative road link accessing urban areas via North Lantau Highway (NLH) at Sunny Bay Interchange, which forms part of highway infrastructure packages with the potential Route 11 or Tsing Yi – Lantau Link to alleviate traffic congestion in North Lantau in the anticipated future. In addition, the land requirement for proposed strategic link to Southeast Lantau,

possibly via Mui Wo, within the proposed reclamation area has been taken into account in all three themes. This will provide a strategic road corridor connecting NWNT, North Lantau, the ELM, and Western Hong Kong Island, which forms part of the ELM-associated strategic highway network in the long term.

(ii) Based on the initial findings of the preliminary TTIA, it is envisaged that Lantau Link would experience traffic congestion under both with and without the proposed SHW development in design year 2031. Amongst the three themes, it is identified that Theme 2 is the least critical case by considering the traffic performance of the existing/ planned external road corridors connecting to North Lantau as Theme 2 has the smallest population/employment and contributes the least traffic generation to the local traffic network. Thus, theme 2 performs better for this criterion.

(c) Provision of pedestrian linkage to adjacent areas and cycling facilities

For all the themes, a comprehensive pedestrian network shall be established to promote a pedestrian friendly walking environment. Possible pedestrian connections directly linking to the potential SHW railway station will be explored to enhance the accessibility to railway transit, while a comprehensive cycle track network within the reclamation area will also be established for integrating the future cycle track network in North Lantau. As such, all themes perform equally well for this criterion.

3.3.2.5 Create Attractive and Continuous Waterfront for Public Enjoyment

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To create an attractive and continuous waterfront for public enjoyment	(a) Optimization of the waterfront frontage for public enjoyment and creation of vibrancy along the waterfront
	(b) Sensible building height profile at the waterfront

(a) Optimisation of the waterfront frontage for public enjoyment and

creation of vibrancy along the waterfront

For all the themes, a network of open spaces is provided along all the waterfront of the reclamation sites to increase the liveability or public enjoyment and vibrancy. Beyond serving as a vital pedestrian link that allows residents/ workers to walk between the two reclamation areas, while a similarly sized open space at the northernmost tip of Site A for all the themes will function as a major public space and lookout point. As such, all the themes perform equally well for this criterion.

(b) Sensible building height profile at the waterfront

While the building height designs along the waterfront are designed sensibly for all the themes according to the nature of their uses, the theme with uses of the least visual impact along the waterfront would be Theme 2, with mostly residential uses of PR2 and building heights of 10 to 12 storeys at Site A, along with educational uses of PR3 and building heights of 12 to 14 storeys at Site B. Meanwhile, residential uses of PR4 and PR5 for Theme 1 along the waterfront between the two sites ranges from 22 to 27 storeys (+80 to +100mPD), and hotel/ resort uses along the waterfront for Theme 3 are mostly 12 to 14 storeys. As such, with uses that feature a larger number of lower building heights along the waterfront, Theme 2 performs the best for this criterion.

3.3.2.6 Enable Cost-Effective Solution, Smooth Implementation and Holistic Developments, in particular for Transport Infrastructure

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To ensure cost-effectiveness and smooth implementation	(a) Optimisation of reclamation extent for development
	(b) Reference with the AHR on development intensity
	(c) Timely implementation programme
To develop in a holistic manner	(d) Programme interface with surrounding infrastructures

(a) Optimisation of reclamation extent for development

Based on the multiple constraints to reclamation, the reclamation extent is fixed on a consistent basis for all the themes and thus perform equally well.

(b) Reference with the AHR on development intensity

All three themes make reference to the existing constraints of the AHR for the proposed land uses and development intensity, whether the sites are utilized for residential, education, commercial, hotel/ resort uses, etc. It is noted that there is the potential to review the AHR which may have implications on the existing constraints associated with the AHR, but as a whole, all the themes perform equally well with referencing the AHR on the development intensities proposed.

(c) Timely implementation programme

With the possible topside development of MTR SHW Depot, SHW railway station and AHR review, there are various factors that could potentially affect the implementation programme of proposed land uses for each of the themes. Amongst the three themes, Theme 1 shows the largest daily rail person trip generator. Thus, the largest population (residents/ students/ workers) would be affected if the potential SHW railway station cannot implemented in a timely manner. In contrast, the proposed low-density quality living and knowledge zone of Theme 2 and hotel/ resort facilities areas with educational facilities of Theme 3 would rely less heavily on having an additional railway station at SHW as it is expected that commuters would alternatively travel by private vehicles or shuttle buses. With less factors that would affect its implementation, Theme 2 and 3 could be potentially implemented in a more timely manner compared to Theme 1.

(d) Programme interface with surrounding infrastructures

(i) All three themes are developed assuming that the nearby facilities including SHW WTW, SHW STW, Chlorine Transhipment Dock and OWTF remain at the current location. There is no interfacing issue with the possible relocation of these facilities.

(ii) All three themes require the construction of new supporting road networks. There is no remarkable difference between the three themes in terms of programme interface with road networks. Amongst the three themes, Theme 1 shows the largest daily rail person trip generator. Thus, the largest population (residents/ students/ workers) would be affected if the potential SHW railway station cannot implemented in a timely manner

(iii) The sewage generation and water demands for Theme 1 is larger than the other 2 themes due to the larger population/employment involved and give higher loading to the SHWWTW and SHWSTW. Taking into account the sewage demand of all existing and planned development in the catchment served by the SHWWTW and SHWSTW, upgrading of the plants are necessary and the implementation schedule will be interdependent to each other. With a smaller sewage generation and water demand in Theme 2 and Theme 3, they may possibility be catered for more readily and thus performs better.

3.3.2.7 Minimize Environmental Impacts

Evaluation Principle and Criteria

Evaluation Principle	Evaluation Criteria
To minimize environmental impacts	(a) Careful land use allocation to mitigate noise and air quality impact from highways
	(b) Consideration of the PHI CZ to minimize the hazard to life impact
	(c) Consideration of design to be compatible with Tai Ho Wan

(a) Careful land use allocation to mitigate noise and air quality impact from highways

With a close proximity of HKIA which is a very busy airport operating 24 hours, aircraft noise due to overflight of approaching and departing aircraft is anticipated for the proposed development.

Theme 3 has the most non-sensitive uses, that are less susceptible to noise impacts. The proposed development including hotels may not be sensitive to noise impact as central air conditioning, rather than open windows for ventilation, is assumed. Theme 2 has slightly more sensitive uses, such as residential, than Theme 3. Theme 1 has the most sensitive uses in terms of housing that could be potentially more exposed to these impacts

Mitigation measures for noise and air quality impacts from the highways has been taken in account in the development of all three themes, such as setback distance of 150m from NLH for sensitive uses. Nonetheless, Theme 3 has the most non-sensitive uses that are less susceptible to noise impacts. Theme 2 has slightly more sensitive uses, such as residential, than Theme 3. Theme 1 has the most sensitive uses in terms of housing that could be potentially more exposed to these impacts. Theme 2 and Theme 3 perform better in this criterion.

(b) Consideration of the PHI CZ to minimize the hazard to life impact

All three themes take the PHI CZ into consideration to minimize the hazard to life and suitable uses such as logistics or commercial, with appropriate development and employment densities proposed. In this regard, all three themes perform equally well.

(c) Consideration of design to be compatible with Tai Ho Wan

Tai Ho Wan and the priority site for enhanced conservation due to the ecological significance of the area is considered in all themes, with the sense to limit potential impacts or optimize the design to reveal, capitalize, and protect the potential value of this area. While there are no apparent developments that would infringe upon the Tai Ho Wan area for Theme 1, Theme 2 and 3 excel more in the sense that Theme 2 proposes only low density housing that is located at a distance from Tai Ho Wan as well as educational facilities that could potentially be used to house programs for eco-education and emphasize the protection of these valuable natural resources and areas. Meanwhile Theme 3 proposes hotels/ resorts to enhance the tourism opportunities of Lantau and could draw focus on utilizing the Tai Ho Wan area for eco-tourism purposes. As such, it can be analysed that both Theme 2 and 3 have their merits in the planning the design to Tai Ho Wan and perform

better, while Theme 1 has no distinguishable merits.

3.3.3 A summary of the broad evaluation on the relative performance of the Initial Land Use Themes are summarized in **Table 3.7**:

3.3.4 From the evaluation, it is considered that Theme 2 "Mix of Residential and Education" performs better balance of the evaluation criteria, in particular on aspects of achieving synergy with the development in Lantau, high value added employment opportunities as well as sensible building height profile at waterfront. It also directly echos the planning direction of the "North Lantau Corridor" and foster SHW as a "Quality Living cum Knowledge Zone". The provision of lower density residential development and educational facilities addresses the major territorial demands for housing, yet provides a sizeable amount of land for educational facilities. Besides being largely compatible with the surrounding environment despite the range of constraints imposed on the SHW sites, these educational facilities also provide a large amount of high value added jobs that bolster the employment opportunities in the territory.

3.4 Updated Initial Land Use Theme 2

3.4.1 Theme 2 was further updated under the Theme of "Mix of Residential and Education" to take into account the broad evaluation and assessment, and to incorporate comments from various departments. The plan and section of the updated Initial Land Use Theme are shown in Figures 3.7. The land use budget and development parameters are summarized in **Tables 3.8 and 3.9**.

Development Theme and Design Vision

3.4.2 The Updated Initial Land Use Theme 2 would carry the similar planning cision which cater for both the territorial housing demand and offer educational space including professional learning facilities for different pillar industries. The proposed education and training service will echo the planning direction for North Lantau development (including SHW) as "Northern Lantau Corridor" and foster SHW's position as a "Quality Living cum Knowledge Zone". This theme's proposal generates a generous amount of high-value added employment opportunities.

3.4.3 Design Objectives for Updated Initial Land Use Themes are summarised below.

(a) This theme aims to complement the mixed-use design vision for the area by:

(b) Providing a balanced combination of high quality and waterfront housing and educational/training facilities that will attract talents from abroad and benefit the wider Lantau;

(c) Optimizing compatibility of the residential components of the site with the waterfront areas as well as the planned SHW Depot top-side development to create a varying building height profile which could also avoid dominating the waterfront and creating an impermeable "wall" along waterfront;

(d) Preserving the conservation value of the mountainous land area adjacent to Tai Ho Wan while increasing their potential for eco-education (providing facilities such as a visitor centre and a botanic garden)

(e) Utilizing the reclaimed land within the PHI to the east of the proposed reclamation by providing uses that are both compatible with the zone as well as serve the strategic commercial/ educational role of the site;

(f) Utilizing the hillside areas to the south of the NLH for educational uses in buildings that will be compatible with the noise nuisance from the highway and will also provide a buffer to allow development of new housing further uphill; and

(g) Ensuring the future development capitalizing on the proposed land assets and being designed to increase value for the wider Lantau community.

(h) The design vision for the reclamation and landside development will be realized by configuring the aforementioned design objectives within the future development. These are intended to ensure that future development is suitable to serve as a new hub for educational accomplishment while balancing the territorial housing needs.

3.4.4 Design Concepts of Updated Initial Land Use Theme 2 are discussed below.

3.4.4.1 Building Height Profile

(a) Housing development in the west part of the reclamation (Site A) is optimized to be compatible with the waterfront location. As such the development intensity reaches a PR3 along the coastal edge, providing a maximum building height up to 12 to 14 storeys. The PR of the housing and commercial developments are optimized to be compatible with the waterfront location in order to establish a stepped building height profile in responding and integrating with topographical setting and the planned development nearby. It is also intended to create vibrant waterfront and public space in human scale to establish a balanced community for inhabitants and visitors. At the geographical centre of the west reclamation, an area for educational uses of PR3 reaches a maximum height of about 12 to 14 storeys.

(b) Development within the PHI CZ in Site B is restricted in intensity. Thus development intensity for the proposed commercial uses will reach a PR0.2 to comply with the restrictions of an assumed maximum 300 occupants. The Computer/ Data Process Centre, Clinical Laboratory or other similar use which are less labour-intensive planned for this area would provide supporting facilities to enrich the education and training/ retraining offer for the pillar industries as well as emerging industries. This provides a maximum height of about 1 to 2 storeys for these structures. The housing site in the eastern reclamation outside the consultation zone (CZ) of the PHI reaches a PR3 providing a maximum building height up to 12 to 14 storeys and do not exceed the existing AHR.

(c) Areas along the landside (Site C) of the Study Area are subject to AHR. This will restrict their maximum height according to their elevation on the hillside slope with the educational buildings closest to the NLH reaching a maximum height of about 40m which also provide a barrier to the highway's noise, allowing building uphill at a further offset distance from the NLH to be developed for residential purposes. The four residential sites will reach a maximum building height of about 55m.

(d) The actual building height is subject to the review of AHR conducted by CAD and the Preliminary Airspace Protection Plan Study for the future operations of Three Runway System (3RS) of the HKIA being conducted by AAHK.

3.4.4.2 Open Space Network

(a) A network of open spaces is provided along the reclamation areas (Site A & B) to increase the liveability of the proposed residential areas to the west while continuing westward to provide a vital pedestrian link that can enable residents and workers to walk between the two areas. The waterfront promenade will reach about 20-30m in width along the coastal perimeter of the reclamation (except at the bottleneck area where only a footpath of about 5m and standard cycle track of 4m will be provided along Road P1). A 8.9 ha open space at the northernmost tip of Site A will function as a public space for residents, students and workers in the area.

(b) Within the landside part of the Study Site (Site C), the development platforms are arranged similar to Theme 1 within the vegetated hillside areas. It is expected that this will maximize the green cover within the site's area and provide possible pedestrian routes between individual platform developments as well provide access to hiking trails leading to the Country Park as well as the conservation areas around Tai Ho Wan. For the pedestrian connection, it is anticipated that a potential pedestrian linkage can be established from Site C to the potential future MTR Station at Siu Ho Wan, which would bridge the linkage further to Site A and the waterfront promenade while there is an existing footpath along Sham Shui Kok Drive which allows pedestrian getting across the North Lantau Highway.

3.4.4.3 View Points and Corridors

(a) Within the western reclaimed portion of the Study Site (Site A), the building and site layout will follow a number of northwest-southeast public pedestrian routes that will also function as view corridors to visually connect the waterfront to the vegetated slopes further south. The reclamation itself is configured with a number of subtle curves to maximize visual interest. The effectiveness of the proposed view corridors should be taken into account the proposed development atop Siu Ho Wan depot in detail design stage of the project.

(c) A major open space is located along the waterfront at the northernmost point of the west reclamation. This is strategically configured to provide panoramic, 180-degree views towards Tuen Mun to the north, the marine park to the east and the TM - CLKL viaduct to the west.

3.4.4.4 Proposed Initial Land Uses

(a) Land Use Mix and Development Intensity

Site A

(i) Low to Medium Density Residential PR3

With the proximity to an established railway line and with the persisting demand for housing supply in the territory, it is viewed that an increase in plot ratio for housing from PR2 to PR3 can be adopted at the reclamation areas to optimize the housing output, while also being compatible with the surrounding landscape and topographies. As such, four residential development sites with PR3 are proposed in Site A. These are proposed to provide a residential community to complement with the nearby residential development atop of the MTR SHW Depot. Moreover, the residential sites could possibly be served by the potential future railway station at SHW, providing convenient public transport access to the urban cores and the rest of North Lantau. The residential developments at Site A of 8.5ha in total will produce around 1,983 units for 5,276 population.

(ii) Educational PR3

Two sites of a total of 7.6 ha are reserved for private professional learning facilities/ tertiary educational uses (with accommodation) to correspond to the developments in North Lantau as proposed under the PMP Study. The educational facilities are expected to generate 399 jobs.

(iii) Commercial PR3

Adjoining the Road P1 at the southern tip of Site A, 1.3ha has been reserved for commercial developments of PR3 to serve the local and regional population with 1,365 jobs expected to be generated. The site adjacent to the Road P1 and the associated road infrastructure will be subject to potential noise pollution impact, mitigation measures may be required subject to further environmental assessments.

Site B

(iv) Low to Medium Density Residential PR3

In order to enhance the housing supply in SHW to enhance its vibrancy and foster creation of a quality community, the education site in the eastern reclamation outside the PHI CZ is proposed to be amended to a housing site. Similar to the 4 sites in Site A, the housing site is proposed with building height of 12 to 14 storeys which do not exceed the existing AHR. The low to medium density residential site of 5.8ha is proposed with a domestic PR of 3 in Site B. It is expected that this housing site will produce around 1,353 units for about 3,600 population.

(v) Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses PR0.2

- Low density Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses are proposed in Site B within the PHI consultation zone in order to provide test bed facilities for supporting the education and training/ retraining services for the pillar industries as well as the emerging industries. Two sites of 19ha are reserved for these uses which are expected to be less labour-intensive or allows for lower level of manned operation. Similar to Theme 1, taking into account the possible risk of hazard to life arising from the adjacent PHI, the number of permitted working population of the area within the PHI CZ would be constrained subject to quantitative risk assessment. With the proposed PR of 0.2, it is assumed that the proposed Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses would generate about 300 jobs. Furthermore, transitional land use (e.g. amenity strip) between the proposed "Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses" and the proposed "Low to Medium Density Residential" use may be required in order to minimise any potential interface issue subject to the detailed design and technical assessment.

- WSD is conducting a risk assessment on the reduction of chlorine risk associated with SHWWTW by conversion

from drum draw-off to cylinder draw-off. If such conversion is found technically feasible and cost effective and finally implemented, the PHI CZ of SHWWTW could possibly be reduced from 1 km to 400m.

(vi) Strategic Road Interchange

To ensure the feasibility of providing a strategic highway link leading to ELM, possibly via Mui Wo, a new interchange at SHW is investigated and proposed under this Study. In addition, the possibility of constructing slip roads connecting the proposed TM - CLKL to SHW at the newly proposed SHW interchange will also be explored, subject to the further studies on the weaving requirement and land constraints. An area of 12.6 ha has been reserved for the new interchange. Within the interchange area, its usage is subject to potential restrictions due primarily to its inclusion within the PHI CZ which restricts the number of simultaneous users within its extents. In addition to the proposed commercial use, it is conceived that there may have opportunities for provision of a regional open/ green space as an alternative land use which will be subject to the further studies on the design of the new interchange and its slip roads and the risk assessment on the chlorine risk associated with SHWWTW. Subject to the aforesaid risk assessment, the provision of open space in this location may therefore be challenging to implement and manage subject to policy support and implementation/ maintenance support by relevant government departments.

Site C

(vii) Low Density Housing PR 1.5

A lower density of residential community is proposed in Site C (total area of 1.3ha) where the topography poses constraints to develop higher density residential developments. The three sites proposed for low density housing are proposed 150m away from the NLH to mitigate the potential noise pollution impacts. The low density residential sites in Site C are expected to produce 152 units with about 403 population.

(viii)Educational PR3

8 sites with PR3 (total area of 4.5ha) are proposed in Site C for private professional learning facilities / tertiary educational uses (with accommodation) with 236 jobs expected to be generated similar to the ones proposed in Sites A and B.

(b) Population Size and Housing Mix

(i) Compared to Initial Land Use Theme 2, this theme provide more housing units and accommodates total population of 9,279 in 3,488 flats.

(ii) It should be noted that it is premature to determine the public: private housing mix at this early stage in determining the initial land use theme options. Nevertheless, in view of the low plot ratio (PR3), it is assumed for the purpose of demonstration of land use theme and subsequent technical assessment that all residential development is private housing under the Updated Initial Land Use Theme 2. Consideration for provision of flexibility to cater for either private / public housing in the land use themes will be given throughout the study.

(c) Employment

A total of 2,300 jobs are expected to be created. While restricted by the PHI CZ, a maximum working population of 300 is assumed to work in the commercial sites in Site B.

(d) Students

The number of students is 12,705 taking into account of the staff : student ratio of 1:20.

(e) GIC and Open Space

For broad brush estimate, a GIC site with an area of 1 ha has been proposed which could accommodate a range of GIC facilities, such as schools, sports centre, health centre/clinic, subject to the requirements/requests from various Government bureaux/departments. In addition, a 30% large site reduction factor has also been conservatively assumed for the population estimates, which could provide additional site to accommodate additional GIC facilities at a later stage of the study, if necessary. 8.9 ha open spaces

are also proposed, including 7.2 ha waterfront promenade (Assume the residential development at the SHW MTR Depot will provide the GIC facilities and open spaces required for their population).

(f) Internal and External Connection

(i) The potential future railway station and public transport terminal adjacent to/ within the MTR SHW Depot may possibly be the main public transportation hub for external connection to the urban areas and Tung Chung new town. The need of additional public transport interchange within the proposed reclamation area shall also be studied at later stage of project. NLH and the proposed strategic link to East Lantau Metropolis (ELM) will be the main external road connection linking to the HKBCF, Tung Chung and/or other parts of HK.

(ii) A comprehensive pedestrian network shall be established to promote a pedestrian friendly walking environment to support SHW Reclamation and Landside Development in later stage of project.

3.5 Potential Long-term Land Use Theme

3.5.1 As required under the Study Brief, a potential Long-term Land Use Theme assuming that the SHWWTW, SHWSTW, SHW Police Vehicle Pound, North Lantau Transfer Station, Organic Waste Treatment Facilities (OWTF) and potential columbarium developments in the area was relocated into caverns have been studied. Figure 3.8 shows the locations of these facilities. The possible land use theme are shown in Figure 3.9. The additional site area is about 34.7 ha.

3.5.2 This potential long-term land use theme as well as the initial land use theme do not represent that the land use theme has been confirmed, and shall not pre-empt other possible land uses options for the site when the Government considers necessary to carry out a detailed planning and engineering study in future.

4 Preliminary Reclamation Study

4.1 General

4.1.1 If residential sites allocated to HA were located on the reclamation area, consolidation settlement of the reclaimed land should be assessed and evaluated to ensure the land was suitable for public housing development.

4.1.2 It is anticipated that there exists thick layer of soft marine clay below seabed at the reclamation site. There will be short-term and long-term settlements of the ground due to the filling works above. Suitable ground treatment should be provided to ensure that the settlement performance of the reclamation site is within acceptance level and suitable for the intended purposes including residential development and that the seawalls are stable during and after reclamation.

4.1.3 There is an existing submarine outfall located within the proposed reclamation site. This submarine outfall shall be protected and modified during the course of reclamation works.

4.1.4 The landside development site is located in steep sloping terrain and is subject to potential natural terrain hazards. NTHA shall be carried out in accordance with the guidelines given in GEO Report 138 and Technical Guidance Note TGN 36.

4.1.5 There are several marine facilities located in the vicinity of the proposed reclamation area that may be affected by the proposed reclamation development. These facilities include Pak Mong Pier, MTR depot berthing facility, Sham Shui Kok Anchorages No. 1 & No. 2, submarine outfall of Siu Ho Wan Sewage Treatment Works (SHWSTW), two mooring buoys, cardinal mark, North Lantau Refuse Transfer Station and Liquid Chlorine Trans-shipment dock (Figure 4.1). The impact to these facilities due to the reclamation development shall be critically assessed. Mitigation measures such as relocation, reprovision shall be considered if necessary.

4.1.6 Pak Mong Pier (Item 1) is located in the immediate west of the drainage outlet of Tai Ho Wan below the North Lantau Highway, and is far from the western end of SHW reclamation.

4.1.7 MTR Siu Ho Wan Depot (Item 2) operated by MTRCL includes a vertical seawall, which provides marine access for barges to deliver new trains and extra-long tracks for MTRCL urban lines. Trains are unloaded from the

barge to a set of rails which are then transported to the depot. There is no other feasible means of delivery of trains and extra-long tracks for urban lines.

4.1.8 The future Road P1 will intersect with the track connecting the existing vertical seawall and the SHW Depot. Hence, a vertical seawall will need to be re-provisioned to enable future loading of trains and tracks to the MTR Deport by marine means. The length of the vertical seawall to be provided shall be the same as the current length. The area immediately adjacent to the vertical seawall shall be free of other structures to facilitate lifting operations. Future Road P1 should also not pose any headroom constraint to their operation with respect to delivery of the trains and tracks. During construction stage, a temporary vertical seawall connecting to the SHW Depot will be required.

4.1.9 Sham Shui Kok Anchorages No. 1 & No. 2 (Item 3) were designated in year 2006 and are used by local vessels, river-trade and ocean-going vessels to anchor during typhoons and for mid-stream operation, i.e. transfer of goods between vessels. These anchorages are zoned as "Mooring Sites" within BMP was designated in end of year 2016. The extent of these anchorages remain the same after the designation of BMP. These anchorages are over 500m north of the proposed reclamation at Siu Ho Wan, and it is expected that the reclamation will not have any significant impact on these anchorages.

4.1.10 Siu Ho Wan Sewage Treatment Works (SHWSTW) is a chemically enhanced primary treatment works designed to serve the population in Tung Chung New Town, HKIA, Discovery Bay and Disneyland. The treated effluent of SHWSTW is discharged into the marine waters of North Western Water Control Zone via a 1.15km long and 1.84m diameter submarine outfall (Item 4). The proposed reclamation straddles across this submarine outfall. A cardinal mark (Q.2m3M) is located at the shore of North Lantau to demarcate the location of submarine outfall. The cardinal mark will need to be relocated to the new edge of SHW reclamation (Item 6). Three options were preliminarily considered to accommodate the existing submarine outfall in the proposed reclamation – (1) permanent diversion of the existing submarine outfall to a parallel off-line pipe which connects back to the riser sections of the existing outfall, (2) permanent diversion of the existing outfall to a new outfall, and (3) no reclamation above the existing submarine outfall. Each of these options have their own pros and cons, and will depend much on the cost-effectivenss and the interface between the SHW reclamation and the proposed extension of

SHWSTW. Detailed options assessment will be required in the future when both project implementation programmes are clearer.

4.1.11 Two mooring buoys (Item 5) located at Sham Shui Kok are used by the Fire Services Department (FSD) and the Hong Kong Police Force (HKPF). Both departments use these mooring buoys during typhoons and for mooring practice. FSD will conduct monthly mooring drill throughout the year, whilst the HKPF practises one to two times per week during typhoon season – around March to December. These mooring buoys will remain within BMP, which has been designated in end year 2016.

4.1.12 North Lantau Refuse Transfer Station (Item 7) operated by EPD is located at Sham Shui Kok with a waterfront berthing facility for loading containerised wastes collected from Hong Kong International Airport and Tung Chung New Town on to Refuse Transfer Vessel "North Lantau" to the West New Territories Landfill (WENT) at Nim Wan. "North Lantau" travels to WENT and returns once per day, and it berths at the station. The impact due to the proposed SHW reclamation development and works on this facility is insignificant as the movement of refuse transfer vessel is twice (two-way) a day only, and the reclamation will not encroach upon this facility.

4.1.13 The Liquid Chlorine Trans-shipment dock (Item 8) operated by WSD handles cylinders of liquid chlorine delivered by barges for the use of WSD. According to WSD, liquid chlorine bottles are transported by barges from Jiangmen to Hong Kong every two weeks. The route of the vessel is via the waters around The Brothers to this location. As the proposed SHW reclamation does not encroach upon this trans-shipment dock, operation of this facility would be insignificant affected.

4.2 Preliminary Design Considerations

Reclamation Formation Level

4.2.1 Reclamation provides a new land platform that connects to the existing land behind the existing coastline, and supports the building and land use developments and infrastructures within the platform.

4.2.2 The formation level of reclamation could vary within its own extent and is determined by considering multiple factors including, but not be limited to:

(a) Connectivity to the adjoining land and infrastructure;

(b) Attack by wave overtopping in consideration of climate change and the type/form of seawall;

(c) Provision of fall to gravity drainage system for discharge from the collection point to the sea at the outfall;

(d) Importance of land use against coastal flooding and backwater drainage flow; and

(e) Availability of fill materials.

4.2.3 From the as-built drawings of the existing seawall in SHW, the formation level of the existing land is +5.5mPD.

4.2.4 The seawall cope level against overtopping was preliminarily assessed and the ground level behind the seawall cope at +5.5mPD is preliminarily recommended in order to maintain the wave overtopping rate below the permissible rates in both normal and extreme loading conditions.

4.2.5 For the design of an urban drainage trunk system, a design return period of 200 years is recommended in the Stormwater Drainage Manual. This requires considering the flood level from a combination of 10-year return period rainfall and 200-year return period sea level. The 200-year extreme sea level is +3.50mPD and +3.90mPD when without and with SLR allowance respectively. The width of reclamation varies between 50m and 650m in the south-north direction. Considering a typical trunk drainage at a gradient of 1v:1000h falling in one direction across the full width of the reclamation, a level difference of 0.7m is required between the upstream end and the discharge point of the drainage. This means the invert level of the upstream end of drainage is +4.20mPD and +4.60mPD without and with SLR respectively. A freeboard of 300mm is recommended to provide the margin of safety, and the site formation level next to the drainage is estimated to be about +4.5mPD and +4.9mPD.

4.2.6 In order to form a continuous platform with the existing land, a reclamation formation level of +5.5mPD is recommended.

4.2.7 For the main reclamation, ground treatment in the form of vertical drains at 1.2m centre-to-centre triangularly spaced together with the placement

of 6m high surcharge is envisaged to be needed to ensure that the design residual settlement is less than the nominal value of 500mm. Additional treatment can be applied to further reduce the residual settlement.

Seawall Design

4.2.8 For the seawalls, the cope level was determined to reduce the risk of wave overtopping to the permissible value. Various options of seawall forms were preliminarily investigated and ground treatment is nonetheless required to provide an environmental friendly non-dredged solution. The seawall edge aligns approximately along the contour of -5mPD and can just allow marine plant to access to perform the treatment works. Deep cement mixing is envisaged to be required to treat the soft marine clay to enable the construction of rubble mound sloping seawall or vertical-faced blockwork seawall.

4.2.9 There is an existing submarine outfall aligning in the northwest-southeast direction, and a drainage reserve is required for this submarine outfall. A number of options to maintain or re-construct the outfall in conjunction with the reclamation works were considered so that the operations of SHWSTW could be maintained. These options nevertheless will need further investigation and study in the future.

4.2.10 An ecological friendly reclamation edge is proposed at the west end of the reclamation site. This provides the opportunity for the establishment of mangroves on this eco-shoreline. Supply of freshwater is possible from either the Tai Ho Stream or surface runoff from the drainage system on the reclamation.

5 Preliminary Site Formation Study

5.1 General

5.1.1 The landside development site is located at steeply terrain. It is obvious that any site formation and development at this site will be extensive and costly.

5.1.2 The site also has a lots of trees and several natural stream, and any site formation works will unavoidably cause adverse impact to these trees and the natural streams.

5.1.3 If residential sites allocated to HA were located on the landside area, Natural Terrain Hazards (NTH) Study and associated assessment should be carried out to ensure the potential sites were not affected or be affected by the NTH. Mitigation measures for the NTH should be in the form of rigid barrier and located outside the residential sites. All the site formation works and NTH mitigation measures should be completed prior to hand over the residential sites to HA for housing development. Site drainage system within the housing site should be separated from the adjacent area to prevent flooding of housing site by discharge from others.

5.1.4 The Geotechnical Engineering Office (GEO) of CEDD commenced the Long-term Strategy for Cavern Development – Feasibility Study under Agreement No. CE12/2012 (GE) on September 2012. Given the overlapping of the potential extent for landside development and the Strategic Cavern Area (SCVA) No. 44 of the Cavern Master Plan, the proposed development shall take account of the SCVA in order to preserve its cavern development potential as far as possible, e.g. by optimising the development layout to allow for certain potential portal access to the SCVA.

5.2 Preliminary Site Formation Options

5.2.1 Three preliminary site formation options were studied under this consultancy for the land side development. These include cut platform, elevated platform, and amalgamation of cut and elevated platform. Details including indicative layout and sections of the three preliminary site formation options are presented in **Figure 5.1 to 5.12**.

5.2.2 Among various options, cut platform (Option 1) has larger developable area, higher flexibility for future implementation and least landscape and

visual impact (with proper slope and landscape design). The excavated fill can also be used for reclamation of SHW.

5.2.3 The pros and cons of the three options are summarised in **Table 5.1**.

5.2.4 These preliminary options are solely developed for the purpose of comparison but do not represent the most suitable or cost-effective site formation scheme, which should be developed in the later stage of the Study, if any. Details of the proposed site formation options such as slope angle, platform level and extent etc. are only preliminary. More ground investigation work and detailed design shall be carried out in detailed design stage of the project, if any, to confirm the scale and extent of formation work.

6 Broad Technical Assessment

6.1 General

6.1.1 There are several on-going studies being carried out by others, the findings of which may result in additional development potential of SHW:- (i) the review of existing AHR at the Potential Development Sites (PDS) identified by CEDD under 2RS operations of HKIA conducted by CAD and the Preliminary Airspace Protection Plan for the future operations of 3RS of HKIA being conducted by AAHK; and (ii) the possible reduction of PHI CZ of SHW WTW from 1km to 400m due to the reduction of chlorine risk associated with SHWWTW by conversion from drum draw-off to cylinder draw-off under study by WSD.

6.1.2 Taking these into account, a scenario with buffer on the population had been explored for the purpose of broad technical assessment with an aim to testing the infrastructure capacity. Amongst the three initial land use themes, Theme 1 "Optimized Residential" with maximum population would be the most critical case in terms of technical assessment. For broad technical assessment, a maximum development potential, where PR5 for residential developments and PR3 for commercial developments in general have been assumed. These assumptions correspond to the similar proposed development in Tung Chung East. Key issues identified from the BTA are highlighted in following sections.

6.2 Geotechnical Appraisal

6.2.1 The reclamation area is located within the Designated Area of Northshore Lantau with complex geological conditions and marble-bearing strata.

6.2.2 Only limited information are available pertaining to the geological stratification in the reclamation area.

6.2.3 Within the land side development site, there are 38 nos. of land ground investigation records, including 6 trial pits and 32 boreholes.

6.2.4 Preliminary ground investigation and laboratory test were carried out under this consultancy. This includes 6 nos. of vertical boreholes within and near the landside development site, and 3 nos. of vertical boreholes at a few locations near the possible portal location / tunnel corridor for

possible connection to future ELM. The results from the project specific GI works indicated that no adverse features are identified. The geological strata, geotechnical parameters and groundwater level were generally agreed with the published records. Additional site investigation works shall be carried out at both reclamation and landside development area in later stage of the Project.

6.2.5 The landside development site is located underneath a natural terrain and may be subject to natural terrain hazards. It is necessary to conduct natural terrain hazard assessment (NTHA) and design necessary mitigation measures in future study in accordance with the guidelines and design requirements given in GEO Report No. 138 (2nd edition) "Guidelines for Natural Terrain Hazard Studies".

6.2.6 As the landside development site is located immediately adjacent to Cheung Tung Road and the North Lantau Highway, assessment on prevention and mitigation measures (e.g. highly effective and robust flyrock protective measures, non-blast buffer zone, temporary road closure, evacuation zone, etc) shall be carried out in the blasting assessment in future study.

6.3 Environmental

General

6.3.1 Aircraft approaching and departing from HKIA" is identified as one of the "key existing noise sources" which affects Siu Ho Wan Area (the Area). Although the Area falls outside the coverage of Noise Exposure Forecast (NEF) 25 contour under the HKIA three-runway system, the Area is in proximity to HKIA, which is a very busy airport operating 24 hours, aircraft noise due to overflight of approaching and departing aircraft should be assessed and adequately addressed. Relevant parties are encouraged to adopt noise mitigation measures as far as possible.

6.3.2 Statutory EIA and town planning process will need to be carried out in future study to critically assess various key environmental impacts (e.g. air quality, noise, water quality, waste, ecology, fisheries, cultural heritage, landscape and visual, hazard to life, etc.) and to formulate appropriate mitigation.

6.3.3 The existing NLH and the future Road P1 are the key emission sources. Locations of future Air Sensitive Receivers (ASRs) in the site may need to

be located away from these sources with sufficient setback in order to minimize significant adverse air quality impacts due to vehicular emission. Other mitigation measures, such as proper orientation of building layout, adoption of noise barrier or semi/full-enclosure along future Road P1, SHW Interchange and internal roads, adoption of acoustic design (e.g. silencers and enclosures), etc., may also be explored.

6.3.4 The chlorine storage at the SHWWTW may cause hazard to life issues to the workers during construction and future population in the area. A quantitative risk assessment (QRA) shall be conducted to evaluate such impact.

Reclamation

6.3.5 The proposed SHW reclamation area is in close vicinity to BMP, which encompasses historic hotspots of CWD habitat. Site-specific CWD had been carried out under the Study between Feb 2016 and Apr 2017 to study the current occurrence and behaviour of CWD in shallow waters of SHW as well as the fine scale usage of CWD habitat. Two surveys namely land-based theodolite tracking and passive acoustic monitoring (PAM) were performed.

6.3.6 A total of 72 days and 431.90 hours of land-based theodolite tracking have been conducted. No CWD were observed or tracked from SHW during this time. Over 4,800 positional fixes of vessels were collected over this combined period, with no concurrent tracks of dolphins and vessels (**Figure 6.1** for the positional fix of vessels off SHW).

6.3.7 Nevertheless, the PAM had recorded some usage in the area of SHW by CWD at night time. This indicated that CWD may avoid the anthropogenic disturbance in the area during the day time, while utilising the area more frequently at night.

6.3.8 Dolphin signals were detected at a greater rate at night (hours 1900 through 0600) than during the day (0700 through 1800) with more than two-thirds (66%) of detections occurring during night-time hours. There are mainly two types of vocals generated by CWD, namely whistles and clicks. Whistles are vocalizations with lower frequency for social communication, while clicks are vocals with higher frequency for echolocation. There are more click detections at night time for all Ecological Acoustic Recorders (EARs) at SHW, suggesting that more feeding activities occurred in the area at night. Whistles were detected at C4 at higher numbers during the

daytime, were rarely detected at C5, and were detected at C6 throughout all hours. (**Table 6.1 and 6.2, Figure 6.2 to 6.5** refers).

6.3.9 Seasonal pattern of CWD off SHW has been reviewed. CWD acoustic signals were detected at every EAR. Although EARs were typically only 1-2 km apart, dolphin detection metrics varied substantially among EAR sites. Dolphins signals were detected on more than 50% of days monitored at site C4 (the western site), and 22-33% of the days monitored at C5 and C6 (the central and eastern sites, respectively). Detection rates varied seasonally and were greatest during autumn (C4 and C5) or spring (C6) and lowest during summer (all EARs). Generally, dolphin detection rates were greater in the dry season and lower in the wet season at SHW.

6.3.10 SHW reclamation would cause the permanent loss of about 82 ha of marine habitat. This area is assumed to be approximately equal to the reclamation area assuming the geometry of the existing and new seawall are similar. Waters in the vicinity of SHW, extending all the way south to the North Lantau coastline were once a very important feeding habitat for CWD in Hong Kong (Jefferson 2000; Hung 2008). Especially the Sham Shui Kok area was a very consistent hotspot for CWD - the most important in Northeast Lantau, and dolphins fed and socialized extensively in this region. This area had the highest densities of CWD in the entire area of Northeast Lantau (Hung 2008).

6.3.11 The SHW reclamation extent has been proposed to be reduced to maintain a separation of 150m from BMP. Nevertheless, the potential impact on the marine park can still be significant due to its close proximity to the important CWD habitat, if the disturbance from reclamation is not properly addressed through stringent protection and mitigation measures.

6.3.12 Possible mitigation measures that should be considered to minimise the potential impacts may include:

(a) Use of non-dredging methods to reduce impact on water quality;

(b) Land-based disposal of all wastes from the site to reduce the risk of water contamination;

(c) Acoustic decoupling of any noisy equipment on barges to reduce noise disturbance to CWD;

(d) Pump sand fill from some distance away from CWD habitat (i.e. east of reclamation and BMP) using trailer suction hopper dredger;

(e) Deliver fill materials using land-based transport so as to reduce traffic volume of construction vessels;

(f) Restriction of speed and number of trips of vessel transport in the

area, so as to reduce disturbance from construction vessels and reduce risk of ship strikes, no stopover or anchoring within The Brothers Marine Park, all vessels to be equipped with Global Positioning System (GPS) and Automatic Identification System (AIS) for real time tracking and monitoring of their travel routings, speed, and anchorage points, etc.;

(g) Avoid construction during the peak calving seasons of CWD, which is between March and June (Jefferson et al. 2012);

(h) Use of Dolphin Exclusion Zones during construction;

(i) Reclamation work to proceed from shore, rather than from the water;

(j) No fast ferry service to the site during both construction and operation of project;

(k) Explore compensation for habitat lost and residual impacts although they are not truly mitigation measures.

6.3.13 The nearest mariculture site is Ma Wan Fish Culture Zone which is about 7km from the reclamation site. During Ebb Tide, tidal current converges and release of suspended solid and toxic substances from filling may affect that area. For capture fisheries, the fishing grounds in the North Lantau waters are partially of very low (>0 & <= 50 kg/ha) and partially of moderate (200 – 400 kg/ha) fisheries production according to Port Survey conducted by AFCD in 2006. There will be a permanent loss of about 82 ha of marine habitat due to reclamation. Incorporation of features with eco-shoreline functions on the future seawall, fisheries resources such as commercial fisheries species will be benefited. Working vessels in the vicinity outside the works area may cause disturbance on fishing operations during construction phase. Non-dredged construction method of seawall and reclamation are recommended to minimize the potential impact due to water quality deterioration. Deployment of silt curtain is also recommended to prevent increasing Suspended Solid to affect adjacent waters.

6.3.14 New artificial reefs will be deployed in The Brothers Marine Park, the proposed SHW Reclamation has avoided the encroachment of The Brothers Marine Park and a separation distance of at least 150m will be provided. The construction method of both seawall and reclamation will be non-dredged. This would minimize the potential fisheries impact due to deterioration of water quality. A more comprehensive fisheries impact assessment, including water quality assessment, shall be carried out under the statutory Environmental Impact Assessment at a future stage of the project.

6.3.15 Other ecological impacts due to reclamation may include permanent loss

of marine benthic habitat and soft substrate seabed which might be used by adult horseshoe crab, fishing grounds.

6.3.16 Marine archaeological potential areas may be affected by the proposed Siu Ho Wan reclamation, and marine archaeological impact shall be assessed in the EIA study

Landside Development

6.3.17 In order to field check and record the baseline ecological conditions of the potential development site and its surrounding area, an ecological site walk has been conducted between December 2015 and June 2016. The site walk included Habitat and Vegetation survey; terrestrial mammal survey; avifauna survey; herpetofauna survey; freshwater community survey; dragonfly and butterfly survey. 5 species of conservation importance, including Lamb of Tartary, Black-crowned Night Heron, Common Rat Snake, Romer's Tree Frog and Tiger Hawker were recorded within the proposed landside development site. Since birds, reptiles and dragonflies are relatively mobile, the direct mortality due to the site formation work is not expected. Generally, fauna of low mobility or low habitat use flexibility (i.e. Romer's Tree Frog) are more vulnerable to site formation, and might cause adverse ecological impact. Capture-and-translocation programme is recommended to minimise the potential impact on this species arising from the site formation works.

6.3.18 There is a bat roost in Tai Ho Wan which was a cave above the intertidal zone along the east shore of Tai Ho Bay. The bat cave is at about 500m from the proposed Landside Development site. To update the status of the bat cave reported by previous studies, bat survey was conducted between 2015 and 2016. Around 200 individuals of bat were recorded within the bat cave. The 2 bat species recorded, namely Pomona Leaf-nosed Bat Hipposideros pomona and Least Horseshoe Bat Rhinolophus pusillus are considered as species of conservation concern.

6.3.19 To minimize the impact to the bat roost site, vibration due to construction activities shall be minimized as much as possible. In addition, direct lighting to Country Park or Tai Ho Priority Site should be prohibited and night-time lighting in the construction sites should be controlled to reduce potential impact to nocturnal fauna (e.g. bats). The potential impact on roosting bats shall be assessed in future study.

6.3.20 'Secondary Woodland', 'Shrubland and Grassland', 'Plantation',

'Watercourses' and 'Urbanised Development' within the landside site will unavoidably be affected. Existing trees shall be retained and protected as far as possible. When avoidance is impossible, transplantation of plant species of conservation importance and compensation of affected habitats of high ecological value (e.g. woodland) shall be considered.

6.3.21 Offset distance from Lantau North (Extension) Country Park and Tai Ho Priority Site is recommended so as to minimise the potential ecological impact on these areas and to protect the riparian habitats of natural streams, particularly those supporting wildlife of conservation importance. The offset area will be used for screening woodland plantings, possible natural terrain mitigation works, drainage system re-provision and works area, etc.

6.3.22 There are several nos. of existing natural streams within the landside development area and these watercourses flow to Tai Ho Wan. The development shall minimize the impact to these natural streams as far as possible. Surface runoff from the landside development area might potentially affect the aquatic habitats and associated flora and fauna in Tai Ho Wan and Tai Ho Stream SSSI. Good site practice and temporary drainage system area recommended to reduce the potential impact of surface runoff to habitat, including Tai Ho Wan, and the associated fauna during construction phase. Besides, drainage system with gullies and grease and sediment traps could be installed to collect the surface runoff from the future development and to minimise adverse water quality to aquatic habitats (e.g. Tai Ho Wan).

6.3.23 The major habitats within the proposed landside development site are shrubby grassland and shrubland, which support low diversity and abundance of wildlife. The potential impact of habitat fragmentation due to the proposed development is not anticipated to be significant. Provision of wildlife tunnel/corridor for non-volant fauna (e.g. reptile) is recommended as precautionary measure to minimise the impact of fragmentation of habitats and/or risks of roadkill.

6.4 Civil Works

Sewerage Works

6.4.1 The estimation of the sewerage flow generated from the SHW development has been made. The Average Dry Weather (ADWF) is

estimated to be 19,670 m3/day under maximum development potential.2

6.4.2 SHWSTW is being relied upon for the treatment of the sewage arising from existing developments and planned developments in North Lantau including the Third Runway of HKIA and Tung Chung New Town Extension, etc. Based on the preliminary sewage flow from other concurrent project, it is noted that the design capacity of SHWSTW, i.e. 180,000m3/day, would be exceeded in about Year 2034 even without the proposed SHW Reclamation and Landside Development. The additional sewage demand from proposed SHW development (with maximum development potential) will cause the exceedance to shift to about Year 2029.

6.4.3 To cater for the uncommitted sewage arising from other developments in the catchment, a joint departmental working group is exploring the feasibility of the long-term expansion for the SHWSTW including the feasibility of expansion inside cavern. However, there is no scheduled completion date for the upgrading project. Therefore, should the proposed SHW development were to be planned for commissioning before the completion of the SHWSTW upgrading project, the proposed development would need to include an assessment for alternative sewage treatment as an interim measure. A new sewerage network and pumping stations would be required to collect sewage flow from the development which shall subsequently be conveyed to SHWSTW or proposed new treatment works for subsequent treatment and disposal.

6.4.4 It is noted from the existing DSD Drainage Record Plans and the planned sewerage estimates from other possible future developments that sewage from the existing and planned developments would be conveyed to SHWSTW by a number of rising mains. Further investigation on the feasibility to minimise the number of rising mains entering to SHWSTW (e.g. proposing a centralise sewage pumping station for Siu Ho Wan Reclamation and Landside Development, or making use of other existing / planning sewage pumping stations and etc.) will be required in the later stage of the Project. One of the major considerations on minimising the number of rising mains by using a centralisated sewage pumping station is the programme of implementation. The implementation of this Project is likely to be undertaken later than the planned developments at North Lantau (e.g. Tung Chung New Town Extension). The centralised sewage

[2] The Average Dry Weather Flow (ADWF) are estimated to be 10,490m^3/day (for Theme 1), 2,931m^3/day (for Theme 2), 5,532 m^3/day (for Theme 3) and 4,585 m^3/day (for updated Initial Land Use Theme 2).

pumping station might not be able to match with the population intake of other planned developments at North Lantau. A review of the project programme together with those for other planned developments will be required. In addition, further liaison with EPD and DSD on the emergency measures for the new pumping station(s) (e.g. sewage by-pass / overflow, emergency storage and etc.) with consideration of environmental issues and maintenance resources for the measures will be required.

Water Supply

6.4.5 The fresh and flushing water demand under maximum development potential at SHW development is estimated to be 21,950m3/day and 4,580m3/day respectively3.

6.4.6 The existing capacity of SHWWTW is 150,000m3/day. This is not adequate to meet the projected maximum mean daily demand of 248,480 m3/day within its water supply zone (including maximum development potential at SHW development and other developments in North Lantau). The planned extension of SHWWTW to an ultimate capacity of 300,000m3/day by the WSD and the associated water transfer facilities will therefore be required.

6.4.7 New fresh water services reservoir (approximately 19,000m3) located adjacent to SHWWTW is envisaged to be required to supply fresh water to SHW development under the scenario with maximum development potential4.

6.4.8 Drainage Works

6.4.9 According to the DSD drainage record plans, there are seven existing drainage outfalls along the existing shoreline which conveyed the runoff generated from the project site. These outfalls will be connected to new drainage box culverts within the reclamation prior to discharging to the sea. The drainage impacts, considering the additional surface runoff from the reclamation, will need to be investigated in detail when the land use layout is determined in the future study. If the hydraulic performance of

[3] The fresh and flushing water demand for Initial land use themes are 12,323 m^3/day and 2,557 m^3/day (for Theme 1), 2,562 m^3/day and 850 m^3/day (for Theme 2), 4,248 m^3/day and 1,261 m^3/day (for Theme 3) and 4,707 m^3/day and 1,067 m^3/day (for updated Initial Land Use Theme 2)

[4] New fresh water services reservoir with volume of approximately 19,000m^3 (for Theme 1), approximately 2,200m^3 (for Theme 2), approximately 3,700m^3 (for Theme 3) and approximately 4000 m^3 (for updated Initial Land Use Theme 2) located adjacent to SHWWTW is envisaged to be required to supply fresh water to SHW development.

these extended box culverts were found to be not acceptable, alternative solution such as aligning an open sea channel between the existing North Lantau shore and the Siu Ho Wan reclamation for discharge of runoff from these outfalls, should be considered. For the reclamation area, U-channels will be provided mainly alongside the pedestrian route to intercept stormwater runoff within its sub-catchments in the site boundary. For the landside development, storm drains will be provided mainly alongside the landside carriageway to intercept stormwater runoff within its sub-catchments in the site boundary.

6.4.10 Climate change may have impact to the design of future drainage system, such as increase in annual rainfall and sea level rise, land formation level and reclamation extent. The projection of climate change effects as promulgated in the updates of Port Works Design Manual and Stormwater Drainage Manual shall be considered in future design.

6.4.11 Drainage Impact Assessment is required to further assess the potential drainage impacts arising from the proposed sites to the existing drainage system. Mitigation measures should be recommended, if necessary, to alleviate the impacts. Other sustainable drainage systems, such as stormwater storage lakes, permeable pavement and rain gardens, shall be explored at later stage of the project.

7 Road Link

7.1 General

7.1.1 Under the Brief, the Consultant is required to assess the preliminary feasibility of a road link between North Lantau to the proposed East Lantau Metropolis (ELM), possibly via Mui Wo based on a broad-brush approach under the following scenarios:

(a) Scenario H1: Connecting to the existing network at SHW via the proposed interchange near Tai Ho;

(b) Scenario H2: Connecting to the existing network at SHW via an alternative connection point;

7.2 Key Issues and Constraints

7.2.1 A key constraint map is presented in **Figure 7.1**.

7.2.1.1 Village Environs (VE)

Several village environs (including Pak Mong, Ngau Kwu Long, Tai Ho, Wong Fung Tin, Tung Wan Tau, Mang Tong, Chung Hau, Pak Ngan Heung, Mui Wo Kau Tsuen, Tai Tei Tong and Luk Tei Tong etc.) are identified within the study area when choosing tunnel alignment. The impact on the VE should be minimized in order to avoid lengthy negotiation, huge compensation and grave difficulties in resolving objections from the villages. The village environ is shown in **Figure 7.1.**

7.2.1.2 Private Lots, Short Term Tenancy and Government Land Allocation

(a) The existing Mui Wo area are covered by a large no. of private land lots. Every effort should be made to minimize the land requirement.

(b) Existing Short Term Tenancy (STT), permanent and temporary Government Land Allocations (GLAs) exists in Siu Ho Wan and Mui Wo Area. Relevant government departments were consulted to provide land status information for some of the area in Siu Ho Wan and Mui Wo. If the land have not yet been earmarked for future use at the time of construction proposed strategic road link, these land can be used.

7.2.1.3 Burial Grounds and Fung Shui Structures

(a) Burial grounds (No. BUL 28L – 37L) are identified in the vicinity of Mui Wo Area. The burial ground is shown in **Figure 7.1**.

(b) Compensation aside, liaison and arrangement for re-provision of burial grounds for the indigenous villagers and Fung Shui Structures are time consuming and complicated on cultural/technical/financial aspect. These issues have to be avoided as much as possible and handled carefully in order to avoid strong objections from local villagers.

7.2.1.4 Silvermine Bay Water Treatment Work (SMBWTW)

Silvermine Bay Water Treatment work is located on the shoulder of a hill near Mui Wo, at 90m above sea level, and is surrounding by woodland. An access road links the site to the South Lantau Road to the North. The proposed road tunnel corridor should avoid affecting the structural integrity of the water treatment work.

7.2.1.5 Country Parks

(a) Hong Kong's country parks are developed and managed for the purposes of nature conservation, countryside recreation and outdoor education, providing facilities and services for the public enjoyment, protecting vegetation and wildlife, and preserving and maintaining buildings and sites of historic or cultural significance. Development, which is defined as the carrying out building, engineering, mining or other similar operations in, on, over or under land, is prohibited without approval. The Country Parks Ordinance (Cap. 208) protects and restricts the destruction of or interference with vegetation within a country park or special area or the doing of anything which will interfere with the soil. Under the Country Parks and Special Areas Regulations (Cap. 208A), consent is required to bring any vehicle, excluding railway or tramway, in country parks. Soil and streams, pools and bodies of water are protected generally, but this does not override license consents granted under the Water Pollution Control Ordinance. On application to AFCD, development within Country Park and special area may be consented and subject to conditions or refused. The study area for this project falls within the three country parks in Lantau Island which are listed below:

(i) Lantau South Country Park occupies 5,640ha, borders with Lantau North Country Park in the north and ends at South Lantau Road in the south. To the west lies Fan Lau and to the east sits the coastal town of Mui Wo. It is the largest country park in Hong Kong and was designated in 1978. Because of its geographical uniqueness situating far from human activities, the Lantau South Country Park embraces a large variety of biodiversity.

(ii) Lantau North Country Park occupies a total area of 2,200ha and was designated in 1978. It encompasses Sunset Peak, Yi Tung Shan, Lin Fa Shan, northern slopes of Lantau Peak, Nei Lak Shan and the region north of Ngong Ping.

(iii) Lantau North (Extension) Country Park covers the hill slopes to the south of North Lantau Highway between Tai Ho Wan and Siu Ho Wan. In addition to the existing 7,800ha of designated Lantau North and South Country Parks, the Lantau North (Extension) Country Park was proposed in the 1999 Policy Address as a positive means to conserve the natural environment of Lantau, and was designated in 2008.

(b) The proposed road links shall not encroach into the Country Park at ground level and above-ground level. This poses a major constraint in determining the location of portals and/or ventilation building for the road link.

7.2.1.6 Sites of Special Scientific Interest (SSSIs)

(a) SSSIs may be land based or marine sites, which are of special interest because of their flora, fauna, or geological features. According to Chapter 10 of the Hong Kong Planning Standards and Guidelines (HKPSG), normally no new development will be permitted within a SSSI unless it is necessary for conservation of the site. The listing of SSSIs is primarily an administrative device to ensure that government departments concerned are aware of the scientific importance of such sites and to ensure that due consideration is given to conservation when development at or near these sites is proposed. AFCD should be consulted for any proposed development at or in the proximity of any SSSI. Tai Ho Stream SSSI is identified within the study area for this project.

(b) Tai Ho Stream SSSI is about 5ha in area and comprises the Tai Ho Stream and the inner part of Tai Ho Wan. Tai Ho Stream includes several tributaries that lie to the south and east of Tai Ho Wan, passing Tin Liu, Tai Ho San Tsuen, and merging just below Ngau Kwu Long, and entering Tai Ho Wan at its southern end. The importance of Tai Ho Stream to Hong Kong's freshwater fish fauna, and the linkages to other ecologically important intertidal habitats in Tai Ho Wan, qualify Tai Ho Stream as a habitat of high ecological value. Conservation and prevention of damage to the stream channel and riparian zone is essential. The Tai Ho Stream and part of its estuarine zone were designated as an SSSI in 1999 in recognition of the ecological importance of the stream and its fish fauna.

(c) The construction of tunnel portals, daylight section, and ventilation building and site formation works shall avoid encroaching in the Tai Ho Stream SSSI and its riparian zone.

7.2.1.7 Priority Site for Enhanced Conservation

(a) According to the new nature conservation policy, AFCD has formulated a list of priority sites for enhanced conservation, and Tai Ho ranks the third place in the list. Tai Ho is situated in the northern part of Lantau Island. The coastal area in Tai Ho is characterised by a narrow shallow flat plain which rises sharply to Sunset Peak. The upland areas are largely composed of shrubland and grassland, in addition to riparian woodland, streams and seasonal marshes. The main Tai Ho Stream and its tributaries run from upland all the way to the lowland estuary where mangrove and mudflat are found.

(b) Any interface between the construction of tunnel portals, daylight section and ventilation building and site formation works and the Priority Site for Enhanced Conservation shall be avoided.

7.2.1.8 Marshland and Other Ecologically Sensitive Areas in Mui Wo

(a) According to the approved EIA Report (AEIAR - 093/2005) for Drainage Improvements in Southern Lantau in Year 2005, freshwater marshes Luk Tei Tong Marsh have been identified in Mui Wo which comprise of active wet agriculture, inactive wet agriculture, pond, and river/ stream. The approximate location of the marshland is shown on **Figure 7.1**. Freshwater marshes are relatively rare habitats in Hong Kong. The ecological value of Luk Tei Tong Marsh was ranked as

moderate to high.

(b) Updated information on the extent of Marshland is not available and thus the extent of marshland in the above mentioned report is adopted as a reference for use in current Study.

(c) Apart from the Luk Tei Tong Marsh, Fung Shui Woodlands were also recorded at Luk Tei Tong and Pak Ngan Heung villages as shown on **Figure 7.1**.

(d) In determining the location of road link in Southeast Lantau, possibly via Mui Wo, the disturbance to marshland and the mature woodland shall be avoided/ minimized where possible.

7.2.1.9 Potential Hazardous Installation - Siu Ho Wan Water Treatment Works (SHWWTW)

(a) Siu Ho Wan Water Treatment Works (SHWWTW) is located near Tai Ho Wan on North Lantau. SHWWTW and the associated raw water and treated water transfer and distribution systems were commissioned in 1997 to provide treated water capacity of 150,000 m3/day. The site platform is about 30m above sea level, and has an area of 5.8ha. The SHWWTW has an allowable storage of chlorine at a capacity of up to 73 tonnes and has an annual chlorine consumption of 296 tonnes. The Hazard Assessment Study conducted in 1992 in assessing the risk levels of the SHWWTW related to the storage, handling and delivery of chlorine recommended a 1km radius (excluding land 50m in altitude above the chlorine building) centred on the chlorine building as the Consultation Zone (CZ) for SHWWTW.

(b) The hazard-to-life assessment for the approved EIA (AEIAR-149/2010) for Organic Waste Treatment Facilities, Phase 1 had been conducted taking into account all the best available information including but not limited to the population at existing facilities such as City Bus Ltd. Bus Depot, Siu Ho Wan Depot, North Lantau Refuse Transfer Station etc. Cost Benefit Analysis was carried out at that stage and mitigated results indicated that most of the risk level falls within the "Acceptable" region.

(c) Another hazard assessment for the approved EIA (AEIAR-158/2011) for Integration of Siu Ho Wan and Silvermine Bay Water Treatment

Works had assumed a population of approximately 1,317 persons during operation in Year 2018 within the 1km CZ. Results indicated that the level of risk to the population falls within the "as low as reasonably practicable (ALARP)" region of the Frequency-Number (F-N) curves after mitigation.

(d) WSD is now planning for a risk assessment on the reduction of chlorine risk associated with SHWWTW by conversion from drum draw-off to cylinder draw-off. If such conversion is found technically feasible and cost effective and finally implemented, the CZ of SHWWTW could possibly be reduced from 1 km to 400m. However, the risk assessment will not be available readily and there is no implementation programme of such conversion work yet.

(e) Where road link is proposed within the PHI CZ, a detailed assessment with Quantitative Risk Assessment (QRA) shall be carried out in future studies taking into account the transient population of the proposed strategic road link and the latest status of the possible conversion work in SHWWTW.

7.2.1.10 Potential Hazardous Installation - Silvermine Bay Water Treatment Works (SMBWTW)

(a) Silvermine Bay Water Treatment Works (SMBWTW) is located to the west of Silvermine Bay on East Lantau with daily treatment of around 165,000 m3/day. The site is formed at an elevation of about 90m above sea level, and has an area of 4.5ha. According to SMBWTW Hazard Report issued in 1989, the chlorine storage capacity of chlorine in the existing SMBWTW compound at a capacity of up to 17 tonnes, with six drums delivered approximately every 25 days. A CZ around the SMBWTW was defined by a 1 km radius circle centred on the works, and the coastline to the east and north east.

(b) According to the approved EIA (AEIAR-158/2011) for Integration of Siu Ho Wan and Silvermine Bay Water Treatment Works, it had assumed a population of around 9,730 persons during operation in Year 2018 within the 1km CZ. Results indicated that the cumulative level of risk to the population falls within the "Acceptable" region of the F-N curves after mitigation, with a narrow margin from the ALARP region.

(c) Where road link is proposed within the PHI 1km CZ, a detailed assessment with Quantitative Risk Assessment (QRA) shall be carried out in future studies taking into account the transient population of the proposed strategic road link and the possible developments in Southeast Lantau, possibly via Mui Wo under ELM Project.

7.2.1.11 The Brothers Marine Park

(a) There is a gazetted BMP at the north of the Siu Ho Wan Reclamation Development. The boundary of which is shown in **Figure 7.1**. The boundary and the neighbouring navigation channel poses a limit not only to the reclamation limit, but also to the road work extent.

(b) This particularly constrain the size and hence radius of curvature of the proposed Siu Ho Wan Interchange.

7.2.1.12 Interface with Road P1 and Tai Ho Interchange

(a) The planned Tai Ho Interchange will be the main access interchange to Tung Chung New Town Extension (East), the western part of Siu Ho Wan Development and the MTR Siu Ho Wan Depot Development. The planned location of the Tai Ho Interchange is a main consideration of the position of the proposed Siu Ho Wan Interchange for the road link.

(b) Currently the Tai Ho Interchange is needed to serve the Tung Chung East New Town Extension, the Siu Ho Wan Depot Top Side Development and the Siu Ho Wan Reclamation Development. The merging / diverging ramps to North Lantau Highway has limited reserved capacity to receive additional traffic from major development or major road.

(c) The design of the Siu Ho Wan Interchange should allow sufficient headroom for the planned Road P1 running underneath.

7.2.1.13 Tuen Mun – Chek Lap Kok Link

(a) The planned merging ramp and diverging ramp of TM - CLKL is a main consideration of the weaving traffic behaviour with the proposed Siu Ho Wan Interchange on North Lantau Highway.

(b) Currently the viaduct structure of TM - CLKL are in relatively high levels to cross the rail lines. There is no provisions for addition merging and diverging on the TM - CLKL mainline.

7.2.1.14 North Lantau Highway / Cheung Tung Road

(a) North Lantau Highway is a dual 3-lane expressway with posted speed at 110km/hr. The high speed on the expressway requires a relatively long junction separation and long weaving length for safe and efficient lane changing. This is a key consideration in the interchange location.

(b) Cheung Tung Road is a single 2-lane service road south of North Lantau Highway. The service road is heavily congested with trunk utilities. Widening work or ramp addition on North Lantau Highway will required the diversion of Cheung Tung Road and the associated utilities.

7.2.1.15 Discovery Bay Road

Discovery Bay Road is a single 2-lane private road joining Cheung Tung Road to the west portal of Discovery Bay Tunnel. It is within the tunnel area. The road is climbing up from west to east. The road level poses a constraint to a road link tunnel portal near it.

7.2.1.16 South Lantau Road

(a) South Lantau Road is a single 2-lane rural road as the main road corridor along South Lantau. The road is currently only opened to vehicles with permit. Its road geometry is characterised by steep gradient and relatively sharp curve.

(b) The road level poses a constraint to a road link tunnel portal near it.

7.2.1.17 Interface with East Lantau Metropolis (ELM)

(a) The strategic road link has to allow future connection with the ELM. Currently the planning of the ELM is at an early stage and hence its external road layout details are yet to be developed. The road link between Southeast Lantau and Hei Ling Chau can either be in the form of viaduct or tunnel, subject to separate feasibility study. The design of the strategic road link intends to reserve the design

flexibility of the future connection with the ELM as far as practicable.

(b) The toll strategy of the ELM as a whole affects the location choice and the physical form of the toll facilities. This is subject to interface liaison with the future ELM project.

7.2.1.18 Existing and Proposed Railway Lines / Stations

(a) Lantau Island is connected to Hong Kong and Kowloon via the TCL and AEL. The two separate services share the same tracks for most of the route on Lantau. There are currently four stations on Lantau/ Airport island, two serving the AEL (Airport Station and Asia World Expo) and two serving the TCL (Tung Chung and Sunny Bay).

(b) There are currently proposals to add more stations on the TCL. These are:

(i) Tung Chung West (TCW) Station – there is a proposal under the Tung Chung New Town Extension Project to build a station near Yat Tung Estate to serve the existing population in vicinity and the future development in TCW.

(ii) Tung Chung East (TCE) Station – there is a proposal under the Tung Chung New Town Extension Project to build a station on the TCL in the TCE due to the large-scale development in TCE.

(iii) Siu Ho Wan (SIW) Station – a station on TCL is being explored by MTRCL to provide train services for the population of the future MTR Depot Topside Development, among others.

(c) Amongst the rail options considered, the potential connection from HKBCF Island to Tung Chung East (TCE) via a subsea tunnel is more favourable.

(d) For the scenario of railway connection from Southeast Lantau, possibly via Mui Wo, to Siu Ho Wanunder the current Study, the interface issue between the SIW Station (along TCL) and the possible SIW Station (along the new rail line connecting to Southeast Lantau, possibly via Mui Wo) is anticipated to be extremely complicated.

(e) For the scenario of railway connection to TCE, the interface issue between the TCE Station (along TCL), the possible TCE station

between ELM and HKBCF via TCE will be taken into account.

7.2.1.19 Other Interfacing Projects

(a) Tung Chung New Town Extension (TCNTE)

(i) The major interfacing issue with TCE is the construction of possible strategic railway link to Southeast Lantau, possibly via Mui Wo / ELM and the TCE Station (the TCE(ELM) Station) within the TCE reclamation area. In designing the rail alignment and TCE(ELM) Station, the effect on TCE development will be minimized. The proposal will also take into consideration that the timely implementation of TCNTE shall not be affected.

(ii) Due to the proximity of the TCNTE, the cumulative impact on existing road, railway and infrastructure capacity shall be considered in the technical assessment of this Study.

(b) MTR Siu Ho Wan Depot Topside Development

(i) As the MTR Siu Ho Wan Depot Topside Development is adjacent to the proposed development, the cumulative impact on existing road, railway and infrastructure capacity shall be considered in the technical assessment of this Study.

(ii) For the study of road and rail link connecting to Siu Ho Wan, various interface issues with the MTR Siu Ho Wan Depot Topside Development shall be resolved. In particular, for the scenario of railway connection from Southeast Lantau, possibly via Mui Wo, to Siu Ho Wan, the proposed railway station and the Topside Development will impose planning and construction constraints to each other.

(c) Topside Development at HKBCF Island of HZMB

(i) Due to the proximity of the HKBCF island to the Study Area, the cumulative effect on existing road, railway and infrastructure capacity will be considered in the technical assessment of this Study.

(ii) In particular, for the scenario of railway connection to TCE, station in TCE is considered more favourable under the

preliminary assessment of HKBCF Topside Development project. Liaison between the two project's teams are required to ensure that the proposals are compatible to each other.

(d) Long-term Strategy for Cavern Development

The proposed tunnel alignment at North Lantau and Southeast Lantau, possibly via Mui Wo are largely within the Strategic Cavern Areas (SCVAs) No. 42 and 44 of the Cavern Master Plan prepared under Agreement No. CE12/2012 (GE) Study on Long-term Strategy for Cavern Development. The proposed alignment of road links should be optimized to take account of the SCVAs in order to preserve their development potentials. For example, provisions could be made to avoid the proposed alignment from obstructing potential portal locations or to allow space for developing other cavern facilities in the SCVA. The proposed alignment should be reviewed and refined to safeguard the development potential of the SCVA when the project is further pursued.

(e) East Lantau Metropolis (ELM)

The proposed alignment of road and rail links will be highly dependent on the development planning of the ELM. At this stage of study where the details of ELM development remains unknown, technical feasibility is carried out on various road and rail options, and selection of preferred option will need to be carried out at later stage when more information on ELM is available.

7.2.1.20 Topography

(a) Siu Ho Wan and Tai Ho areas are separated from Mui Wo by hills of Lo Fu Tau and Lin Fa Shan in the Lantau North (Extension) Country Park. The hill of Lo Fu Tau is up to +465mPD.

(b) There is a saddle between Lo Fu Tau and Lin Fa Shan. Olympic trial between Pak Mong and Mui Wo is running across the saddle. In term of topography only, the saddle is the preferred road link corridor between Tai Ho and Mui Wo. However, the northern part of the saddle is the ecologically sensitive area of Tai Ho Priority Site for Enhanced Conservation.

(c) North Lantau Highway is formed from reclamation. The hillside

south of the MTR Siu Ho Wan depot and south of Sham Shui Kok is relatively steep and poses a constraint on the portal and the interchange location. The area west of the Siu Ho Wan Sewage Treatment Work is reclaimed land and is relatively flat.

(d) Mui Wo is surrounded by hills on north, west and south sides. There are river valleys west of Luk Tei Tong and Mui Wo Kau Tsuen. These are consideration on the vertical profile and sufficient tunnel cover of the road tunnel.

(e) South Lantau Road is separated from the shoreline by hill up to +196mPD in the Lantau South Country Park.

7.2.1.21 132kV Submarine Power Cables & Overhead Lines

(a) The 132kV submarine power cables between Tuen Mun and North Lantau lands near Sham Shui Kok. Diversion of the submarine power cables should be avoided as far as practicable.

(b) The bottlenecks of available space between the existing MTR rail lines and the existing Sham Shui Kok Traction Substation pose a constraint on the ramps of the Siu Ho Wan Interchange.

(c) There are existing 132kV overhead lines between the Sham Shui Kok 132kV substation and South Lantau. Depending on the routing options selection in Mui Wo, local diversion of 132kV overhead lines may be required, in particular near portals at Luk Tei Tong.

(d) Diversion of 132kV overhead lines for tunnel portal locations have been arranged in other tunnel projects and are technically feasible. However it is highlighted that sufficient lead time for 132kV overhead lines diversion should be allowed in the implementation programme.

7.2.1.22 Existing & Planned WSD Water Tunnels

(a) The location of the major WSD water tunnels and submarine pipelines with potential interface with the road link is identified in **Figure 7.1**.

(b) In accordance with communication with WSD, it is understood that there are 2 possible alignments of the planned WSD tunnel. As the

alignment option cannot be confirmed yet, both alignments are being considered as constraints in this Study.

(c) WSD advise that there is a 120m wide tunnel protection zone, i.e. 60m each side from the centre line of the water transfer tunnels. WSD should be consulted for any tunnelling work within the protection zone. When encroachment into the protection zone is unavoidable, e.g. at road tunnel crossing above / beneath the water transfer tunnel, clearance, geological condition and tunnelling method should be analysed.

(d) There is existing WSD submarine water pipelines between Mui Wo and Hong Kong Island. The existing submarine water pipeline is taken as constraint in the routing selection and diversion of which is to be avoided as far as practicable. This can affect the choice of structural form options between at-grade road on reclamation and marine viaduct near the submarine water pipeline.

7.2.1.23 Potential Cavern Sites

The proposed portal locations and road tunnel at Siu Ho Wan and Southeast Lantau, possibly via Mui Wo, are largely within the Strategic Cavern Area (No. 44 and 42 respectively) of the Cavern Master Plan prepared under Agreement No. CE12/2012 (GE), Study on Long-term Strategy for Cavern Development – Feasibility Study. The proposed road links may have interfacing issues with the Strategic Cavern Area, the proposed alignment should be reviewed and refined to safeguard the development potential of the SCVA when the project is further pursued.

7.3 Strategic Road Tunnel

7.3.1 Evaluation Criteria

7.3.1.1 In evaluation of the road link options, the following evaluation criteria are commonly adopted in previous road projects in Hong Kong. They are considered to provide a holistic, systemic and fair assessment:

(a) **Planning and Land Use** – The criteria covers the performance of the road link option in supporting or constraining the intended planning of the area, in both strategic and local context. It also assesses the land requirement.

(b) **Environmental Issues** – The criteria describe the beneficial and adverse implication of the road link option, in term of air, noise, water, waste, ecology and cultural heritage. Sometimes a particular ecology or heritage asset can have such a high importance to the society that will put a particular option as "non-preferable".

(c) **Traffic Planning** – The criteria evaluates the interchange and routing options in meeting the strategic traffic objectives and its impact on traffic performance to the locals.

(d) **Impact on Local Community** – The criteria considers the local's view and acceptance on the different road link options.

(e) **Implementation** – The criteria refer to the time and statutory procedures in delivering the road link options. Road link options allowing fast and straightforward delivery are preferred. In addition, a road option with higher flexibility in response to future interfacing project development scores a high point in this aspect.

(f) **Engineering** – The criteria include engineering aspects like constructability, design and construction safety, operation and maintenance, etc.

(g) **Cost** – The criteria assess the capital, compensation and maintenance cost. Since it is for broadbrush option evaluation purpose only, usually a qualitative approach will be adopted.

7.3.1.2 The Brief requires a broad-brush approach in carry out the preliminary feasibility study. Therefore a qualitative evaluation based on these criteria is carried out.

7.3.1.3 In view of the planning uncertainty of Mui Wo and East Lantau Metropolis, the qualitative option evaluation presented in this report mainly focuses on the SHW side.

7.3.2 Interchange at North Lantau Option Identification

7.3.2.1 On the north side, options for the interchange location are identified along North Lantau Highway. The location is shown in **Figure 7.2 as N1 to N3**.

7.3.2.2 **Interchange Point N1** refers to a connection to the planned Tai Ho Interchange, which is planned as a three-lane grade-separated roundabout, under the Tung Chung New Town Extension (East) project.

7.3.2.3 **Interchange Point N2** is located slightly west of the Siu Ho Wan Sewage Treatment Plant and has closer junction separation with the ramps of TM - CLKL.

7.3.2.4 **Interchange Point N3** is located slightly east of the Siu Ho Wan Water Treatment Work and south of Sham Shui Kok. It has a further junction separation with the ramps of TM - CLKL.

Plate 7.1 Interchange Point N3 at Siu Ho Wan

7.3.3 Routing Option Evaluation

7.3.3.1 Based on the above interchange points, the following routing options are formulated as presented in **Figure 7.2**:

(a) Route 1, characterised by connecting to Tai Shui Hang;

(b) Route 2, characterised by connecting to Southeast Lantau, possibly via north Mui Wo;

(c) Route 3 (eastern tunnel option), characterised by connecting to Southeast Lantau, possibly via shorter main tunnel through south Mui Wo;

(d) Route 4 (western tunnel option), characterised by connecting to Southeast Lantau, possibly via longer main tunnel through south Mui Wo;

(e) Route 5, characterised by interchange point at Tai Ho.

7.3.3.2 The qualitative evaluation is summarised in **Tables 7.1 & 7.2**. The explanatory statement of the evaluation is given below.

(a) Route 1

(i) The main characterises of Route 1 is connecting to Tai Shui Hang.

(ii) With reference to the published LanDAC TT SC Paper No. 12/2015, there is an indicative conceptual link between North Lantau and Hei Ling Chau through Mui Wo. The Route 1 is connecting to the Peng Chau direction and does not support this strategic planning direction. As such Route 1 is considered as a non-preferable option in term of strategic planning.

(iii) The route has the shortest total length. From cost perspective, the route has the lowest construction and maintenance cost as compared to other options. The route is considered the most attractive in term of cost.

(iv) The route has no significant encroachment to major environmental constraints. It also keeps a separation from the major residential areas of Mui Wo and Discovery Bay. The route is therefore considered to have a fair performance in environmental issue and impact on local community.

(v) Since Route 1 is not a preferable option in terms of strategic planning, it is not further pursed in subsequent assessment.

(b) Route 2

(i) The main characterises of Route 2 is to connect to Southeast Lantau, possibly via north Mui Wo.

(ii) The key pro of Route 2 is its relatively short overall length with direct route linking North Lantau to Hei Ling Chau.

(iii) The key cons of Route 2 is the adverse impact on the natural setting of the northern shoreline of Silvermine Bay.

(iv) The route is considered to have poor performance in term of environmental issue, impact on locals and traffic. The route is therefore not recommended.

(c) Route 3 (eastern tunnel option)

(i) The main characterised of Route 3 is to connect to Southeast Lantau, possibly via shorter main tunnel through south Mui Wo.

(ii) The main tunnel length could be designed to about 3.5km approximately such that the need for middle ventilation building and the associated ventilation shaft could be eliminated. It is anticipated to have a lower cost than the longer western tunnel option (Route 4).

(iii) The alignment of this option will likely be in closer proximity to Mui Wo and will likely have larger impact to locals and rural setting of Mui Wo.

(d) Route 4 (western tunnel option)

(i) The main characteristics of these route options is to connect to Southeast Lantau, possibly via the longer main tunnel through south Mui Wo.

(ii) The option can bypasses most sensitive receivers at Mui Wo, hence less impact in term of environmental issue and disturbance to locals.

(iii) Due to topographical constraints, the main tunnel could be up to approximately 6km in length which will likely become the longest tunnel in Hong Kong. A middle ventilation building is anticipated. The major drawback of this route option is the high construction and maintenance cost.

(e) Route 5

(i) The route explores the possibility of connecting to the planned Tai Ho Interchange.

(ii) A clear disadvantage of this route is that it unavoidably has to encroach onto the Tai Ho priority site for enhanced conservation (**Figure 7.3**), which is directly south of the planned Tai Ho Interchange. The Tai Ho priority site for enhanced conservation is of ecological importance that harbors the Tai Ho Stream SSSI and its estuary of relatively high fish diversity. From the Report of Preliminary Ecological Review, plenty species of conservation importance has been identified on the hillside just south of Tai Ho Interchange. This further confirms the ecological significance of the Tai Ho Wan Bay area. Encroachment is likely going to attract very strong objections. This factor alone makes the route a non-preferable option. Apart from that, the route is at approximate 150m to Tai Ho Stream SSSI. The extensive site formation and terrain modification works required on the steep hillside would likely lead to site run-off that causes possible adverse impact to the ecologically sensitive Tai Ho Wan and the Tai Ho Stream SSSI.

(iii) In addition, the traffic performance is not satisfactory in this option. The planned Tai Ho Interchange is a grade-separated roundabout already planned to serve the Tung Chung New Town Extension (East) and potentially also to serve the Siu Ho Wan Development. The roundabout is severely constrained by the TM - CLKL ramps and difficult to be further expanded. Based on the traffic forecast obtained in preliminary traffic and transport impact assessment for initial land use themes, Tai Ho Interchange (THI) would approach design capacity in design year 2041, with a Design Flow/Capacity (DFC) of 0.8, taking account the major developments in North Lantau, particularly including SHW MTR Depot topside, SHW reclamation and landside development, Tung Chung New Town Extension, etc. It is envisaged that THI would be overloaded with a DFC over 1.3 if the additional ELM-North Lantau traffic on MW-SHW Link, (ranging from 2,800 to 4,000 pcu/hr, subject to the combination of strategic highways for the proposed ELM Development) was loaded to THI. Moreover, it is anticipated that the up-ramp and down-ramp of THI for accessing NLH to/ from the airport/ Tung Chung/ NWNT would also be operating over capacity by considering the majority of additional ELM-North Lantau traffic on MW-SHW Link would take this path. Therefore, it is undesirable to connect MW-SHW Link to THI directly from traffic point of view.

(iv) The TM - CLKL ramps are at three levels and very high above around. Any additional ramps to connect directly with the TM-CLKL ramps at Tai Ho will be at the four levels, having very significant visual impact. It is desirable to locate the new interchange away from this bottleneck.

7.3.3.3 From the above evaluation, Route 1 and 5 have disadvantages in strategic planning context and environmental impacts. Route 2 and Route 3 (the eastern tunnel option) have relatively high environmental impacts and impact to locals. Route 4 (the western tunnel option) has less environmental issues and impact to locals, despite having a relatively high cost. This option is therefore assumed for preliminary feasibility study under this Study.

7.3.4 Location of Siu Ho Wan Interchange

7.3.4.1 Three locations N1, N2 and N3 are selected along the North Lantau Highway for evaluation.

7.3.4.2 The qualitative evaluation is summarised in **Tables 7.3 & 7.4**. The explanatory statement of the evaluation is given below.

(a) Interchange Option N1

(i) A clear disadvantage of this interchange point is that the mainline further south will unavoidably has to encroach into the Tai Ho priority site for enhanced conservation. The Tai Ho priority site for enhanced conservation is of ecological importance that harbors the Tai Ho Stream SSSI and its estuary of relatively high fish diversity. From the Report of Preliminary Ecological Review, plenty species of conservation importance has been identified on the hillside just south of Tai Ho Interchange. This further confirms the ecological significance of the Tai Ho Wan area. Encroachment is likely going to attract very strong objections. This factor alone makes the interchange point a non-preferable option.

(ii) In addition, the traffic performance is not satisfactory in this option. The planned Tai Ho Interchange is a grade-separated roundabout already planned to serving the Tung Chung New Town Extension (Tung Chung East) and potentially also to serve the Siu Ho Wan Development. The roundabout is severely

constrained by the TM - CLKL ramps and difficult to be further expanded. The roundabout do not have sufficient junction and ramp capacity to receive additional traffic from a trunk road link. In other word the Southeast Lantau, possibly via Mui Wo - North Lantau connectivity will experience congestion at the roundabout.

(iii) The TM - CLKL ramps are at three levels and very high above around. Any additional ramps to connect directly with the TM - CLKL ramps at Tai Ho will be at the four levels, having very significant visual impact. It is desirable to locate the new interchange away from this bottleneck.

(iv) The interchange Option N1 is ruled out due to the ecological constraint and the traffic bottlenecks at Tai Ho .

(b) Interchange Option N2

(i) The key consideration of the choice between interchange option N2 and N3 is the weaving behaviour with the merging ramp and diverging ramp of TM - CLKL.

(ii) From road hierarchy perspective, a free-flow interchange (i.e. without intermediate stopping at traffic signals or roundabout) is preferred between North Lantau Highway and the future road tunnel. Length for chevron nose and climbing gradient to cross the rail lines and expressway has to be allowed.

(iii) From broadrush traffic analysis, it is estimated that the desirable weaving length between the TM - CLKL and the proposed Siu Ho Wan Interchange is in order of 1,000m. The absolute weaving length for a 110km/hr road is 390m.

(iv) The location of N2 is close to the TM - CLKL and cannot provide even the absolute weaving length. The result is negative to traffic safety. The option has poor traffic performance and traffic safety. This is illustrated in **Figure 7.4**. In simple term, traffic congestion is anticipated between the link roads of TM - CLKL and Siu Ho Wan Interchange due to insufficient length for lane changing activity and there is a higher risk of traffic accident.

(v) The advantage of this interchange point is the minimal land intake and has less implication to the planning of the Siu Ho Wan east reclamation area. However it should be noted that reduced land intake is due to substandard (less than absolute weaving length) road network design.

(vi) As this option does not fulfil the fundamental functional requirement of the Siu Ho Wan Interchange, it is considered inappropriate.

(c) Interchange Option N3

(i) The location of N3, on the other hand, provides approximately 1,015m weaving length and is considered better in traffic function and safety. This is illustrated in **Figure 7.4**. The interchange option fulfils the traffic needs.

(ii) Another advantage of this option is that it offers a long weaving length between the ramps and the tunnel portal. This also allows southbound heavy vehicles to safely select the slow lane, and northbound vehicles to select the appropriate lanes to destination.

(iii) With the long length between the ramps and tunnel portal, there is a flexibility for this interchange option to be modified to provide additional ramps to support the long-term development south of Cheung Tung Road. This however is subject to separate study.

(iv) The drawback of this interchange option is it requires land take in the Siu Ho Wan east reclamation area. The size of the interchange, however, is not particularly large when compared to other major interchanges like the Sunny Bay Interchange and the TM - CLKL. The land within the "loop" of the Siu Ho Wan Interchange is available for development.

(v) The interchange has to cross the rail lines posing some construction difficulties. However this can be resolved by appropriate engineering design, as shown in many previous project examples.

(vi) N3 is located within the SHWWTW PHI CZ. A detailed

assessment on the QRA shall be carried out in future studies taking into account the transient population of the proposed strategic road / rail link.

(vii) The nearest distance between the recommended road link at Siu Ho Wan and Tai Ho Wan (Tai Ho Stream SSSI) is more than 600m (**Figure 7.5**), the impacts due to terrain modification and site formation are therefore not expected to be significant.

7.3.4.3 Based on the above, it is recommended that Interchange Option N3 is adopted for further design development.

7.3.5 At the south, as the preferences and details will be highly dependent on the development planning of the ELM and Mui Wo, the selection of the preferred alignment and landing point will need to be further studied at a later stage when more information of ELM is available.

7.3.6 Other technical assessments such as geometric design, building services engineering, bridge engineering, tunnel and geotechnical, environmental consideration, land requirement, implementation programme and costing are presented in **Appendix A**.

7.4 Road P1 Siu Ho Wan Section & Road Access to Reclamation Development

7.4.1 General

7.4.1.1 The Road P1 Siu Ho Wan Section and the interchange access is presented in **Figure 7.6 – 7.8**. The layout of the district distributors and local distributors are subject to the planning parcels of the Reclamation Development and are flexible.

7.4.2 Key Issues and Constraints

7.4.2.1 Interface with Tung Chung East New Town Extension

(a) The Tung Chung East New Town Extension project has planned the Road P1 Tai Ho Section and the Tai Ho Interchange to serve as an additional road access to the Tung Chung East New Town. Due to its location and interchange spacing requirement on expressway, it is planned that the Tai Ho Interchange will also need to serve the future Siu Ho Wan areas.

(b) The conforming road layout included a grade-separated roundabout interchange on Road P1 Tai Ho Section. The Road P1 roundabout interchange was linked to the Tai Ho roundabout by an elevated link bridge. The grade-separated Tai Ho roundabout was linked to the North Lantau Highway by four ramps. The Road P1 mainline runs at-grade.

(c) At the time of Investigation of the Tung Chung East New Town Extension, the feasibility study for the Siu Ho Wan Reclamation Development has not commenced and BMP boundary has not been published. The Tung Chung East New Town Extension has, with agreement from the departments, based upon the best available information at that time to carry out the interchange design. It has been mentioned in its highway infrastructure study that the interchange option may need to be revisited in the future in related to the latest design development in the interface projects.

(d) As the layout of the Siu Ho Wan Reclamation develops, the design of the Tai Ho Interchange needs to be refined and updated to reach an optimistic layout to serve all the interfacing projects.

(e) However, it is respected that the Tung Chung East New Town Extension is under a fast track programme to provide timely housing support. Any layout refinement should not have adverse impact to the overall programme of Tung Chung East New Town Extension. It is considered that the reclamation extent under Tung Chung East New Town Extension should not be increased so as to avoid a lengthy update on the environmental impact assessment.

(f) The Road P1 Tai Ho Section has reserved provision for future extension to the Road P1 Siu Ho Section. The study should take the opportunities offered by the interface project.

7.4.2.2 Interface with Siu Ho Wan Topside Development

(a) The MTR Siu Ho Wan Depot Topside Development shares similar road access to the Siu Ho Wan Reclamation Development. The traffic arrangement of the two neighbouring developments are coordinated.

(b) The Siu Ho Wan Topside Development planned to use the Tai Ho Interchange as the main access at the west. The refinement in the Tai Ho Interchange under this study should make due regard on the planned access arrangement to the topside development.

(c) In the long run, an interchange access to the eastern part of the Siu Ho Wan Reclamation Development is needed. This may offer an opportunity of backup road access to the Siu Ho Wan Topside Development at the east.

7.4.2.3 MTR Siu Ho Wan Depot Operation

(a) The MTR Siu Ho Wan Depot currently has marine access to the waterfront for delivery of rail carriages and track components. The frequency of delivery is in order of once per month.

(b) According to discussion with MTRCL's operation team, it is intended that the marine access should be maintained and reconfigured as necessary when the Siu Ho Wan reclamation is implemented. A maintenance railway track is needed to connect the depot to the waterfront.

(c) From discussion with MTRCL's operation team, it is learnt that

the maintenance railway track will be without overhead line. The minimum horizontal radius of curvature for the railway track is 140m.

(d) The exact connection point of the maintenance railway track on the depot side is subject to the design development of the MTR Siu Ho Wan Topside Development.

7.4.2.4 The Brothers Marine Park

(a) BMP is a new constraint not available at the time of design of Tai Ho Interchange during the Tung Chung East New Town Extension Investigation.

(b) In addition to BMP boundary, a 150m offset from the boundary is proposed. This limits the Siu Ho Wan reclamation extent and creates a bottleneck as shown in **Figure 7.6**.

(c) The bottleneck only allows space for passage of the Road P1 mainline and the adjacent promenade footpath and cycle track. There is insufficient space for a road access at this location, which is originally assumed in previous studies.

(d) The road access to the west reclamation area has to be shifted to the west of the bottleneck. This creates short junction spacing with the Road P1 roundabout proposed in Tung Chung East New Town Extension project. The interchange arrangement therefore needs to be refined under this study.

7.4.2.5 Existing Drainage Culvert

(a) There are several existing box culverts collecting drain off from the hillside of North Lantau across North Lantau Highway and MTR Siu Ho Wan Depot to the waterfront.

(b) Upon the Siu Ho Wan reclamation, the box culverts are anticipated to be extended into the reclamation area.

(c) The underground drainage culverts pose a constraint on the vertical profile and pier arrangement of Road P1. In particular, depressing Road P1 may result in conflict with the box culvert extension.

7.4.2.6 Road P1 Sunny Bay Section

(a) At this moment, there is no further updates from other studies on the routing of the Road P1 Sunny Bay Section.

(b) The eastern end of the Road P1 Siu Ho Wan Section is therefore assumed to be tie-in to the same connection point as in the previous Lantau Logistics Park study, which is the latest available information.

(c) In case there is future updates on the Road P1 Sunny Bay Section, there is flexibility to adjust the highway alignment of Road P1 Siu Ho Wan Section at eastern end to facilitate interface tie-in.

7.4.3 Access to West Reclamation Area Options Evaluation

7.4.3.1 Three interchange options for the road access to the Siu Ho Wan west reclamation area have been formulated.

(a) Option 1

(i) Option 1 is presented in **Figure 7.9**.

(ii) In Option 1, an at-grade roundabout interchange is proposed at the Siu Ho Wan reclamation area east of Tai Ho roundabout.

(iii) The at-grade roundabout serve Tung Chung East New Town Extension, Siu Ho Wan Reclamation Development and Siu Ho Wan Topside Development. The interchange collects / distributes all the local traffic from Tung Chung and Siu Ho Wan and then joins together to the Tai Ho roundabout.

(iv) The relatively long separation between the Tai Ho roundabout and the at-grade roundabout not only provides the gradient for the level difference, but also provides length for traffic to weave to the appropriate entry lanes.

(v) Road P1 mainline crossed the at-grade roundabout in the form of elevated viaduct.

(vi) An additional at-grade access is available for the Siu Ho Wan

Topside Development.

(vii) The at-grade roundabout encroaches into the 150m offset from to BMP.

(viii) The land requirement of the whole interchange scheme is approximately 11 ha.

(b) Option 2

(i) Option 2 is presented in **Figure 7.10**.

(ii) In Option 2, an elevated roundabout interchange is proposed at the Road P1 Tai Ho Section west of Tai Ho roundabout, but east of the constraint of the TM - CLKL viaduct piers.

(iii) The elevated roundabout serve Tung Chung East New Town Extension. An additional junction is necessary further east to provide road access to the Siu Ho Wan west reclamation area.

(iv) A link bridge joins the elevated roundabout at Road P1 to the Tai Ho roundabout. The length of the link bridge is relatively short to Option 1 due to the constraint of TM - CLKL piers.

(v) Road P1 mainline crossed underneath the elevated roundabout in the form of at-grade carriageway.

(vi) This option is equivalent to the Option 6 in the highway infrastructure study of Tung Chung East New Town Extension Study and is the conforming scheme for EIAO.

(vii) The land requirement of the whole interchange scheme is approximately 10 ha.

(c) Option 3

(i) Option 3 is presented in **Figure 7.11 – 7.12**.

(ii) In Option 3, an at-grade roundabout interchange is proposed at the Road P1 Tai Ho Section west of Tai Ho roundabout, but east of the constraint of the TM - CLKL piers.

(iii) The at-grade roundabout is enlarged to 3-lane circulatory path and provide an extra arm as road access to the Siu Ho Wan west reclamation area. The interchange serve both the Tung Chung East New Town Extension and the Siu Ho Wan Reclamation Development.

(iv) A link bridge joins the at-grade roundabout at Road P1 to the Tai Ho roundabout. The length of the link bridge is relatively short to Option 1 due to the constraint of TM - CLKL piers. The maximum gradient is limited to 4%.

(v) Road P1 mainline crossed above the at-grade roundabout in the form of elevated viaduct.

(vi) This option is equivalent to the Option 7 in the highway infrastructure study of Tung Chung East New Town Extension Study.

(vii) The enlarged at-grade roundabout is still within the reclamation extent proposed in Tung Chung East New Town Extension. However the remaining clearance between the road kerb and seawall copeline is narrow for passage of cycle track to the planned cycle park at Tai Ho Interchange. As such, an interim stage arrangement is developed for consideration.

(viii) In the interim stage arrangement shown in **Figure 7.12**, the Tung Chung East New Town Extension project will only construct a 2-lane circulatory path roundabout and have at least 7m clearance for the cycle track passage. The provision for future modification is reserved by hatched road marking. The future Siu Ho Wan Reclamation project will modify the roundabout to 3-lane circulatory path with additional arms. Minimal abortive work is involved.

(ix) Discussion with the Tung Chung East New Town Extension project team on this option has been initiated. Further interface coordination shall be continued.

(x) The land requirement of the whole interchange scheme is approximately 10 ha.

7.4.3.2 Option Evaluation

(a) Option 1

(i) The advantage of the option is that the design provides a high traffic reservation for future developments in Siu Ho Wan. The scheme provides long queuing distance and weaving distance between junctions and provides an additional road access to the Siu Ho Wan Topside Development. The option has relatively better traffic accessibility.

(ii) The at-grade interchange collects / distributes all the local traffic from Tung Chung and Siu Ho Wan and hence can reduce the overall junction number along Road P1.

(iii) The option minimises the reclamation extent of Road P1 Tai Ho Section near Tai Ho Wan.

(iv) The critical disadvantage of this option is the at-grade roundabout on Road P1 encroaches onto the 150m offset from BMP.

(v) The layout is also not compatible with the conforming interchange arrangement in the Environmental Impact Assessment of Tung Chung East New Town Extension project. In particular significantly larger reclamation has to be carried out in the interim stage by Tung Chung East New Town Extension project. This may require additional lengthy water quality and ecological impact assessment and have adverse impact to the implementation programme of Tung Chung East New Town Extension. The implementation arrangement is not preferred.

(vi) As such this option is the least preferred.

(b) Option 2

(i) The advantage of the option is that the conforming layout in the Tung Chung East New Town Extension is adopted. Implementation and interface liaison is relatively straightforward.

(ii) The critical disadvantage of this option is the restriction to the development potential for the Siu Ho Wan Reclamation Development.

(iii) Due to the constraint of the gazetted BMP, there is now insufficient land and weaving distance to house another large-capacity grade-separated interchange east of the roundabout on Road P1 Tai Ho Section. Only a signalised junction on Road P1 is proposed for road access to the west reclamation.

(iv) A signalised junction on the Road P1 with design speed of 80km/hr is considered inappropriate from road hierarchy and traffic safety perspective.

(v) A signalised junction on Road P1 also offers limited junction capacity for the west reclamation area. As such the development potential of the Siu Ho Wan Reclamation Development will be restricted by the limited traffic connectivity.

(vi) The option also does not offer a secondary access to the west reclamation area in event of traffic accidents.

(c) Option 3

(i) The advantage of this option is that the enlarged roundabout provides a high traffic reservation for future developments in Siu Ho Wan. The development potential of the west reclamation area can be maximised.

(ii) The at-grade interchange collects / distributes all the local traffic from Tung Chung and Siu Ho Wan and hence can reduce the overall junction number along Road P1.

(iii) The Road P1 mainline is designed as free flow at 80km/hr.

(iv) The layout also offers an opportunity for a "left-in left-out" secondary access in event of traffic accidents, as discussed in below sections.

(v) A side advantage is that the bridge structure is relatively further away from the waterfront than in Option 2. This

brings slight improvement to the visual appearance from the promenade.

(vi) The disadvantage is that the Road P1 mainline has to climb up and down above the at-grade roundabout, instead on the flat vertical alignment in Option 2. This however is considered to be minor as compared to the traffic connectivity improvement.

(vii) Another issue is that the option has refined the conforming layout in the EIA of Tung Chung East New Town Extension project. Interface liaison and potential variation to environmental permit (if necessary) will be arranged.

(viii) The overall advantage is considered more significant than the disadvantages.

7.4.3.3 In highway network planning for a new development area, in addition to the sufficiency of the link and junction capacity, it is preferable to include a secondary access. The secondary access can provide alternative access route in case of traffic accidents in the main access, and provides a more reliable highway network. This is particularly important for emergency vehicle access to a community with reasonably large population.

7.4.3.4 In Option 3, the at-grade roundabout interchange provides the all-direction main road access to the west reclamation area. Further east it is technically feasible to provide a "left-in left-out" secondary access, as shown in **Figure 7.11**.

7.4.3.5 Due to limitation in junction spacing, right-turning movements, controlled by either signals or grade separation, are not recommended, so as not to congest the free flow along the mainline. However, the eastbound traffic can U-turn in the proposed diamond interchange at the east reclamation area. With detour, the traffic can still access to all destinations. Considering this is only the backup and supplementary access, this arrangement is considered acceptable.

7.4.3.6 Sufficient diverging and merging length has been allowed on Road P1 mainline to allow safe diverging and merging. On eastbound the merging from the roundabout is relatively close to the diverging to the

secondary access. An additional weaving lane ("lane gain, lane drop") is recommended of this road segment.

7.4.3.7 The secondary access offers two functions. Firstly it shares part of the traffic from the main access roundabout. Secondly it offers a contingency

7.4.3.8 Based on the above, Interchange Option 3 is recommended to provide the main access to the Siu Ho Wan west reclamation area. The at-grade roundabout connects with both the Road P1 Siu Ho Wan Section and the Tai Ho roundabout to North Lantau Highway. A secondary access in the form of "left-in left-out" free flow slip roads is also recommended to provide an alternative access to the west reclamation area.

7.4.4 Access to East Reclamation Area Options Evaluation

7.4.4.1 Road access to the east reclamation area is provided from the Road P1 Siu Ho Wan Section. From Road P1, the area is accessible to the North Lantau Highway through the Tai Ho Interchange and the future Sunny Bay Interchange.

7.4.4.2 From traffic planning perspective, since the east reclamation area is in relatively low density due to constraint from the Potential Hazard Zone, a direct connection to Siu Ho Wan Interchange is considered not necessary and not justified with the current assumption. In case there is a change in the planning assumption and the deletion of the Road P1 Sunny Bay Interchange, a direct connection should be further reviewed.

7.4.4.3 The Road P1 is a primary distributor with design speed 80km/hr. The road hierarchy and the design speed justifies a grade-separated interchange. As the development density is small, a signalised controlled diamond interchange is considered sufficient and can minimise the land requirement.

7.4.4.4 There is a specific requirement for a maintenance rail track to cross the Road P1 Siu Ho Wan Section as mentioned in **Section 7.4.2.3**. Considering the operation need of the depot, it is preferable that the maintenance rail track is at-grade and grade-separated with the Road P1 mainline. 5.8m minimum headroom for the rail track without overhead

line is suggested. It is also suggested that the maintenance rail track to run in the future drainage reserve for effective land use.

7.4.4.5 There is a culvert extension near the proposed diamond interchange. Road P1 mainline in the form of underpass will conflict with the culvert extension structure. As such the Road P1 is recommended to be in the form of elevated viaduct above the at-grade signalised diamond interchange.

7.4.4.6 The traffic signal also controls the passage on the rail carriage delivery. The arrangement should be similar to typical at-grade junction between Light Rail and road vehicles in Tuen Mun and Yuen Long.

7.4.4.7 At the crossing of rail track and carriageway, concrete pavement and specific rail track is recommended. Typical examples are the tram track and the light rail track at junction.

7.4.4.8 Based on the above, two junction options for the road access to the Siu Ho Wan east reclamation area have been formulated.

(a) Option 1

Option 1 is presented in **Figure 7.13**. The maintenance rail track is in parallel to the signalised junction. The Road P1 mainline is grade-separated with the at-grade junction in the form of elevated viaduct. At the junction, segregated lane is provided to facilitate westbound traffic to left-turn into the depot.

(b) Option 2

Option 2 is presented in **Figure 7.14**. The maintenance track crosses the centre of the signalised junction. The Road P1 mainline is grade-separated with the at-grade junction in the form of elevated viaduct. The junction arms are perpendicular to each other.

7.4.4.9 The two options are similar in traffic performance. Both facilitates the required traffic accessibility and the depot operation needs.

(a) Option 1

(i) Option 1 involves less rail track crossing the carriageway.

The maintenance is relatively easier than Option 2 with the track crossing the junction.

(ii) Also in Option 1 the track is perpendicular to the running traffic direction. It provides slightly better driving comfort when the car crosses the track.

(iii) The option is therefore slightly more preferable.

(b) Option 2

Option 2 involves rail track crossing the middle of the junction. This is less preferable for the temporary traffic management for the pavement and track maintenance.

7.4.4.10 Road P1 at East Reclamation Area

(a) There exist various maintenance access gates and emergency evacuation gates on the north side of Airport Express Line and Tung Chung Line. The southern verge of the Road P1 Siu Ho Wan section should maintain these access. Further coordination with MTRCL is required.

(b) The Road P1 Siu Ho Wan Section will require a localised diversion of the at-grade section of existing Sham Shui Kok Drive. Road P1 and the diverted Sham Shui Kok Drive has avoided the planned columbarium site at the western end of Sham Shui Kok Drive.

7.4.4.11 Recommendation

(a) The two junction options are both feasible. Option 1 is slightly preferred for the above reasons.

(b) A grade-separated diamond interchange is recommended to provide the road access to the east reclamation area from Road P1 Siu Ho Wan Section.

(c) The northern arm of the diamond interchange will extend to the future district distributor in east reclamation area, and potentially the Sham Shui Kok Drive if the need arises. The local road hierarchy is subject to the planned land use.

(d) The southern arm of the diamond interchange will re-provide the emergency vehicle access to the MTR Siu Ho Wan depot and connect with the Siu Ho Wan Topside Development if necessary.

7.4.5 Geometric Design

7.4.5.1 The design speed of Road P1 mainline is 80km/hr and a dual 2-lane configuration is assumed. The design speed of the interchange slip road (leading to district distributors) is 50km/hr and a 1-lane slip road configuration is assumed.

7.4.5.2 The minimum horizontal radius of curvature adopted for Road P1 mainline is R5 = 450m. It is intended to limit the superelevation up to 5% to facilitate easier tie-in with the neighbouring formation level and to enhance the driving comfort. The marginal strip is widened to provide sufficient sight distance at appropriate curve locations.

7.4.5.3 The desirable maximum gradient for primary distributor = 4 % and the minimum gradient = 0.67% is adopted for Road P1 mainline. However, at the road access to west reclamation area, due to the headroom constraints of TM –CLKL viaducts and the link bridge between Road P1 and Tai Ho Interchange on top and the at-grade roundabout underneath, absolute K-values = 30 at crest and 20 at sag are anticipated necessary. Justification for relaxation and approval from the authority shall be followed up as the design develops.

7.4.5.4 Road cross sections along the Road P1 Siu Ho Wan Section are shown on **Figure 7.15 – 7.16**.

7.4.6 Bridge Engineering

7.4.6.1 The bridges have a short total length and has typical span. The bridge is on virgin site and there is no particular constraint on temporary traffic management. In-situ concrete bridge on falsework can be a cost effective solution in this site condition.

7.4.6.2 The bridge for Road P1 mainline near Tai Ho Interchange has to be constructed under the Tuen Mun - Chek Lap Kok Link which is under construction. While the ramps of TM - CLKL is at a high level and has sufficient construction headroom underneath, it is suggested to avoid

the foundation directly beneath the TM - CLKL bridge to enhance the constructability.

7.4.7 Geotechnical Engineering

7.4.7.1 The Road P1 Siu Ho Wan Section and the road access to the reclamation development will sit on newly reclaimed land. The reclamation will allow sufficient surcharge period and appropriate ground improvement measure to reduce the long-term settlement to an acceptable value and is suitable for the intended purposes including road access to residential development.

7.4.7.2 The viaduct portion of the Road P1 Siu Ho Wan Section and the associated interchanges will sit on deep foundation, typically bored piles or pre-bored H-piles. The appropriate piling system will be determined in detailed design stage after a comprehensive ground investigation is carried out.

7.4.7.3 As the portion of Road P1 Siu Ho Wan Section and the road access to the reclamation development on the proposed newly reclaimed land are located within the Designated Area of Northshore Lantau, GEO Technical Guidance Note No. 12 (TGN 12) should be referred to. It is suggested that ground investigation works within the area should refer to the technical recommendations in the TGN and the adverse geological features such as the presence of soft, loose and weakly lithified sediments, metasedimentary rock, and variable rockhead level at the area shall be reviewed with cautions in order to minimize the geological risks posing to the deep foundation works. For the next stage of GI works, in addition to the sinking of drillholes, geophysical surveying of the area shall also be considered for identifying localized areas of complex geological conditions.

7.4.8 Environmental Consideration

7.4.8.1 The western access is such arranged to avoid encroachment to BMP. The road work does not encroach into major ecological areas.

7.4.8.2 The viaduct in western access Option 3 is further away from the promenade than in western access Option 2. It is considered that Option 3 will have a lower visual impact.

7.4.8.3 The eastern access is a grade-separated interchange to facilitate the MTR Siu Ho Wan depot operation and to facilitate through traffic along the primary distributor Road P1. The viaduct structure is lower than the future platform of Siu Ho Wan topside development. Aesthetic design of the viaduct structure will need to be considered in the detailed design stage.

7.4.8.4 Quantitative noise assessment will be carried out in the EIA stage to determine the exact extent of the noise mitigation required along Road P1 Siu Ho Wan Section. The ventilation and fire protection issues are to be observed when determining the extent of the noise mitigation. It is noted that the sensitive receiver, i.e. the planned Siu Ho Wan topside development, is sitting above podium, which already provide noise screening to the road side. It is not effective to further reduce the noise level by depressing the road. The effective way to further reduce the noise level is to provide screening to the road top, i.e. by semi noise enclosure or full noise enclosure. The noise enclosure may be in the form of landscape desk providing pedestrian linkage between the topside development and the promenade. This is subject to future planning, maintenance agreement, and design.

7.4.9 Land Requirement

7.4.9.1 The Road P1 Siu Ho Wan Section and the road access to the reclamation development are on newly reclaimed land. No land resumption is anticipated, except the modification of the right-of-way ROW to MTRCL's Lot No. 2 RP at the eastern end.

7.5 Road Access to Landside Development

7.5.1 General

7.5.1.1 The access road is presented in **Figure 7.17**. The layout of the local distributors are subject to the planning parcels of the Landside Development and are flexible.

7.5.2 Key Issues and Constraints

7.5.2.1 Topography

(a) The major constraint of the road access is the steep topography of the site. The geometry of the road access should be detailed to fit

with the topography and to minimise the slope work as far as practicable.

(b) The length of the road access depends on the maximum gradient and the level to be climbed up. The top level in turn depends on the site formation platform design level.

7.5.2.2 Country Parks & Priority Site for Enhanced Conservation

(a) The southern edge of the Landside Development is the boundary of the Lantau North (Extension) Country Park. The western edge of which is the boundary of the Tai Ho Priority Site for Enhanced Conservation. Encroachment to these areas should be avoided.

7.5.2.3 Geometric Design

(a) The design speed is 50km/hr and a single 2-lane configuration is assumed.

(b) The vertical alignment is controlled by the level to be climbed up. In accordance with Scheme 1 of the Landside Development, the access road has to connect between the Cheung Tung Road at approximately +10mPD and the site formation platform at +40mPD.

(c) The Landside Development is planned to land use that bus service is anticipated. As such, the absolute maximum gradient 8% is recommended as the limit, considering the downhill safety and the uphill gradeability of the bus.

(d) Depending on the exact climbing length and the traffic forecast, climbing lane may be considered.

(e) The horizontal alignment is controlled by the limited space bound by the Country Park and the existing Cheung Tung Road. Due to the severe space limit to climb up, the absolute radius of curvature R1=44m has to be proposed. Road widening and unobstructed sight line at curve are proposed.

7.5.2.4 Bridge Engineering

(a) The bridge has a relatively small curvature at inner radius = 44m

and a short total length. In-situ concrete bridge can be a cost effective solution in this site condition.

(b) The bridge is above 15m above ground. The aesthetics aspect of the bridge has to be carefully considered in the detailed design stage.

7.5.2.5 Geotechnical Engineering

The formation and slope work of the road access to the landside development is part of the formation design of the landside development. The design has to be discussed in a holistic manner. The geotechnical review is presented in Report on Preliminary Site Formation Study for Landside Development.

7.5.2.6 Environmental Consideration

The road access to the landside development is such arranged to avoid encroachment to the Tai Ho priority site for enhanced conservation and only shrubby grassland (low ecological value) is anticipated to be affected. The site formation work for the road access will also be carefully considered during further study to minimize landscape and visual impact to nearby sensitive receivers (e.g. road users along NLH, residents in planned Siu Ho Wan topside development, hikers on Lantau North (Extension) Country Park etc.) and the potential impacts on Tai Ho Wan and Tai Ho Stream SSSI.

7.5.2.7 Land Requirement

The landside development is on Government Land. No land resumption is hence anticipated to its access road.

7.5.3 Alternative Road Access to Landside Development

(a) An alternative road access from the eastern side of the landside development is explored and presented on **Figure 7.18**.

(b) The alternative road access climbs up from the Discovery Bay Tunnel Road, which is currently a private road. The absolute maximum gradient 8% is also adopted to climb up from +21.0mPD to +40.0mPD. Depending on the exact climbing length and the traffic forecast, climbing lane may be considered.

(c) The alternative road access involves significant slope cut. It is highlighted that a major natural stream will be blocked by the road and need proper drainage diversion. As the natural stream is major, it is anticipated the relevant diversion work will be difficult and costly.

(d) The alternative road access involves bridge structure to cross valley.

(e) This option is involving the use of a section of the private road. Liaison with Discovery Bay Tunnel will be needed on the implementation.

(f) Generally this alternative road access is therefore considered as less desirable than the conforming one. However the alternative road access is reported here to provide an additional option for consideration in the next phase.

8 Railway Link

8.1 General

8.1.1 The Study studied the following scenarios of Railway link connecting North Lantau and Southeast Lantau, possibly via Mui Wo, for further connection to ELM:

(a) Scenario R1: Connecting to SIW from Southeast Lantau, possibly via Mui Wo; and

(b) Scenario R2: Connecting to TCE from Southeast Lantau, possibly via Mui Wo.

8.1.2 Major constraints pertaining to the railway link are summarized in **Figure 7.1**.

8.2 Rail Tunnel Options Evaluation

8.2.1 These railways have long distances between stations and therefore benefit from a higher maximum speed to keep journey times as short as possible. It is therefore assumed that the maximum speed is 140 kph, similar to MTR lines of this type (e.g. West Rail, Tung Chung Line). In comparison with most urban MTR lines the distances between stations are much shorter and hence high acceleration of the trains rather than high maximum speed is preferred. If the maximum speed of this line was limited to 80 kph, journey times will be longer and extra rolling stock will be required. For all alignment options, suitable horizontal and vertical radii have been used so that a maximum speed of 140 kph is assumed, hence allowing a shorter journey time. In locations near to the proposed stations, the radius can be reduced down to 300m and the maximum speed is reduced to 80 kph with reference to the MTRCL Design Standard Manual.

8.2.2 Various options of rail tunnel alignments for scenarios R1 and R2 have been preliminarily studied, **Figure 8.1** and **8.2**.

8.2.3 In view of the planning uncertainty of Mui Wo and East Lantau Metropolis, the qualitative option evaluation presented in this report mainly focuses on the SHW side.

8.2.4 Station in SIW under Scenario R1

8.2.4.1 Under scenario R1, the connection point in North Lantau is proposed to be located in SIW. The proposed station locations are shown indicatively in **Figure 8.3**.

8.2.4.2 A new SIW station on TCL is being explored by MTRCL to provide train services for the population of the future MTR SHW Depot Topside Development, among others. Based on MTRCL's preliminary indicative proposals, the station platform is located between the proposed MTR Depot and the approach ramps of the TM – CLKL in an east-west orientation near western side of the MTR Depot.

8.2.4.3 SIW Station proposed under this Study will be an interchange station with the TCL and so the preferred location shall allow for the most convenient interchange possible.

8.2.4.4 A station with the same orientation (East-West) as the SIW station under TCL is thus proposed (SIW Station – Option 1). This will, however, necessitate complicated interfacing issues with the proposed SIW station under TCL and the MTR Depot Topside Development. The construction of station in close vicinity of the operating TCL and AEL also add to the technical difficulties of this option.

8.2.4.5 Considering the MTR Depot Topside Development is at a more advanced stage of planning, the interfacing issues may have impact on the implementation programmes.

8.2.4.6 Thus, an alternative station location in the new reclamation area (SIW Station – Option 2) is also considered. The station will be positioned in an North-South orientation to allow more direct routing from Southeast Lantau, possibly via Mui Wo. This option is proposed on the assumption that development in the SHW Reclamation will go ahead.

8.2.4.7 This location will have less impact on the proposed MTR Topside Development but the passenger connectivity will not be ideal. The construction of the station in the newly reclaimed area will be relatively simple as compared to the complicated interfacing issues involved in Option 1. This option, however, will impose constraints to the future

land use planning of the SHW reclamation area, which is not envisaged to be a critical issue considering that planning is only at initial stage.

8.2.4.8 For both options, the proposed station serves the population in MTR SHW Depot Topside Development (approx. 38,000 people) and the proposed development under this Study.

8.2.4.9 Possible connection to HKBCF and Tuen Mun from proposed Siu Ho Wan Station is not in line with concepts of strategic transport networks for Lantau in LanDAC TT SC Paper No. 12/2015.

8.2.5 Station in TCE under Scenario R2

8.2.5.1 Under Scenario R2, the connection point in North Lantau is proposed to be located in TCE. The proposed station is shown indicatively in **Figure 8.4**.

8.2.5.2 There is a proposal under the Tung Chung New Town Extension (TCNTE) study to build a TCE station on TCL which the station platform is located in an east-west orientation near the existing shoreline.

8.2.5.3 The proposed TCE station for rail link connecting to Southeast Lantau, possibly via Mui Wo, under this Study will be an interchange station with TCL. Taking into account that the draft Outline Zoning Plan (OZP) for TCE development has already been gazetted, the determination of station size and orientation shall minimize the disturbance on the OZP. Therefore, the proposed TCE station to Southeast Lantau, possibly via Mui Wo, under this Study is proposed to run north-south orientation through the central green corridor along the future development with an attempt to minimize the effect on the land parcels in TCE. The proposed stations will be a T-shaped interchange to the proposed TCE station along TCL. The station is proposed to be located within TCE instead of southwards underneath TCL and NLH. This is due to the high construction risk and difficulty associated with building large underground structures under the existing TCL and NLH. Also, placing the TCE station further away from the population in TCE is considered not preferable.

8.2.5.4 This option serves the population in TCE (about 118,900 upon full development) which is substantially larger than the population in SHW.

8.2.5.5 Similar proposal on TCE station orientation and location is also given under the HKBCF Topside Development Study for the rail link connecting HKBCF and TCE. Thus, the rail link from Southeast Lantau, possibly via Mui Wo, to TCE can be further connected to HKBCF and Tuen Mun which is in line with the concepts of strategic transport networks for Lantau in LanDAC TT SC Paper No. 12/2015.

8.2.5.6 Although the choice of station location has already attempted to minimize the impact on the TCE OZP, the proposed station and construction area will still unavoidably trigger the need of amendment of TCE OZP.

8.2.6 Routing Options under Scenario R1

8.2.6.1 Under Scenario R1, the rail link connects Siu Ho Wan to Southeast Lantau, possibly via Mui Wo. A total of 4 routing options (Option R1-A, R1-B, R1-C and R1-D) have been considered to connect the proposed stations described in above sections. The proposed routing options are shown in **Figure 8.1**.

8.2.6.2 Route R1-A

(a) Route R1-A connect the SIW Station – Option 1 to Southeast Lantau, possibly via Mui Wo, with an estimated main tunnel length of approximately 5.5 km.

(b) Under this alignment, construction of SIW Station will necessitate complicated interfacing issues with the proposed SIW station under TCL and the MTR Depot Topside Development. The south of the proposed SIW station is also bounded by ramp of TM-CLKL. A clearance of 2m should be maintained between proposed station and the highway structures for inspection and maintenance purposes.

(c) Due to the complicated construction in SIW Station involved, the construction cost of this option is expected to be very high.

8.2.6.3 Route R1-B

(a) Route R1-B is similar to Route R1-A but with different alignment at Siu Ho Wan side (more to the east for Route R1-B). The main tunnel is approximately 5.3 km for Route R1-B.

8.2.6.4 Route R1-C

(a) Route R1-C connects the SIW Station – Option 1 to Southeast Lantau, possibly via Mui Wo, with a main tunnel length of approximately 6.3 km which is much longer as compared to the other routes.

(b) Comparing to other options, this option is envisaged to have less impact to locals and freshwater marshlands as this longer alignment is more away from Mui Wo.

8.2.6.5 Route R1-D

(a) Route R1-D connects the SIW Station – Option 2 to Southeast Lantau, possibly via Mui Wo, with main tunnel length of approximately 5.2 km which is the shortest amongst Scenario R1. The curvature of this alignment is relatively gentle and forms good alignment for strategic link.

(b) This option has the advantage of less interface issue with TCL and MTR Siu Ho Wan Topside Development but is less desirable interchange with SIW (TCL) station. Instead of having a direct interface between the SIW(ELM) Station, SIW(TCL) Station and the MTR SHW Depot Topside Development, the proposed railway tunnel runs underneath the Topside Development. An underground reservation zone where no piles shall be constructed is required for future tunnel construction. The tunnel will also run across the alignment of TM-CLKL viaducts and clearance shall be made with the sub-structures of the viaducts.

(c) This option runs underneath the Priority Sites for Enhanced Conservation in Tai Ho to the south of the NLH as shown in **Figure 8.1**. Due to environmental constraint, any large-scale surface excavation including the cut-and-cover box for TBM receiving shaft is not feasible. Thus, the main tunnel alignment from SIW to MW shall be constructed by TBM in mixed ground condition, instead of drill-and-blast option for other options. The construction cost by TBM in hard rock is substantially higher than that for drill-and-blast.

8.2.7 Routing Option under Scenario R2

8.2.7.1 Under Scenario R2, the rail link connects TCE to Southeast Lantau, possibly via Mui Wo. A total of 2 routing options (Option R2-A and R2-B) have been and are shown in **Figure 8.2**.

8.2.7.2 Route R2-A

(a) Route R2-A connects TCE Station to Southeast Lantau, possibly via Mui Wo, with the alignment approximately 5.1 km long which is the shortest amongst all options.

(b) From TCE station, the rail link could also be possibly connected to HKBCF and Tuen Mun.

(c) Under this alignment, the proposed TCE Station and construction area will unavoidably trigger the need of amendment of TCE OZP. With the land issue resolved, the construction is relatively less technically challenging.

(d) Due to the relatively less complicated construction in TCE (as compared to SIW Station Option 1), the construction cost of this option is expected to be lower than the options under Scenario R1.

8.2.7.3 Route R2-B

(a) Route R2-B is similar to Route R2-A but with a different alignment from TCE (more to the west for Route R2-B), which is more away from the locals and freshwater marshland in Mui Wo.

(b) Despite less impact to locals and freshwater marshland, the construction cost of this option is expected to be higher than Route R2-A because of the longer tunnel length.

8.2.8 Options Evaluation

8.2.8.1 Based on the above discussions and option evaluation in **Tables 8.1** and **8.2**, it is considered that Route R2-A with connection to TCE is the better option in terms of making the most direct alignment between North Lantau to Southeast Lantau, possibly via Mui Wo. The rail link could also be possibly connected to HKBCF and Tuen Mun. This option can serve a greater population in Tung Chung. This is also in line with the concepts of strategic transport networks for Lantau in LanDAC TT SC Paper No. 12/2015. As the railway link may encroach upon the

marshland at Mui Wo, disturbance to the area shall be avoided/ minimized where possible. Detailed Environmental Impact Assessment under the EIAO shall be carried out in the future study to assess the environmental impact on the marshland.

8.2.8.2 On the other hand, connection to SIW station will unavoidably necessitate complicated interface issues with the MTR Siu Ho Wan Topside Development. Considering the MTR Siu Ho Wan Depot Topside Development is at a more advanced stage of planning, the interfacing issues may have impact on the implementation programmes and physical site constraints.

8.2.8.3 Both options would run at the rock level beneath the country park and the minimum distance between the proposed railway link and Tai Ho Wan (Tai Ho Stream SSSI) is more than 400m (**Figure 8.2**), thus, environmental impacts due to proposed link are also expected to be insignificant.

8.2.8.4 For illustrative purpose, the alignment and the vertical profile of the Option R2-A is shown in **Figure 8.5 – 8.8** and **Figure 8.9 – 8.17**. As this rail line could possibly be connected to the HKBCF-TCE rail link under separate study, the same chainage system is adopted to facilitate interface liaison between two projects. The chainage at TCE station is at approx. Ch. 2+700mPD.

8.2.8.5 The railway from TCE to SHW runs underground. The track level is at approx. -20mPD at TCE Station at Ch. 2+700. The level then ascends towards the south at a gradient of 1% to reach a maximum level of approx. +2.5mPD at approx. Ch. 5+100 within the country park. At this location, the ground level is at about +240mPD. Afterwards, the track descends at a gradient of 1%. These gradients allow drainage under gravity flow.

8.2.8.6 The rail alignment of Route R2-A intercepts on plan the proposed road tunnel, WSD existing water tunnel and WSD planned water tunnel on plan. However, the proposed rail tunnel will be at level much lower than that the road tunnel and WSD water tunnels. The proposed rail track level is at approx. -10mPD near the intersecting location, while the invert level for the existing and planned WSD water tunnel is at approx. +43mPD and +32mPD respectively. Thus the clearance with the rail tunnel is over 30m. The invert level for the road tunnel is at approx. +70mPD at intersecting location with rail tunnel, with a vertical

clearance distance of over 70m. Given the large clearance distance, no significant interfacing issues are envisaged. Nonetheless, more detailed assessment on tunnelling shall be carried out in future studies.

8.2.8.7 With the long tunnel length for all options, the fire engineering and building services design is anticipated to be challenging but yet technically feasible (**Sections 8.3.1 & 8.3.2** refer).

8.3 Key Engineering Issues

8.3.1 Fire Engineering

8.3.1.1 The fire engineering strategy to be applied for the railway link shall follow Guidelines on Formulation of Fire Safety Requirements for New Railway Infrastructures 2016 (the Railway Guidelines) and Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment (2012) issued by Fire Services Department (FSD). For any new and special design features to cope with the site constraints, Performance-based Fire Engineering Approach may also be adopted in the design stage, subject to the approval of FSD.

8.3.1.2 Key aspects that need to be considered in fire engineering design for trackside and station fire safety include fire service installation (FSI), smoke control measures, Means of Escape (MoE) and Means of Access (MoA), and fire separation compartmentation.

8.3.1.3 Trackside Fire Safety

(a) Fire Service Installations (FSI)

FSI shall be provided in accordance with Para 2.4.1 of the Railway Guidelines which shall include:

(i) Closed circuit television system

(ii) Emergency power supply

(iii) Emergency lighting

(iv) Directional exit signs/ exit signs

(v) Emergency communication system and emergency services radio coverage

(vi) Trackside fire hydrant system

(vii) Special equipment as required by FSD

(viii)Tunnel ventilation system and smoke control system

(b) Smoke Control Measures

(i) The fire size to be adopted for smoke control system design will depend on the train type, materials used, operation arrangement such as headway and the like. These factors will be subject to the information from railway operator. The proposed line is envisaged to operate as a typical MTR line in Hong Kong. Making reference to the largest train fire size from the passengers train of the recent typical railway line operating within Hong Kong i.e. IKK SP 1900 train used for the Shatin and Central Line and West Rail Line, etc. of MTRCL, the 17MW designed fire size is thus adopted and assumed in this feasibility study for smoke control system spatial, tunnel alignment and cost planning only. This 17MW fire size can cover that of the quoted example in Section 8.2.1. (train for West Rail line – 17MW (train model: IKK SP 1900), Tung Chung Line – 5MW (train model: K-stock). As the train model for the proposed rail link are yet to be confirmed in this early stage of project, the designed train fire size shall be further reviewed in future detailed design stage for the agreement of the Authority and FSD.

(ii) Longitudinal type (Push-pull) tunnel ventilation system will be employed in the tunnels as a conventional practice for smoke control. This is aimed to maintain a smoke free path for emergency evacuation and fireman's access in case of fire. In order to control the direction of smoke movement inside the tunnel and prevent 'back layering' of smoke in the direction of passenger evacuation, the designed tunnel airflow velocity in the incident tunnel shall be higher than the critical velocity (i.e. The minimum steady-state velocity of the ventilation airflow moving toward the fire within a tunnel that is required to prevent back layering) at the fire site. The

Push-pull tunnel ventilation system should be capable to operate in both forward and reverse directions (bi-directional) to control the smoke flow direction inside the tunnel. For the determination of critical velocity, total heat release rate of the train fire shall be adopted instead of convective heat release rate. The tunnel ventilation system shall also be designed to prevent hot smoke flowing from the incident tunnel to non-incident tunnel. A positive airflow from non-incident tunnel to incident tunnel through cross-passage doors located at the downstream of the fire should be maintained to avoid smoke spread when those door are opened for evacuation. For the details methodology and determination of the critical velocity and positive airflow generated to prevent smoke spill from the incident tunnel to non-incident tunnel, it will be established and agreed in the design stage with the general building plan submission.

(iii) In view of the topography condition, the performance of the designed tunnel ventilation system shall be demonstrated by computational simulation in the design stage in future studies, taking into account the designed train fire size and the tunnel geometry and alignment.

(iv) One-train-rule shall be applied to regulate only one train in each tunnel ventilation section at any time. For the implementation of the push-pull ventilation system, the tunnels are divided into a number of sections if the designed tunnel airflow velocity and/or the one-train-rule cannot be achieved in the entire tunnel between stations. As the new line will run under steepy topography, ventilation building at middle of tunnel is not practical. Thus, overhead ductworks inside the tunnels may be provided to achieve the push-pull ventilation strategy for each tunnel ventilation section. The concept of smoke control strategy is illustrated in **Plate 8.1** for indication. Details please refer to the MEP Sections of this document.

The "overhead ductworks" concept maybe adopted to ensure the "one-train-rule" strategy if more than one train stay in the long tunnel. The "overhead ductworks" concept is conservatively assumed for estimating the possible tunnel and building infrastructures size at this stage. This may only

be adopted if more than one train stays in the long tunnel.

Since the type of trains to be used and the headway information are yet to be confirmed in this early stage of project, the detailed efficiency, arrangement and capacity of tunnel ventilation system (TVS) together with the overall building infrastructures size shall be further reviewed in future detailed design stage for the agreement of the Authority and FSD.

Also, the performance of the system shall be further verified by computation software.

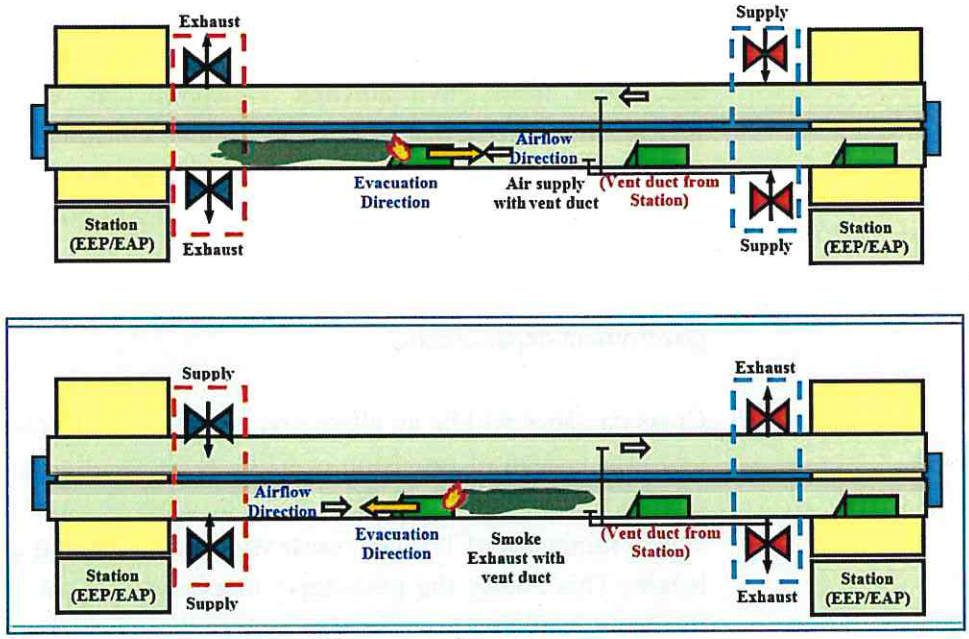


Plate 8.1 Smoke Control Strategy

(v) Basically, push-pull tunnel ventilation system should be provided to cover the tunnel including cross-over, overrun tunnel and refuge sidings, if any. The system should be provided to confine the smoke in one tunnel tube. If necessary, additional tunnel ventilation fans and/or ventilation building have to be considered. The operation and design shall be studied and developed during design stage in future studies and shall be based on the Railway Guideline and agreed with FSD.

(c) Means of Escape (MoE) and Means of Access (MoA)

(i) Apart from the conventional FSIs and smoke control measures, the means of escape (MoE) and means of access (MoA) will also play an important role in trackside fire safety. With consideration of the proposed tunnel length, Emergency Egress Point (EEP) and Emergency Access Point (EAP) should be provided with intervals of not more than 762m and 1000m respectively. However, most of the proposed tunnel alignment is located under the mountain area of the Lantau North (Extension) Country Park. If EAPs/ EEPs are located to the intermediate section of the tunnel, the level difference between the track level and the access/ exit at ground level will be varying from approx.100m to 300m. Provision of the associated access/ exit will also involve large scale site formation work within the Country Park which is not acceptable from environmental viewpoint. As detailed investigation is required to provide genuine constraints and justifications, these shall be studied during design stage in future studies. If it is finally studied that EEP/ EAP with sufficient access road can be constructed in the future, EEP/ EAP shall be provided and details to be agreed with relevant government departments.

(ii) Cross passages will be an alternative option with an interval of 244m instead of provision of EEP. A photo of a typical cross passage is shown in **Plate 8.2**. The cross passage shall have a minimum of 1800mm clear width and 2200mm clear height. This allows the passengers to evacuate to the non-incident tunnel as a temporary safe place during emergency. The cross wall or cross-passage door shall be of fire rated and self-closing type.

(iii) In addition, Backup Access Vehicle (BAV) should be proposed and positioned at the stations as appropriate mitigation measure for means of access, to increase the efficiency. A typical BAV is shown in **Plate 8.3**.

Plate 8.2 Example of Cross Passage

Plate 8.3 Typical Backup Access Vehicle (BAV

(iv) As for EAP, when further information regarding the rail link is available in the design stage in future studies, more detailed liaison will be carried out with FSD to discuss whether the extended distance between EAPs with appropriate mitigation measures in place such as BAV is considered acceptable for this rail link, as in the precedent cases in Shatin to Central Link, etc.

(v) According to the Railway Guideline and precedent cases with similar tunnel length (e.g. Tai Lam Tunnel of West Rail Line, Lion Rock Tunnel cum approaching tunnel to Diamond Hill Station of Shatin to Central Link), Emergency Rescue Station (ERS) is not required so it is not considered in the proposed scheme.

(vi) Since the proposed railway link will be a new railway line, side detrainment shall be adopted according to the Railway FS Code and also consistent with the latest new railway lines in Hong Kong. In this regards, emergency side walkways will be proposed along the tunnel. The emergency side walkway shall have a minimum of 850mm clear width and 2200mm clear height.

(d) Fire Separation and Compartmentation

Elements of construction of underground trackway shall have a fire resistance rating (FRR) of not less than 4 hours. 4-hour fire separation partition wall shall also be maintained between uptrack and downtrack tunnels, including the cross passage doors, and between trackways and overhead ductworks therein.

8.3.1.4 Station Fire Safety

(a) Fire Service Installations (FSI)

The provisions of FSI shall follow the Railway Guidelines requirements which shall cover:

(i) Audio/visual advisory system

(ii) Automatic actuating devices

(iii) Automatic fixed installation other than water

(iv) Emergency power supply

(v) Emergency lighting

(vi) Exit sign

(vii) Fire alarm system

(viii) Fire control centre

(ix) Fire detection system

(x) Fire hydrant/hose reel system

(xi) Fire Services communication system

(xii) Fireman's lift

(xiii) Firefighting and rescue stairway

(xiv) Portable hand-operated approved appliance

(xv) Pressurization of staircase

(xvi) Sprinkler system

(xvii) Static or dynamic smoke extraction system

(xviii) Street fire hydrant system

(xix) Special equipment/requirement

(xx) Ventilation/air conditioning control system

(b) Smoke Control Measures

Smoke control including smoke extraction system and pressurization of protected means of access/egress routes will be provided in stations to allow effective smoke control to provide a tenable environment for egress and fireman's access from/to the station and tunnel. Independent and dedicated ventilation shaft shall be provided for smoke control systems (i.e. smoke extraction system and staircase pressurization) of the station and tunnel ventilation system.

(c) Means of Escape (MoE)

(i) Similar to other latest new railway station design in Hong Kong, design of Place of Safe Passage in the station public area shall be adopted to provide a safe egress route for the station users. The egress time limit of 4.5 minutes will be considered for sizing the egress route to allow the passengers timely evacuate to Place of Safe Passage/Protected Route/Place of Ultimate Safety.

(ii) Conventional station entrances with escalators and stairs will be the key components in station egress leading to the Place of Ultimate Safety.

(d) Means of Access (MoA)

(i) The means of access provision including Designated Emergency Entrance (DEE) and Supplementary Emergency Entrance (SEE) shall be provided to provide the required coverage as per FSD requirement (i.e. 60m). If necessary, Fire Separated Corridor and extended protected corridors can be planned in order to achieve the required coverage. The FS provisions including telephone panel, inlets, etc. for the DEE and SEE shall also be provided.

(ii) The provision of Emergency Vehicular Access (EVA) for the stations shall be provided according to FSD requirements. Further, parking spaces for 7 numbers of 12m long fire appliances are required for DEE and SEE.

(e) Fire Separation and Compartmentation

(i) The station public area will not be subdivided into various fire compartments. However, the platform, concourse and Concession Areas will be designed with dedicated smoke zones incorporating with dedicated smoke control system and ductwork. The length of a smoke zone shall not exceed 60m. In some cases, where the length of smoke zone may exceed 60m, justification and mitigating measure should be provided in the design stage.

(ii) Cabin concept as described in the Railway Guidelines shall be adopted for the concession areas of the Station.

(iii) The ductworks and shafts shall have the same fire rating with the fire barrier where penetration occurs.

(f) Back of House (BoH) Area and Ancillary Building

The MoE, MoA, fire separation designs etc. of the BoH area and the ancillary building shall comply with the relevant prescriptive code requirements including the Railway Guidelines and FS code.

8.3.2 Building Services Engineering

8.3.2.1 Tunnel ventilation system for railway options

(a) The tunnel ventilation scheme to be applied for the proposed railway link from Siu Ho Wan to Southeast Lantau, possibly via Mui Wo (Scenario R1), or Tung Chung East to Southeast Lantau, possibly via Mui Wo (Scenario R2), will be very similar in nature. Push-pull ventilation method will be adopted for both options.

(b) The majority of the proposed tunnel alignment is running underneath the boundary of Lantau North (Extension) Country Park, Priority Site for Enhanced Conservation in Tai Ho and the extent of ecological constraints as shown in **Figure 8.1 - 8.2**. Under these environmental constraints, large scale site formation works associated with construction of tunnel ventilation facilities above ground is not allowed. Tunnel ventilation facilities can only be located at one end of each railway station and there will be no intermediate ventilation building along the approximate 5km run railway tunnels. The arrangement and capacity of tunnel ventilation shall be developed, reviewed and formulated with performance to meet the requirement of FSD in future detailed design stage, when the types of trains to be used, headway information and rail tunnel sections will be available. The design of tunnel ventilation system shall comply with Guidelines on Formulation of Fire Safety Requirements for New Railway Infrastructures and the geographic constraints. This is key constraint to the design of tunnel ventilation system. Long tunnel and so the distance between tunnel ventilation plants, is uncommon in Hong Kong. Yet, there is a precedent case from the Express Rail Link - the longest separation between ventilation buildings exceeds 6km.

(c) Under any alignment and any tunnel length, the tunnel ventilation system will consider different ventilation rates during normal mode, congestion mode and fire emergency mode, as tabulated below. The whole tunnels are assumed to be divided into 2 sections, where maximum 2 fleet of trains can be allowed to stall inside, based on the one-train-rule principle. In fact, the number of tunnel sections is related to the expected headway – shorter headway may mean more tunnel sections. 2 or more fleets of trains can be catered and the arrangement can be re-visited with known

headway in future studies. Similarly, the design fire size for tunnel ventilation system shall be reviewed and formulated with performance to meet the requirement of FSD in future detailed design stage.

Operation scenarios of tunnel ventilation system for rail options

Scenario	Descriptions	Dominance
Normal Mode	Draught relief induced by piston effect through vent shafts located within rail stations	No tunnel ventilation fans (TVFs) will be in operation.
Congestion Mode	TVFs will be operated in push-pull mode to establish a longitudinal airflow for tunnel environment control	Dominant
Fire Emergency Mode	TVFs will be operated in push-pull mode in the incident tunnel to control the spread of smoke by creating air stream of velocity higher than the critical velocity to prevent smoke back-layering	Most dominant as to archive the critical velocity

(d) The design of tunnel ventilation system shall refer to and base on the following codes, regulations and standards:

(i) Kennedy, W. D. "Critical Velocity: Past, Present and Future", One Day Seminar - Smoke and Critical Velocity in Tunnels, London, 1996;

(ii) Guidelines on Formulation of Guidelines on Formulation of Fire Safety Requirements for New Railway Infrastructures (2016), HKFSD;

(iii) Codes of Practice for Minimum Fire Services Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment (2012) (FSI code) and latest Circular letters, FSD, HK;

(iv) New Works Design Standards Manual Section 7 – Electrical and Mechanical Systems, MTR Corporation Limited.

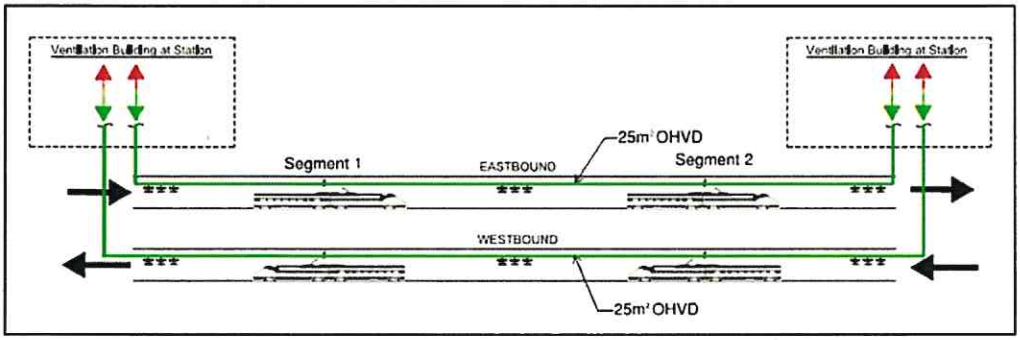


Plate 8.1 Assumed Tunnel Ventilation Scheme

(v) During fire emergency scenario, push-pull mode will be activated for the incident tunnel segment, with the TVFs at near end operating in push mode and those at the far end operating in pull mode.

8.3.2.2 Other building services & railway system requirements

(a) Each railways stations – Siu Ho Wan, Tung Chung East or Southeast Lantau, possibly via Mui Wo – should consist of platform level & concourse level. The stations should be divided into front-of-house and back-of-house areas where all supporting services and plant rooms will be located.

(b) In general, types of key building services installations and railway-related E&M installations required are summarised in **Table8.3** :

(c) All of these aforementioned building services and railway-related E&M installations will be required under any routing options.

(d) For the additional EEP/EAP facility at Mui Wo, all the aforementioned building services, except tunnel ventilation system and railway related E&M installations will be required.

8.3.3 Envisaged Tunnelling Method

8.3.3.1 For the stations in TCE and Southeast Lantau, possibly via Mui Wo, the track level will need to be at approx. -20mPD to pass underneath TCL, AEL and NLH in Tung Chung, and private lots in Southeast Lantau. The stations is envisaged to be constructed using cut-and-cover method.

8.3.3.2 Immediately south of TCE Station, to maintain the operation of TCL, AEL and NLH uninterrupted, construction of the tunnel by cut-and-cover method is not possible. Soft ground tunnelling technique will be required for constructing this section. Similarly, soft ground tunnelling technique will also be required for the tunnel section immediately north of station at Southeast Lantau before the tunnel is well inside rock.

8.3.3.3 For the majority of the tunnels in rock, drill-and-blast or TBM are possible options for the construction method. It is envisaged that the tunnel alignment will run across four geological faults, namely, Park Mong Fault, Ngau Kwu long Fault, Tai Ho Fault and Yam O Fault. Particular attention shall be paid when developing appropriate measures during tunnel construction.

8.3.4 Other Key Issues

8.3.4.1 There are several key issues which will affect the choice of preferred tunnel corridor and the schematic design of road and rail links.

8.3.4.2 The ventilation buildings at North Lantau may be within the Strategic Cavern Areas (SCVAs) No. 44 and 45 of the Cavern Master Plan prepared under Agreement No. CE12/2012 (GE) Study on Long-term Strategy for Cavern Development. The proposed alignment of rail links and ventilation buildings shall take account of this SCVAs in order not to affect their development potential.

8.3.4.3 NTHS will be required to assess whether the natural landslide hazards will affect the proposed ventilation buildings when the location is confirmed.

8.3.4.4 Blasting assessment, as well as further study on the establishment of project-specific explosives magazine(s), and explosives unloading pier(s) if considered necessary, shall be carried out in the event that blasting for tunnel excavation is confirmed in future study.

8.3.4.5 The preferences and details of the rail alignment in Southeast Lantau, possibly via Mui Wo, is highly dependent on the development planning of the ELM and Southeast Lantau, possibly via Mui Wo. The selection of the preferred options will need to be further studied in future study when more information of Southeast Lantau and ELM is available.

8.3.4.6 Station at Southeast Lantau may fall within the 1km Consultation Zone

of SMBWTW. Though the station itself would be located underground, the ventilation buildings (with intake louvers) of the station would be erected above ground level and there might be a possibility that the chlorine gas would immigrate into the station through the intake locations. In the event of any possible chlorine gas leakage, chlorine could be drawn into the station via the ventilation buildings. QRA is required in future study to demonstrate that the risks due to new rail link, which results in increase of transient population within the CZ, are acceptable in accordance with the Risk Guidelines.

8.3.4.7 The PHI for SHWWTW could affect the feasibility of Siu Ho Wan Interchange, while the PHI of SMBWTW could affect the feasibility of road connection in Southeast Lantau, possibly via Mui Wo, as there might be a possibility that the chlorine gas would immigrate into the tunnel through the portals. QRA shall be carried out in future studies for the PHI CZ of the water treatment works to assess in more detail the risk and the mitigation works required.

8.3.4.8 Freshwater Marshland are relative rare habitats in Hong Kong and has been identified in Mui Wo in older studies. The disturbance to these area shall be minimized where possible. However, the available information dates back in Year 2005. Updated information on the extent of Marshland in Mui Wo shall be identified in future study.

8.3.4.9 The land area at south of Cheung Tung Road adjacent to existing SHWSTW is a possible location of Administration Building for the road tunnel due to proximity to tunnel portal for fast response. However, there might be potential expansion of SHWSTW in that area as well which is also at an early stage of project. Continuous liaison shall be carried out in future studies.

8.3.4.10 For rail scenario R2 connecting TCE to Southeast Lantau, possibly via Mui Wo, the TCE station shall allow flexibility for further connection to the possible rail link between TCE and HKBCF. Further liaison with HKBCF Topside Development on the rail alignment and implantation programme shall be carried out in future study.

8.3.4.11 For rail scenario R2 connecting TCE to Southeast Lantau, possibly via Mui Wo, the TCE station and rail tunnel alignment run through the proposed TCE development area and the TCE OZP will possibly be affected. Further coordination with TCE to assess the impact on their OZP shall be carried out in future study.

9 Preliminary Traffic and Transport Impact Assessment

9.1 General

9.1.1 Preliminary TTIA was conducted under the Study to assess the traffic and transport impacts of SHW Reclamation and Landside Development under initial land use themes and with consideration of other major on-going and future developments such as ELM, NTN, Tung Chung New Town Extension, Sunny Bay Reclamation, North Commercial District, SHW MTR depot, HKBCF Topside Developments, etc.

9.1.2 A strategy transport model (STM) is developed to provide quantitative input for highway and railway network capacity analysis of major highway and railway links for accessing North Lantau under scenarios of without and with SHW development. The STM takes into account of demographic, socio-economic and infrastructure assumptions in estimating traffic and transport demand on major traffic corridor and strategic highway at North Lantau. It also estimates public transport demand on major facilities.

9.1.3 Assuming the year of full population intake of SHW development is 2031, assessment years of this preliminary TTIA are design years 2026, 2031, 2036 and 2041 based on various territorial planning assumptions and parameters provided by relevant authorities.

9.1.4 The assessment scenarios include:

(a) Base Case in design years 2026, 2031, 2036 and 2041

(Without SHW development)

(b) Reference Case

(Base Case + SHW development under maximum development potential scenario in design years 2031, 2036 and 2041, and Base Case + updated Initial Land Use Theme 2 in design year 2041, discussed in **Section 3**)

(c) Test Case in design years 2031, 2036 and 2041

(Reference Case + possible highway improvement schemes)

9.1.5 Apart from our SHW development, other major developments in the vicinity of North Lantau that had been considered in the preliminary TTIA include:

(a) Demographic data for design years provided in TPEDM dataset

(b) Tung Chung East and Tung Chung West Developments

(c) Other Housing Developments in Tung Chung

(d) North Commercial District

(e) Siu Ho Wan MTR Depot Development

(f) Potential Sunny Bay Reclamation Site

(g) Topside Development at Hong Kong Boundary Crossing Facilities (HKBCF)

(h) Tung Chung East and Tung Chung West Developments

(i) Potential Columbarium Sites in North Lantau

(j) ELM/NTN developments and its associated infrastructures (as assumptions for sensitivity study which shall be discussed in **Section 10**)

9.1.6 The operational performances of associated junctions in the vicinity area are assessed for design years.

9.2 Base Case (without SHW Development)

Major Road Links Assessment under Base Case

9.2.1 Considering the existing/ planned external corridors connecting to North Lantau (i.e. Lantau Link and TM-CLKL), the traffic forecast indicates that in design year 2026, Lantau Link would operate within the manageable degree of congestion, whereas in design years 2031 onwards, Lantau Link would operate over the manageable degree of congestion. The forecast reconfirms the earlier findings of the previous studies, for example, LegCo Paper No. CB(1)1096/04-05 (07) in 2005, which indicated that additional strategic road link might be required to cater for the traffic demand incurred by long-term development of Lantau.

Major Junctions Assessment under Base Case

9.2.2 Considering the vehicular access arrangement of the proposed SHW development and the adjoining SHW MTR Depot Development, and their major routings accessing urban areas, the airport and Tung Chung, three major junctions in the close vicinity are therefore identified, which would be operating with ample capacity in design years 2026, 2031, 2036 and 2041, with a Reserved Capacity (RC) over 15% for signalised

junctions and a Design Flow Capacity (DFC) below 0.85 for priority junctions and roundabouts.

Railway Assessment under Base Case

9.2.3 According to LegCo Paper CB(1)1132/14-15(01), the construction of an overrun tunnel in Hong Kong Station and upgrading of signalling system can increase the maximum carrying capacity of Tung Chung Line between Tsing Yi and Hong Kong from 26,700 pphpd to 47,000 pphpd under 4 ppsm. The above increased capacity formed the basis of the railway assessment under this Study.

9.2.4 In design years 2026-2041, the loading of critical link section of Tung Chung Line during the morning peak would be in the range of 84% - 93% under 4 ppsm. The preliminary result indicates that Tung Chung Line would operate within it capacity under 4 ppsm in all design years without SHW development.

9.3 Reference Case (with SHW Development)

9.3.1 Among the initial land use themes discussed in **Section 3,** the scenario with maximum development potential was initially established for broad technical assessment. Subsequently, the updated Initial Land Use Theme 2 is further developed and corresponding traffic assessment is therefore supplemented and elaborated under this study.

Major Road Links Assessment under Reference Case

9.3.2 In view of road link assessment results under Base Case discussed in **Section 9.2**, it is identified that Lantau Link (Tsing Ma Bridge) would operate marginally at the onset of serious congestion in design year 2031. The traffic forecast of SHW development (under maximum development potential) for design year 2031 is therefore conducted to understand its impact to the external road corridors.

9.3.3 Lantau Link (Tsing Ma Bridge) would operate over the manageable degree of congestion at a V/C ratio of 1.23, while TM-CLKL Northern Connection would operate within the manageable degree of congestion with a V/C ratio of 1.07 in design year 2031.

9.3.4 It is also identified that the performance in design year 2041 would be

the worst case among all design years. The traffic forecast of the SHW development (under updated initial land use theme 2) for design year 2041 is therefore conducted to assess the most critical scenario from traffic point of view.

9.3.5 In consideration of the proposed SHW Development (under updated Initial Land Use Theme 2) in design year 2041, Lantau Link (Tsing Ma Bridge) would operate at the onset traffic congestion during morning and evening peak hours, as compared to Base Case.

9.3.6 In summary, it is envisaged that even without the proposed SHW Development, Lantau Link (Tsing Ma Bridge) would operate over the manageable degree of congestion in design year 2031onwards. It is therefore ascertained that additional highway infrastructures should be provided to accommodate long-term traffic demand in North Lantau. Notwithstanding the above, the traffic benefits of potential highways in Lantau such as Lantau Road P1, Route 11, etc. indicated in the recently released Sustainable Lantau Blueprint would be subject to further investigation under other studies.

Major Junction Assessment under Reference Case

9.3.7 Taking into account the peak hour traffic generation by the SHW development (under updated Initial Land Use Theme 2) on the local traffic network, all assessed major road junctions (i.e. Tai Ho Interchange, a roundabout to the external connecting road, and signalised junction at SHW MTR Depot Development access) in the vicinity would be operating at satisfactory level.

Railway Assessment under Reference Case

9.3.8 For the railway assessment of updated Initial Land Use Theme 2 in design year 2041, loading of critical link of Tung Chung Line during morning peak would be 94% under 4ppsm. Therefore, with the proposed SHW development (under updated Initial Land Use Theme 2), the preliminary railway forecast indicates that Tung Chung Line would operate within its capacity under 4 ppsm.

9.4 Test Cases

9.4.1 To alleviate the anticipated traffic congestion in Lantau at strategic level, three major highway infrastructures are identified as below.

(a) *Route 11* – It will be a proposed dual 3-lane carriageway, connecting Lam Tei in Northwest New Territories (NWNT) to Sunny Bay in Northeast Lantau via So Kwun Wat and Tsing Lung Tau. Strategically, Route 11 will function as an alternative external road link for traffic accessing between Yuen Long/ Tin Shui Wai / Hung Shui Kiu and Lantau/ airport. The main trunk road of Route 11 consists of Lam Tei Tunnel, Tai Lam Chung Tunnel, and Tsing Lung Bridge, connecting Lam Tei, So Kwun Wat, Tsing Lung Tau, and Sunny Bay. So Kwun Wat Link Road, a dual-2 link road will connect Route 11 to Tuen Mun Road at So Kwun Wat.

(b) *Lantau Road P1* – It will be a dual 2-lane carriageway running between Tung Chung and Sunny Bay. It provides access to the developments along the north shore of Lantau Island, including Tung Chung East New Town Extension, SHW Reclamation and Landside Development, as well as Sunny Bay Reclamation Development. Further extension of Lantau Road P1 to East of Sunny Bay Interchange with a direct connection linking between Lantau Road P1 and Route 11 would also be considered as one of possible mitigation measures for traffic assessment.

(c) *Tsing Yi – Lantau Link (TY-LL)* – It will be a proposed dual 3-lane carriageway, will connect Sunny Bay and Tsing Yi. Strategically, it will serve as an effective parallel route to Lantau Link (Tsing Ma Bridge) and share its traffic loading, for accessing between the Airport and urban areas.

9.4.2 Three test cases for design years 2031, 2036 and 2041 were studied to evaluate the effectiveness of these highway infrastructures to the road network in Lantau:

(a) Test case 1: Ref case + Lantau Road P1 + Route 11

(b) Test case 2: Ref case + Lantau Road P1 + Route 11 + TY-LL

(c) Test case 3: Ref case + Lantau Road P1 + Route 11 + Lantau Road P1 extending to East of Sunny Bay Interchange

9.4.3 The above test cases were carried out based on the assumed maximum development potential scenario (i.e. land use theme with buffer population) as discussed in **Section 3**. This assumed maximum development potential of SHW does not represent the proposed land use theme, but was merely an assumed scenario to preliminarily assess the likely worst case traffic condition.

9.4.4 The assessment result indicates that the provision of Lantau Road P1 and Route 11 (Test Case 1) alone would not be sufficient in alleviating the traffic congestion in North Lantau. On the other hand, additional highway infrastructure with Road P1+ Route 11 + Tsing Yi-Lantau Link (Test Case 2) are identified as possible mitigation measures to

alleviate traffic congestion in North Lantau. For the case with additional highway infrastructure comprising Road P1 + Route 11 + Road P1 extending to East of Sunny Bay Interchange (Test Case 3), the V/C ratio of Lantau Link is estimated to be marginally over 1.20 in design year 2041. Nevertheless, if the population in SHW is not based on the land use theme with maximum development potential as discussed in **Section 3**, it may not be impossible that the V/C ratio of Lantau Link in 2041 could be reduced to slightly less than 1.2. Further assessment will be required in future study to ascertain this possibility.

9.4.5 The purpose of the assessment is primarily for comparison of different proposals in mitigating the anticipated traffic congestion problem in North Lantau from traffic and transport perspective. It should not form the conclusion that TY-LL is the preferred solution.

10 Sensitivity Study on Railway and Road Links

10.1 General

10.1.1 A series of test scenarios for design year 2041 with different combinations of assumed highway and railway connections under ELM and NTN developments were carried out to test the performance of transport infrastructures related to SHW development (under land use theme with maximum development potential) and ELM/NTN.

10.1.2 Highway and railway infrastructure assumptions and the preliminary findings based on the forecast results for each test scenario are presented in the following sub-sections.

10.2 Highway Infrastructure Assumptions

10.2.1 For the purpose of preliminary traffic assessment under this study, the maximum provision of highway infrastructure assumed for connecting the ELM to the urban areas in the territory and connecting among different development areas within the ELM are:

(a) A strategic highway corridor linking western Hong Kong Island, the ELM including Kau Yi Chau (KYC), Hei Ling Chau (HLC) and Southeast Lantau, possibly via Mui Wo (MW), and North Lantau at SHW. Tuen Mun – Chek Lap Kok Link (TM-CLKL) under construction extends this corridor to NWNT at Tuen Mun.

(b) A strategic highway corridor linking western Hong Kong Island, ELM at KYC, Sunny Bay in Northeast Lantau, Tsing Lung Tau, and Lam Tei for accessing NWNT at areas of Hung Shui Kiu/ Tin Shui Wai/ Yuen Long.

(c) Lantau Road P1 and Tsing Yi – Lantau Link run parallel to Lantau Link to provide additional traffic capacity for east-west movement between the Airport and the urban areas.

10.2.2 In addition to the highway links discussed in **Section 9.4.1** (including Lantau Road P1, Route 11 and TY-LL), there are other major road links serving as the main external road access for supporting the future developments in Lantau. More detailed descriptions on these road links are discussed as below.

10.2.3 Highway Link Connecting Kennedy Town, KYC, HLC, and MW

10.2.3.1 This proposed highway link essentially connecting the ELM near KYC and western Hong Kong Island at Kennedy Town may be a dual 3-lane carriageway, subject to further studies.

10.2.3.2 Subject to further studies, it may further extend to connect different development areas within the ELM at KYC, HLC, and MW.

10.2.4 Highway Link Connecting to Southeast Lantau, possibly via Mui Wo, and North Lantau

10.2.4.1 In accordance with the Clause 6.4.1 of the Study Brief, the highway link connecting between Southeast Lantau, possibly via Mui Wo, and North Lantau is proposed and assessed under this Study. This transport infrastructure shall consider the below:

(a) Road link between SHW and Southeast Lantau, possibly via Mui Wo, for further connection to ELM, connecting to the existing network at SHW via the proposed interchange near Tai Ho

(b) Road link between SHW and Southeast Lantau, possibly via Mui Wo, for further connection to ELM, connecting to the existing network at SHW via an alternative connection point

10.2.4.2 Based on the broad-brush traffic assessment, a dual 2-lane carriageway is proposed for connecting Southeast Lantau, possibly via Mui Wo, and SHW at Siu Ho Wan Interchange.

10.2.5 Highway Link Connecting Sunny Bay and KYC

10.2.5.1 This proposed highway link is known as the parts of Hong Kong – Lantau Link, connecting Sunny Bay and KYC. It will complete the strategic corridor connecting between the areas in the NWNT, North Lantau, the ELM, and Hong Kong Island, with the provisions of Route 11 and the highway link connecting Kennedy Town and KYC.

10.2.6 Extension of Route 4

10.2.6.1 The proposed extension of Route 4 connecting the Kennedy Town and Aberdeen may serve as an alternative link between western and southern parts of Hong Kong Island. There is currently no timetable for the design and implementation programme of Route 4 Extension from Kennedy Town to Aberdeen.

10.3 Railway Network Assumptions

10.3.1 For the purpose of preliminary traffic assessment under this study, the maximum provision of railway network assumed for connecting the ELM to the urban areas in the territory and connecting among different development areas within the ELM, as well as NTN development are:

(a) East Lantau Rail Line (from Kennedy Town to Tuen Mun South)

A railway corridor connecting the western Hong Kong Island at Kennedy Town, the ELM and further to the NWNT at Tuen Mun South.

(b) East Lantau – Kowloon Line (from KYC to West Kowloon)

A railway corridor connecting the ELM at KYC and western Kowloon, and forming part of the long-term North-South Railway corridor.

(c) North-South Railway (from Mei Foo to Liangtang)

A railway corridor connecting the western Kowloon and NTN development, which will complete the railway corridor linking the NTN and ELM developments.

10.4 Test Scenarios and Preliminary Findings

10.4.1 Test Scenario Setting

10.4.1.1 A total of 14 test scenarios, which have been categorised into five groups under different combinations of highway and railway connections, were conducted in design year 2041 in comparison of base case and reference case (i.e. with SHW development under land use theme with maximum development potential). Main objectives of each group of test scenarios are discussed as below.

(a) Test scenarios A1-A3 test the performance of highway infrastructure for the proposed SHW development with different mitigation measures in place. These scenarios are same as the test cases discussed in **Section 9**.

(i) Test scenario A1 – with provisions of Road P1 and Route 11

(ii) Test scenario A2 – with provisions of Road P1, Route 11 and Tsing Yi – Lantau Link

(iii) Test scenario A3 – with provisions of Road P1 and Route 11,

while Road P1 extending to East of Sunny Bay Interchange with a direct connection linking between Road P1 and Route 11

(b) Test scenarios B1 – B5 mainly test the performance of railway network with ELM Development in place and evaluate the rail connection options between Southeast Lantau, possibly via Mui Wo, and North Lantau. They are tested under the maximum high provision of ELM.

(i) Test scenario B1 – without rail connection between Southeast Lantau, possibly via Mui Wo, and North Lantau

(ii) Test scenario B2 – with rail connection between Southeast Lantau, possibly via Mui Wo, and Siu Ho Wan

(iii) Test scenario B3 – with rail connection between Southeast Lantau, possibly via Mui Wo, and Tung Chung East (TCE)

(iv) Test scenario B4 – with rail connection between Southeast Lantau, possibly via Mui Wo, and Tung Chung West (TCW)

(v) Test scenario B5 – adopted the preferred options from test scenarios B2 – B4, with removal of the rail connection between HZMB HKBCF Island and Tuen Mun South

(c) Test scenario C1 studies the impact of toll level on highway link connecting Southeast Lantau, possibly via Mui Wo, and North Lantau. It is tested under the preferred railway connection option identified in test scenario group B.

(i) Test scenario C1 - no toll at Southeast Lantau, possibly via Mui Wo - Siu Ho Wan Link

(d) Test scenarios D1-D4 test the performance of highway network with ELM Development in place. They are tested under the preferred railway connection option identified in test scenario group B.

(i) Test scenario D1 – provision of Lantau Road P1, Hei Ling Chau – Southeast Lantau Link (possibly via Mui Wo), KYC - Hei Ling Chau Link, HK-Lantau Link - Section between

KYC and HKI, Route 4 extension and Southeast Lantau Link (possibly via Mui Wo) – Siu Ho Wan Link (removal of Route 11, Tsing Yi – Lantau Link and HK-Lantau Link - Section between KYC and Sunny Bay from test scenario B3 highway network)

(ii) Test scenario D2 – provision of Lantau Road P1, Hei Ling Chau - Southeast Lantau Link (possibly via Mui Wo), KYC - Hei Ling Chau Link, HK-Lantau Link - Section between KYC and HKI, and Route 4 extension (removal of Southeast Lantau, possibly via Mui Wo – Siu Ho Wan Link, Route 11, Tsing Yi – Lantau Link and HK-Lantau Link - Section between KYC and Sunny Bay from test scenario B3 highway network)

(iii) Test scenario D3 – provision of Lantau Road P1, Hei Ling Chau – Southeast Lantau Link (possibly via Mui Wo), KYC - Hei Ling Chau Link, HK-Lantau Link - Section between KYC and HKI, Route 4 extension, Southeast Lantau (possibly via Mui Wo) – Siu Ho Wan Link, Route 11 and Tsing Yi – Lantau Link (removal of HK-Lantau Link - Section between KYC and Sunny Bay from test scenario B3 highway network)

(iv) Test scenario D4 – provision of Lantau Road P1, Hei Ling Chau - Southeast Lantau Link (possibly via Mui Wo), KYC - Hei Ling Chau Link, HK-Lantau Link - Section between KYC and HKI, Route 4 extension, Southeast Lantau (possibly via Mui Wo) – Siu Ho Wan Link, Route 11 and HK-Lantau Link - Section between KYC and Sunny Bay (removal of Tsing Yi – Lantau from test scenario B3 highway network)

(e) Test scenario E1 studies the additional impact to the infrastructure if NTN Development is in place. It is tested under the preferred highway and railway connection options under test scenario group D.

(i) Test scenario E1 - with rail connection linking the NTN at Liantang and ELM

10.4.1.2 Among test scenarios, highway traffic flows, public transport passenger flows across screenlines, and railway passenger flows during peak hour at critical line segments were investigated. Preliminary findings based on the forecast results for each group of test scenarios are presented as follows.

10.4.2 Forecast for Base Case, Reference Case and the Highway Test Result with SHW development in place

10.4.2.1 Preliminary findings of base case, reference case and test scenarios A1 – A3 have already been discussed in **Section 9**. To recap, the highway forecasts for base case indicate that Lantau Link will operate at congestion level even without the SHW development, while the highway forecasts for reference case in test scenarios A1 – A3 indicate that Tsing Yi – Lantau Link is a better provision to alleviate the traffic congestion in North Lantau in future. However, the purpose of the test is primarily for comparison of different proposals in mitigating the anticipated traffic congestion problem in North Lantau from traffic and transport perspective. The finding should not form the conclusion that Tsing Yi – Lantau Link is the preferred solution.

10.4.3 Test Result for Preferred Railway Connection between Southeast Lantau, possibly via Mui Wo, and North Lantau

10.4.3.1 The rail assumption in test scenarios B1-B5 could all support the ELM development. However, considered the strategic benefit brought by the rail infrastructure, it is preferable to provide connection between NWNT and Hong Kong Island, via TCE and Southeast Lantau, possibly via Mui Wo, as assumed in test scenario B3 (i.e. with rail connection between Tuen Mun South and Hong Kong Island via Tung Chung East, Mui Wo and ELM) from transport planning point of view.

10.4.4 Test Result for Highway Toll for Southeast Lantau (possibly via Mui Wo) – Siu Ho Wan Link

10.4.4.1 In test scenario C1, the key road performance will be similar.

10.4.5 Test Result for Preferred Highway Network for ELM Development

10.4.5.1 Based on the highway performance among the highway network options under test scenarios D1-D4, the highway assumptions in test scenarios D1 and D3 which feature two external highway connections

serving the ELM could both support the North Lantau and ELM developments. The strategic role of Kennedy Town - KYC Link and Southeast Lantau (possibly via Mui Wo) - Siu Ho Wan Link is ascertained. Test scenarios D2 and D4 were carried out to test the highway performance under the network with one and three external highway connections serving the ELM respectively. By comparing the test result, the highway assumptions in test scenarios D1 and D3 will be more preferable. Comparing test scenarios D1 and D3, taking the cost-effectiveness of transport infrastructure provision into consideration, it is preferable to adopt a strategic highway corridor connecting North Lantau, Southeast Lantau (possibly via Mui Wo), ELM and Hong Kong Island, as assumed in test scenario D1, from transport planning point of view.

10.4.6 Test Result with NTN Development in place

10.4.6.1 Test scenario E1 indicates that the NTN development will have rather minimal impact to the trip distribution of SHW and ELM developments, as reflected from the highway and rail line performance in their vicinity.

10.4.7 Preferred Highway and Railway Network for ELM Development

10.4.7.1 As a result of this assessment, the preferred highway and railway infrastructure in the vicinity of SHW and ELM developments is identified in test scenario D1. The preferred highway and railway infrastructures include a railway corridor connecting NWNT and Hong Kong Island, via TCE, Southeast Lantau (possibly via Mui Wo) and ELM, and a strategic highway corridor connecting North Lantau, Southeast Lantau (possibly via Mui Wo), ELM and Hong Kong Island.

10.4.8 Implementation of the Preferred Highway Infrastructure

10.4.8.1 In view of implementation of highway infrastructure, Tsing Yi-Lantau Link is identified as proposed highway infrastructure in relieving the congestion at key highways in North Lantau under without ELM development (as in test scenario A1). However, for the series of test on preferred transport infrastructure with ELM development, the strategic highway corridor including Kennedy Town-KYC Link, Southeast Lantau (possibly via Mui Wo) – Siu Ho Wan Link, etc. will also help alleviate the congestion in North Lantau (as in test scenario D1). Provision of Tsing Yi – Lantau Link together with the strategic highway corridor including Kennedy Town – KYC Link, and Southeast Lantau

(possibly via Mui Wo) – Siu Ho Wan Link (as in test scenario D3 which includes the proposed road infrastructure of both test scenarios A1 and D1) is less preferable in consideration of the cost-effectiveness in enhancing/ improving the road network performance in the vicinity of SHW and ELM developments.

10.4.8.2 In this regards, separate study may be required by the Government in long-term transport planning to prioritise land use (ELM) and transport infrastructure development (Tsing Yi – Lantau Link or Kennedy Town-KYC Link, Southeast Lantau (possibly via Mui Wo) – Siu Ho Wan Link) in North Lantau and ELM. Consideration may also be given in exploring any alternative alignment option other than Tsing Yi – Lantau Link which could alleviate the anticipated traffic congestion at North Lantau Highway in medium term, and serve ELM traffic in long term.

11 Conclusion and Way Forward

11.1.1 Taking into consideration the site constrains and opportunities, the maximum potential extents of SHW Reclamation and Landside Development were preliminarily studied. Three initial land use themes were formulated and subsequently evaluated against a set of guiding principles and criteria so that the relative performance of each element of the theme were compared. Based on the comparative evaluation, a land use theme was further developed and used for broad technical assessment.

11.1.2 There may be an increase in the development potential based on (i) the review of existing AHR at the PDS identified by CEDD under 2RS operations of HKIA conducted by CAD and the Preliminary Airspace Protection Plan for the future operations of 3RS of the HKIA being conducted by AAHK and (ii) potential reduction of PHI CZ of SHWWTW due to the reduction of chlorine risk associated with SHWWTW by conversion from drum draw-off to cylinder draw-off under study by WSD.

11.1.3 Findings of the above studies will also have implications to the future land use that can be proposed in SHW. The future land use shall be reviewed in a holistic approach with the considerations of the land use compatibility of the proposed developments in the close vicinity.

11.1.4 Based on the preliminary sewage flow from other concurrent project, it is noted that the design capacity of SHWSTW, i.e. 180,000m^3/day, would be exceeded in Year 2034 even without the proposed SHW Reclamation and Landside Development. The additional sewage demand from proposed SHW development (with maximum development potential) will cause the exceedance to shift to Year 2029. To cater for the uncommitted sewage arising from other developments in the catchment, a joint departmental working group is exploring the planning feasibility of the long-term expansion for the SHWSTW including the feasibility of relocating it inside a cavern. However, there is no scheduled completion date for the upgrading project. Therefore, should the proposed SHW development were to be planned for commissioning before the completion of the SHWSTW upgrading project, the proposed development would need to include an assessment for alternative sewage treatment as an interim measure. A new sewerage network and pumping stations would be required to collect sewage flow from the development which shall subsequently be conveyed to

SHWSTW or proposed new treatment works for subsequent treatment and disposal.

11.1.5 The fresh water demand is estimated and ranged to be 21,950m^3/day (for Theme 2) and 12,323 m^3/day (for maximum development potential), while the flushing water demand is ranged to be 850 m^3/day (for Theme 2) and 4,580 m^3/day (for maximum development potential) for SHW development.

11.1.6 As the existing capacity of SHWWTW is 150,000m^3/day, this is not adequate to meet the projected maximum mean daily demand within its water supply zone (including SHW development and other developments in North Lantau). The planned extension of SHWWTW to an ultimate capacity of 300,000m^3/day by the WSD and the associated water transfer facilities will therefore be required. New fresh water services reservoir, ranged from approximately 2,200m^3 (for Theme 2) and 19,000m^3 (for maximum development potential) located adjacent to SHWWTW is envisaged to be required to supply fresh water to SHW development.

11.1.7 There are several marine facilities located in the vicinity of the proposed reclamation area, impact to these facilities due to reclamation development shall be critically assessed. Mitigation measures such as relocation, reprovision shall be considered if necessary.

11.1.8 Three preliminary site formation options were studied. Among various options, cut platform is considered relatively more preferable in view of larger developable area, higher flexibility for future implementation and least landscape and visual impact (with proper slope and landscape design). The excavated fill can also be used for reclamation of SHW.

11.1.9 Site-specific CWD had been carried out under the Study between Feb 2016 and Apr 2017 to study the current occurrence and behaviour of CWD in shallow waters of SHW as well as the fine scale usage of CWD habitat. No CWD sightings were recorded at SHW during the monitoring period. Nevertheless, the PAM had recorded some usage in the area of SHW by CWD at night time. This indicated that CWD may avoid the anthropogenic disturbance in the area during the day time, while utilising the area more frequently at night.

11.1.10 SHW reclamation would cause a permanent loss of about 82 ha of marine habitat which is in close vicinity to BMP encompassing historic

hotspots of CWD habitat. This area is assumed to be approximately equal to the reclamation area assuming the geometry of the existing and new seawall are similar. The SHW reclamation extent has been proposed to be reduced to maintain a separation of 150m from BMP. Nevertheless, the potential impact on the marine park can still be significant due to its close proximity to the important CWD habitat, if the disturbance from reclamation is not properly addressed through stringent protection and mitigation measures.

11.1.11 The CWD survey and impact assessment conducted under this Study are preliminary only and were carried out in advance of the statutory Environmental Impact Assessment Ordinance (EIAO). In view of the on-going construction activities of HZMB-related Hong Kong projects, the survey findings under this Study will only be taken as reference to facilitate the broad CWD impact assessment at this stage, and will not be used as the sole baseline for subsequent CWD impact assessment. A more comprehensive CWD monitoring and impact assessment shall be carried out under the statutory Environmental Impact Assessment at a future stage of the project.

11.1.12 Statutory EIA and town planning process will need to be carried out in future study to critically assess various key environmental impacts (e.g. air quality, noise, water quality, waste, ecology, fisheries, cultural heritage, landscape and visual, hazard to life, etc.) and to formulate appropriate mitigation.

11.1.13 For road connection, a road tunnel between North Lantau and Southeast Lantau, possibly via Mui Wo, with reserve for a future connection to ELM can be further studied.Based on the option evaluation on the main tunnel alignment, the proposed Siu Ho Wan Interchange (Interchange N3) is identified as the possible interchange between the North Lantau Highway and the road tunnel. The nearest distance between the suggested road link at Siu Ho Wan and Tai Ho Wan (Tai Ho Stream SSSI) is more than 600m, the impacts due to terrain modification and site formation are therefore not expected to be significant. Detailed impact assessment for road connection will be carried out at the later stage by the future project proponent under EIA Ordinance.

11.1.14 For rail connection, connection to TCE is more preferable and technically feasible because of least interfacing issues with MTRCL and most direct alignment for possible connection to HKBCF and Tuen Mun which is in line with the concepts of strategic transport networks

for Lantau in LanDAC TT SC Paper No. 12/2015. It also serves Tung Chung which has the greatest population in North Lantau. The suggested railway link would run at the rock level beneath the country park and the minimum distance between the proposed railway link and Tai Ho Wan (Tai Ho Stream SSSI) is more than 400m, Thus, environmental impacts due to proposed link are also expected to be insignificant. Detailed impact assessment for rail connection will be carried out at the later stage by the future project proponent under EIA Ordinance.

11.1.15 There are several key issues affecting the choice of tunnel corridor and the schematic design of road and rail links which are subjected to review in the next stage study with reference to the latest development of other interfacing projects. These issues include:

(a) Development in ELM and Southeast Lantau (possibly via Mui Wo) – At the south, as the preferences and details of the road tunnel corridor will be highly dependent on the development planning of the ELM and Southeast Lantau, possibly via Mui Wo, it is suggested that the selection of the preferred options will need to be further studied at a later stage when more information of ELM is available.

(b) Quantitative Risk Assessment (QRA) of PHI in SHWWTW and SMBWTW – The PHI for SHWWTW is a key constraint affecting the feasibility of Siu Ho Wan Interchange, while the PHI of SMBWTW is a key constraint affecting the feasibility of road connection to Southeast Lantau, possibly via Mui Wo. QRA shall be carried out in future studies for the PHI CZ of the water treatment works to assess in more detail the risk and the mitigation works required. Attention is also drawn that the PHI CZ of SHWWTW could possibly be reduced from 1km to 400m subjected to possible update of WSD operations. Further liaison with WSD on the updates of PHI CZ shall be carried out in future studies.

(c) Coordination of Road P1 Design with other interfacing project – The Road P1 Siu Ho Wan design will need to be further coordinated with the latest development in other interface projects, including the MTR Siu Ho Wan Depot Topside Development, the Tung Chung East New Town Extension and the Road P1 Sunny Bay Section.

(d) Extent of Marshland in Mui Wo – Freshwater Marshland are relative rare habitats in Hong Kong and has been identified in Mui Wo in older studies. The disturbance to these area shall be avoided/ minimized where possible. The available information which is adopted as reference in this Study dates back in Year 2005.

Updated information on the extent of Marshland in Mui Wo is not available and shall be identified in future studies. Detailed Environmental Impact Assessment under the EIAO shall be carried out in the future Study to assess the environmental impact (both construction and operational) of the proposed road, in particular the freshwater marshland which will be affected.

(e) The proposed tunnel alignment at North Lantau and Southeast Lantau, possibly via Mui Wo, are largely within the Strategic Cavern Areas (SCVAs) No. 42 and 44 of the Cavern Master Plan prepared under Agreement No. CE12/2012 (GE) Study on Long-term Strategy for Cavern Development. The proposed alignment of road links should be optimized to take account of the SCVAs in order to preserve their development potentials. For example, provisions could be made to avoid the proposed alignment from obstructing potential portal locations or to allow space for developing other cavern facilities in the SCVA. The proposed alignment should be reviewed and refined to safeguard the development potential of the SCVA when the project is further pursued.

(f) Implementation of Electronic Road Pricing System / Location of Toll Facilities - Subject to the implementation programme of the road link and the adoption of electronic road pricing system, it is possible that toll plaza will not be necessary. The most important criteria on the location of the toll facility is the tolling strategy on the traffic planning to ELM. While possible locations of toll facilities have been identified in the report, it is premature to determine the location of the toll facility at the current stage and shall be further investigated in future studies when more information on ELM is available.

(g) Possible location of Administration Building for Road Tunnel in Siu Ho Wan – The land area at south of Cheung Tung Road adjacent to existing SHWSTW has been identified as a possible location of Administration Building due to proximity to tunnel portal for fast response. It is learned that there might be potential expansion of SHWSTW in that area which is also at an early stage of project. Continuous liaison shall be carried out in future studies.

(h) Further ground investigation works – The available ground information along the proposed road alignment is limited. More ground investigation works shall be carried out in future studies to confirm the geology along the road alignment. When more geotechnical information are available, the road tunnel portal design and preliminary blasting assessment can be carried out in future studies.

(i) Programme Uncertainties – At this early stage of project, the derivation of a construction programme can only be ascertained in very broad terms. Factors such as site access, storage areas,

construction plant etc. will all play a part in determining duration of the works.

(j) Potential conflict between the alignment of the rail corridor, the possible HKBCF-TCE rail link and TCE OZP.

11.1.16 For the traffic assessment in design year 2031, with the proposed SHW Development (under maximum development potential), Lantau Link (Tsing Ma Bridge) would operate over the manageable degree of congestion at a V/C ratio of 1.23, while TM-CLKL Northern Connection would operate within the manageable degree of congestion with a V/C ratio of 1.07.

11.1.17 It is estimated that even without the proposed SHW Development, Lantau Link (Tsing Ma Bridge) would operate over the manageable degree of congestion in design year 2031 onwards. It is therefore ascertained that additional highway infrastructures should be provided to accommodate long-term traffic demand in North Lantau.

11.1.18 Three test cases on additional highway infrastructures were studied to evaluate their effectiveness to the road network of North Lantau. The assessment result for test cases indicates that the provision of Lantau Road P1 and Route 11 (Test Case 1) alone would not be sufficient in alleviating the traffic congestion in North Lantau. On the other hand, additional highway infrastructure with Road P1+ Route 11 + Tsing Yi-Lantau Link (Test Case 2) are identified as possible mitigation measures to alleviate traffic congestion in North Lantau. For the case with additional highway infrastructure comprising Road P1 + Route 11 + Road P1 extending to East of Sunny Bay Interchange (Test Case 3), the V/C ratio of Lantau Link is estimated to be marginally over 1.20 in design year 2041. Nevertheless, if the population in SHW is not based on the maximum development potential as discussed in **Section 3**, it may not be impossible that the V/C ratio of Lantau Link in 2041 could be reduced to slightly less than 1.2. Further assessment will be required in future study to ascertain this possibility.

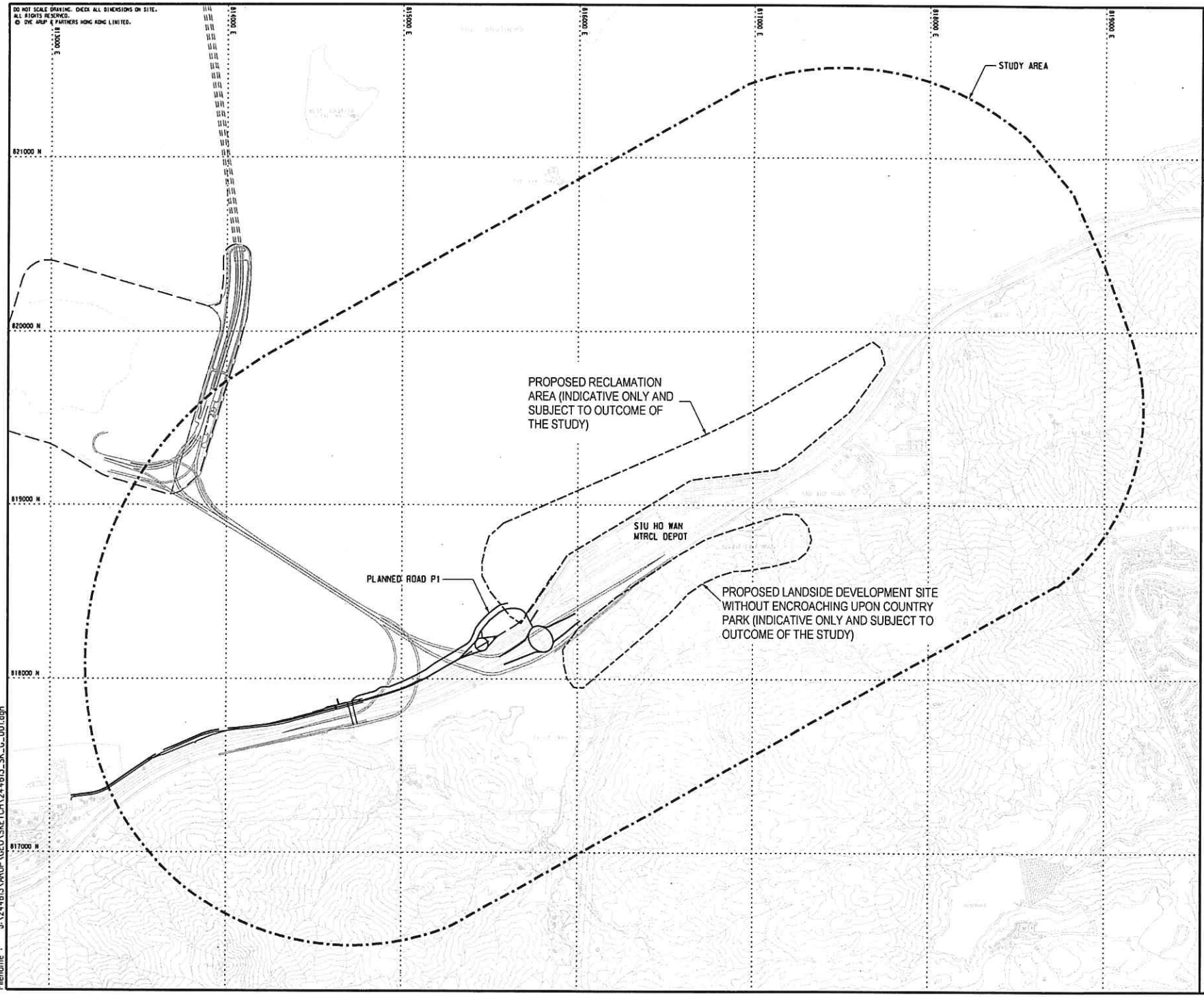
11.1.19 The railway forecast indicates that Tung Chung Line would operate within its capacity under 4 ppsm for design year 2041. This reveals that Tung Chung Line would have sufficient capacity to support the proposed SHW development (under updated Initial Land Use Theme 2).

11.1.20 Assessment for 14 test scenarios with different combinations of highway and railway connections has been carried out and the test

scenarios are categorised into five groups (A1-A3, B1-B5, C1, D1-D4, and E1) in design year 2041. Among test scenarios, highway traffic flows, public transport passenger flows across screenlines, and railway passenger flows during peak hour at critical line segments were investigated. For the highway test scenarios with SHW development in place, the result indicates that Tsing Yi – Lantau Link is a better provision to alleviate the traffic congestion in North Lantau in future. For the series of test scenarios with ELM development in place, the result indicates that a railway corridor connecting NWNT and Hong Kong Island via TCE, Southeast Lantau (possibly via Mui Wo) and ELM is more preferable while a strategic highway corridor connecting North Lantau, Southeast Lantau (possibly via Mui Wo) , ELM and Hong Kong Island has better performance from transport planning point of view.

11.1.21 It is worth highlighting again that the primary objectives of this Study, among others, are to test the technical feasibility of the proposed SHW development and define its maximum potential development extent. Hence, the recommendations of the Study, including the reclamation extent, land use themes, development parameters, etc., should only be regarded as preliminary proposals to facilitate the required broad technical assessments, but do not represent the development has been confirmed, nor to pre-empt other possible land uses options for the site. In planning the next stage of studies, various factors including the potential impacts on habitats near The Brothers Marine Park, as well as the potential development intensity of the MTR Siu Ho Wan Depot Topside Development should be duly taken into account.

Figures



KEY PLAN

Rev	Description	By	Date
C	THIRD DRAFT ISSUE	JW	11/15
B	SECOND DRAFT ISSUE	KL	10/15
A	FIRST ISSUE	KL	08/15

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

Study Area

Drawing no. Figure 1.1 Rev. C

Drawn	Date	Checked	Approved
RL	08/15	JW	HS

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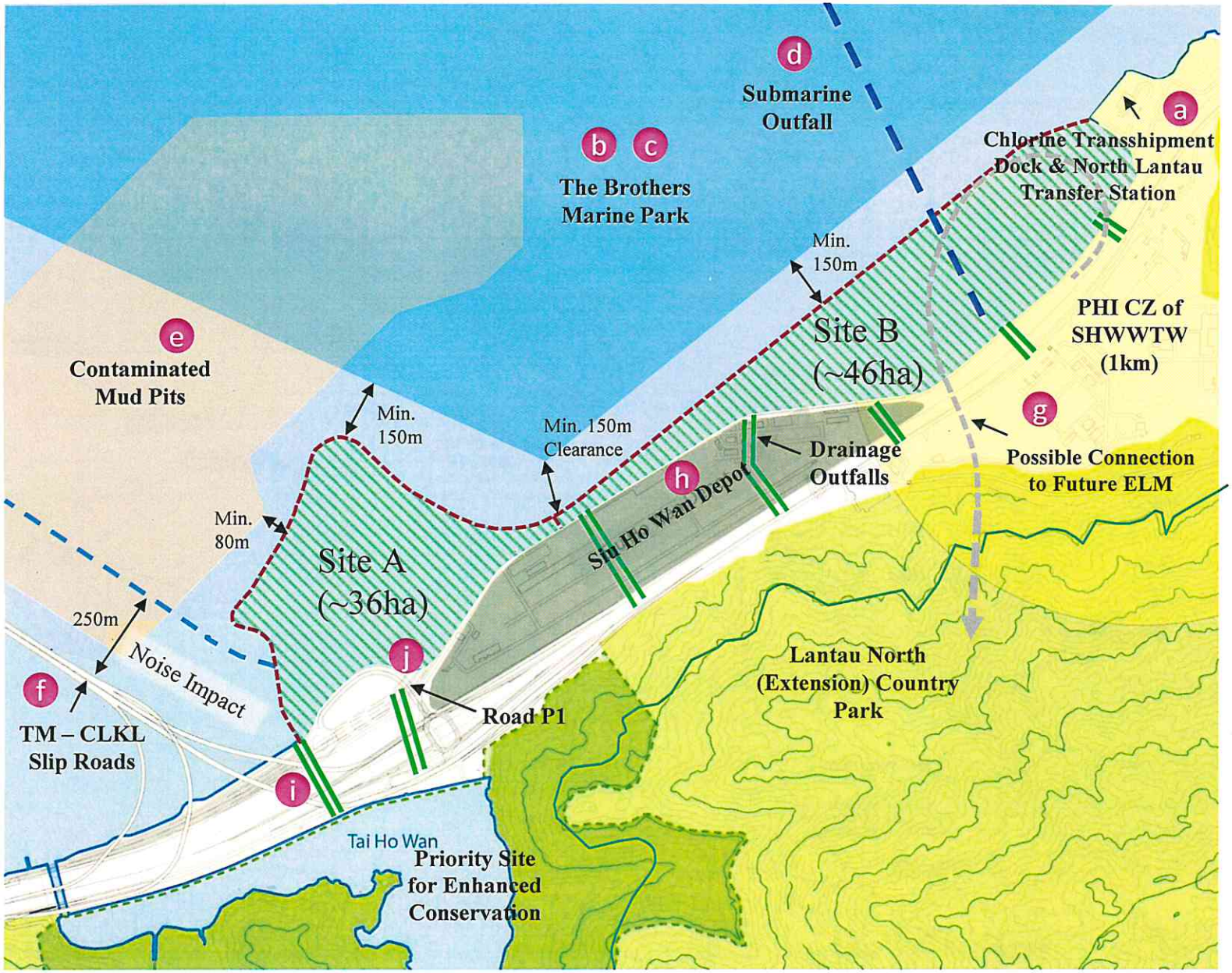

Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Key Considerations and Maximum Potential Extent of Siu Ho Wan Reclamation

Drawing no. Figure 2.1 Rev.

Drawn	Date	Checked	Approved

Scale | Status

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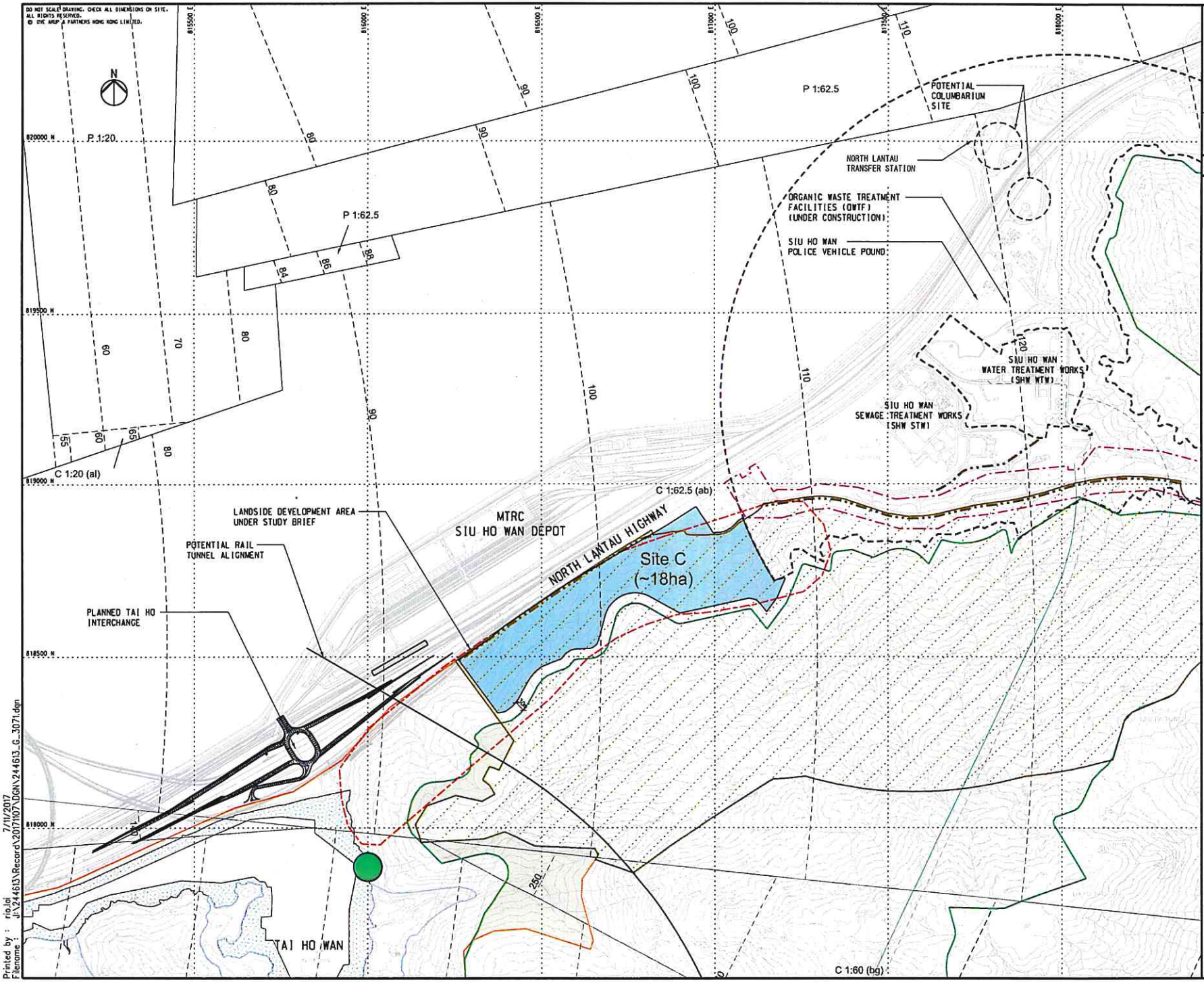

KEY PLAN

LEGEND

- POTENTIAL DEVELOPMENT SITE UNDER STUDY BRIEF
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF ARCHAEOLOGICAL INTEREST
- TUNNEL AREA OF DISCOVERY BAY TUNNEL
- INTERTIDAL MUDFLAT
- BAT ROOST SITE
- EXISTING AND PLANNED WSD WATER TUNNEL
- 110 AIRPORT HEIGHT RESTRICTION (mPD)
- POTENTIAL RAIL TUNNEL ALIGNMENT FROM SIU HO WAN TO MUI WO
- EXTENT OF POTENTIAL PORTAL LOCATIONS
- STRATEGIC CAVERN AREA NO. 44 - SIU HO WAN
- MAXIMUM POTENTIAL EXTENT OF SHW LANDSIDE DEVELOPMENT

Rev	Description	By	Date
C	THIRD ISSUE	JS	11/17
B	SECOND ISSUE	JW	02/17
A	FIRST ISSUE	KC	06/16

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Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

KEY ISSUES MAP FOR LANDSIDE DEVELOPMENT

Drawing no.	Rev.
Figure 2.2	C

Drawn	Date	Checked	Approved
HYC	05/16	JW	HS

Scale: 1:5000 @ A1

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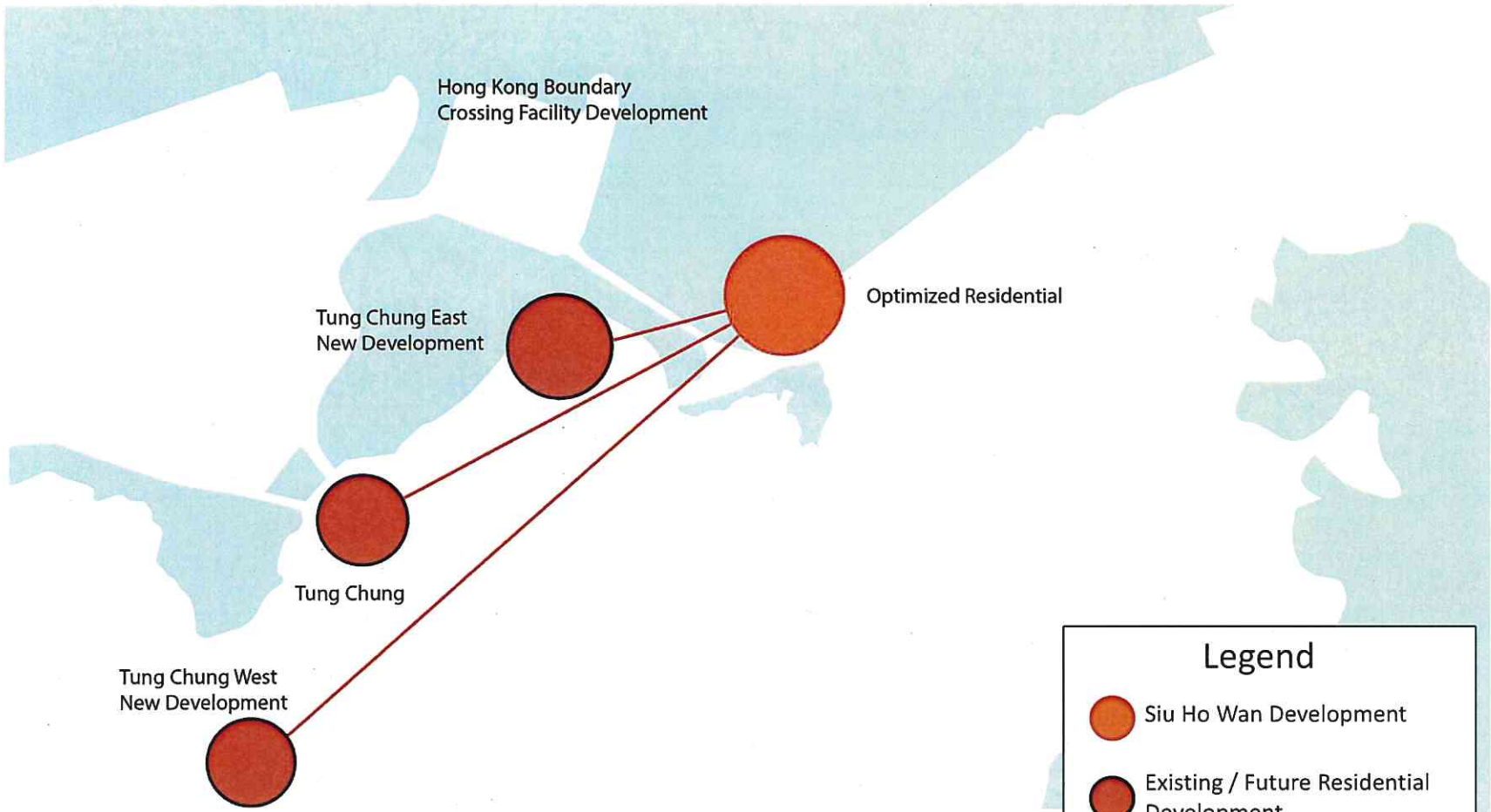
7/11/2017

Theme 1:
Optimized Housing



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Drawing title

Initial Land Use Themes Positioning (Theme 1)

Drawing no. Figure 3.1 Rev.

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Scale Status

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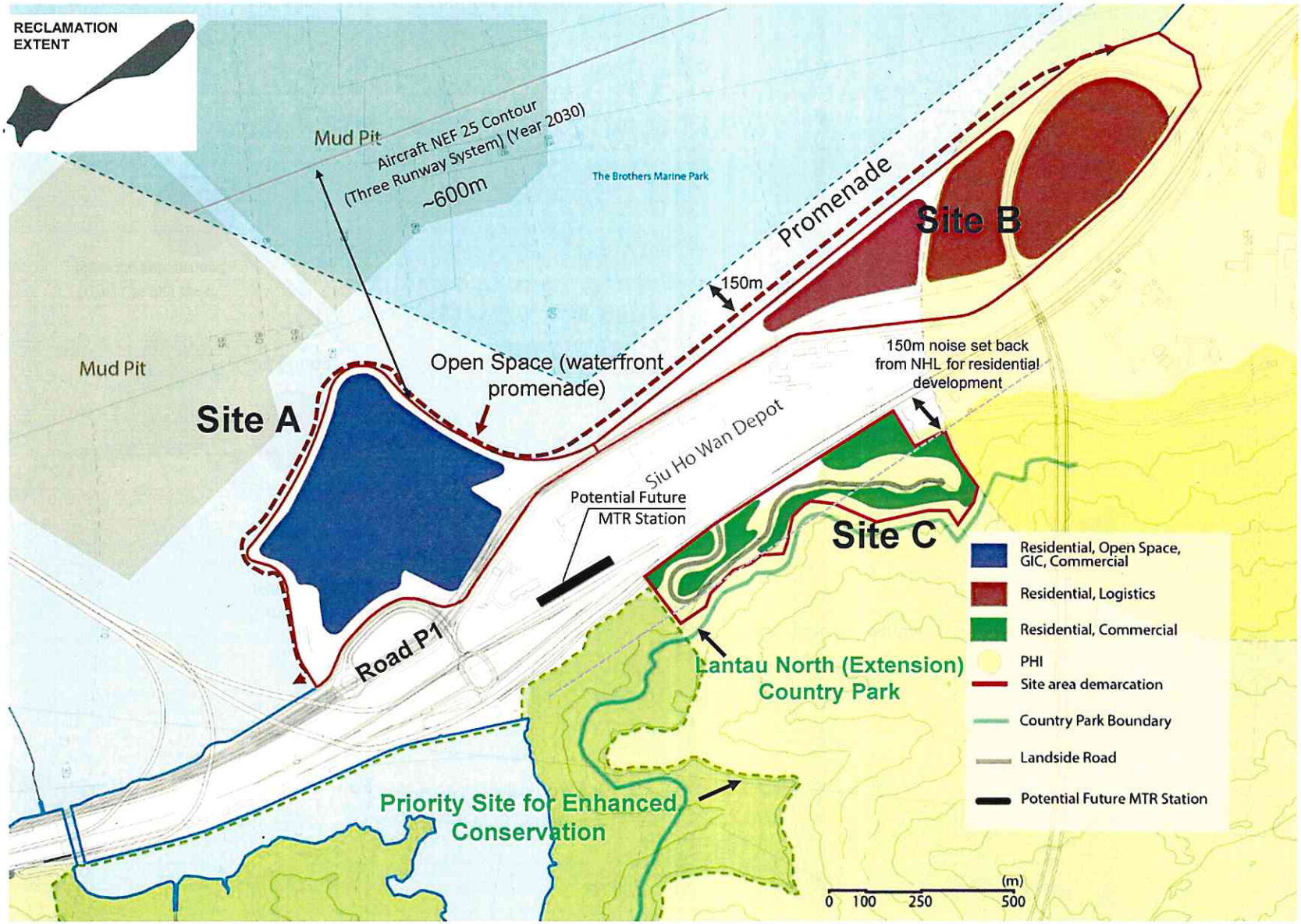

Note: This initial land use theme does not represent that the land use theme has been confirmed, and shall not pre-empt other possible land uses options for the site when the Government considers necessary to carry out a detailed planning and engineering study in future.

Rev	Description	By	Date

Consultant
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Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Theme 1 Optimized Residential

Drawing no. Figure 3.2 Rev.

Drawn	Date	Checked	Approved
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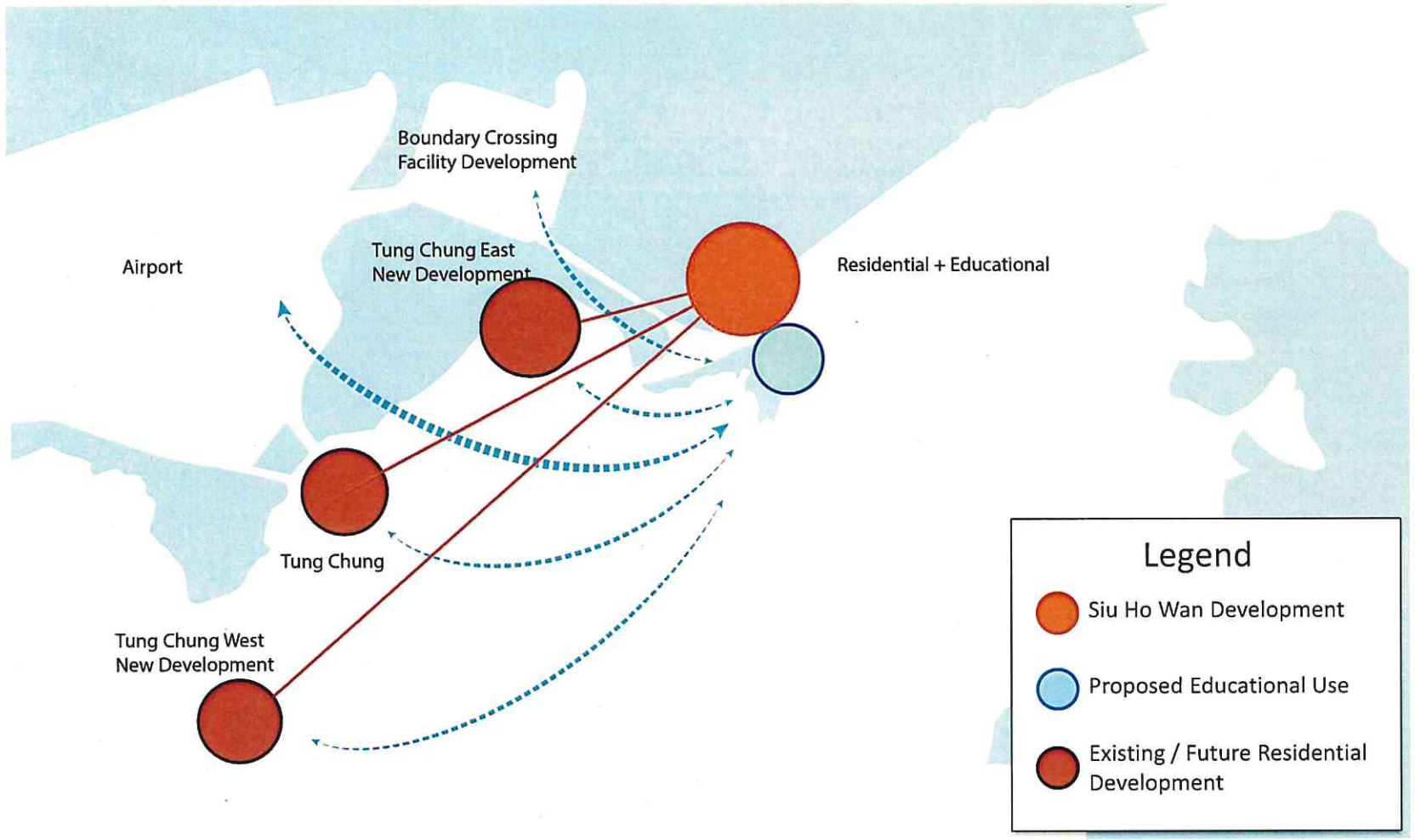
Theme 2:
Mix of Residential and Education



Rev	Description	By	Date

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Drawing title

Initial Land Use Themes Positioning (Theme 2)

Drawing no. Figure 3.3 | Rev.

Drawn	Date	Checked	Approved
Scale		Status	

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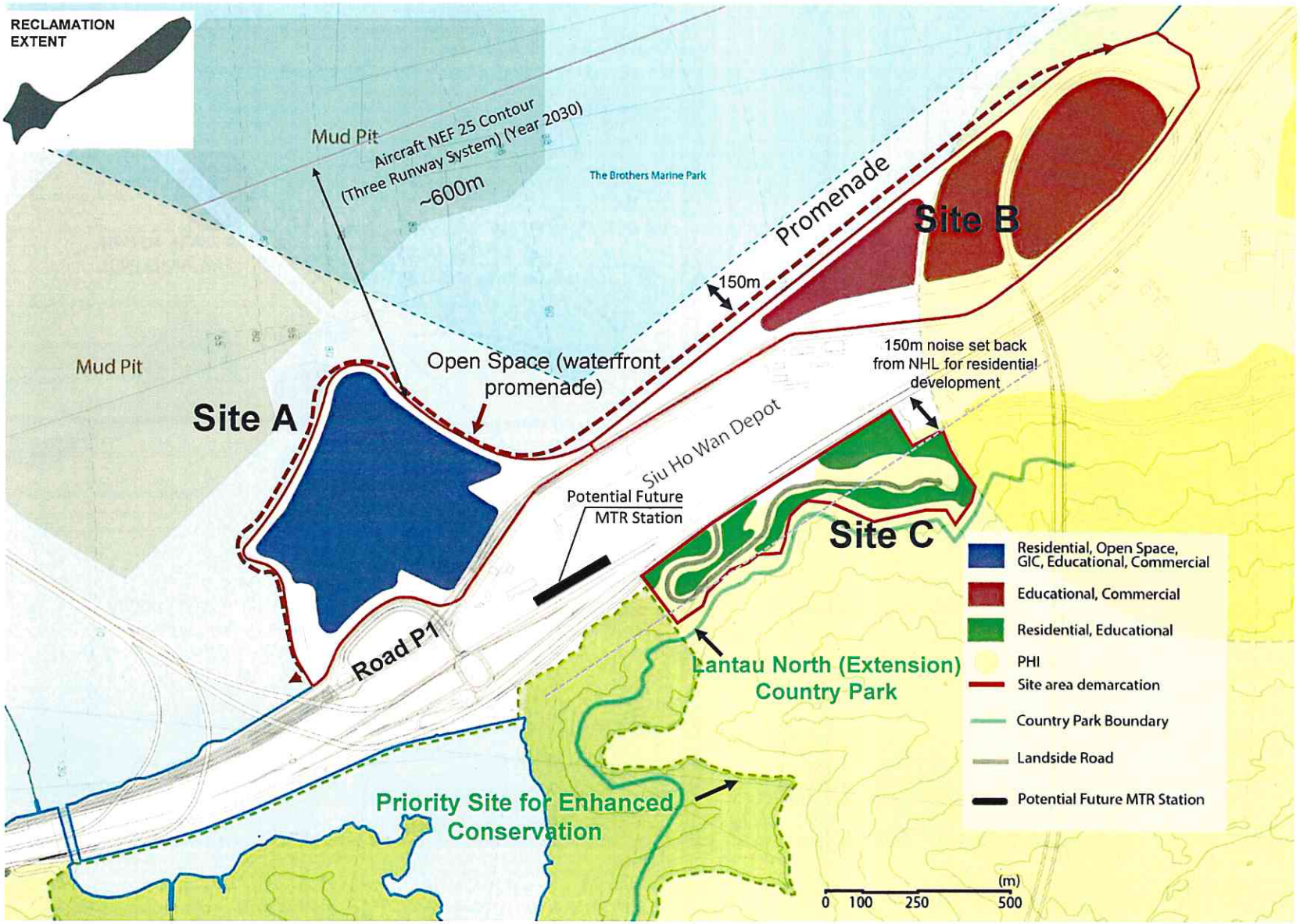

Note: This initial land use theme does not represent that the land use theme has been confirmed, and shall not pre-empt other possible land uses options for the site when the Government considers necessary to carry out a detailed planning and engineering study in future.

Rev	Description	By	Date

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Drawing title
Theme 2 Mix of Residential and Education

Drawing no. Figure 3.4 Rev.

Drawn	Date	Checked	Approved
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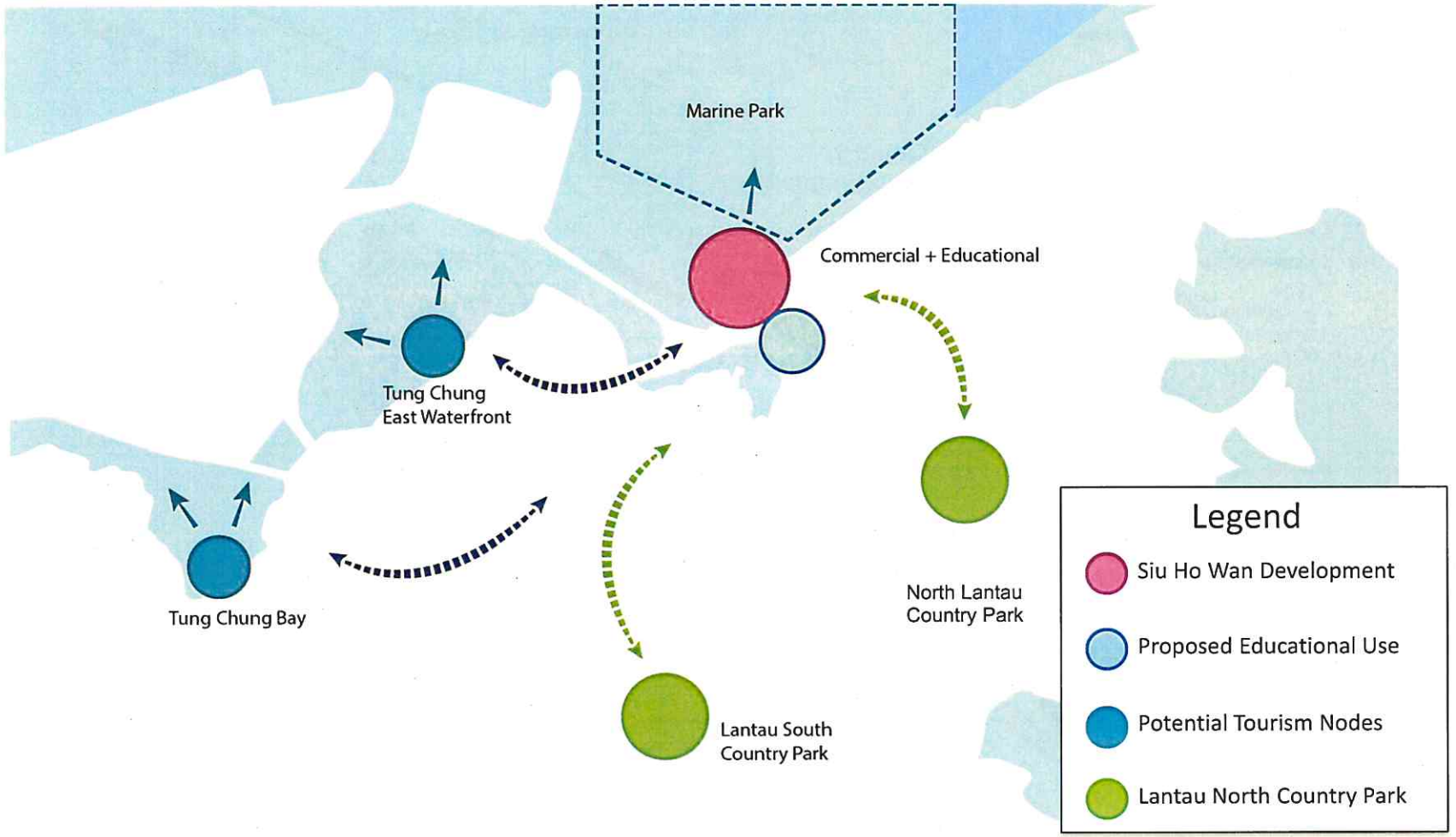
Theme 3:
Enhanced Tourism and Education



Rev	Description	By	Date

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Drawing title

Initial Land Use Themes Positioning (Theme 3)

Drawing no. Figure 3.5 Rev.

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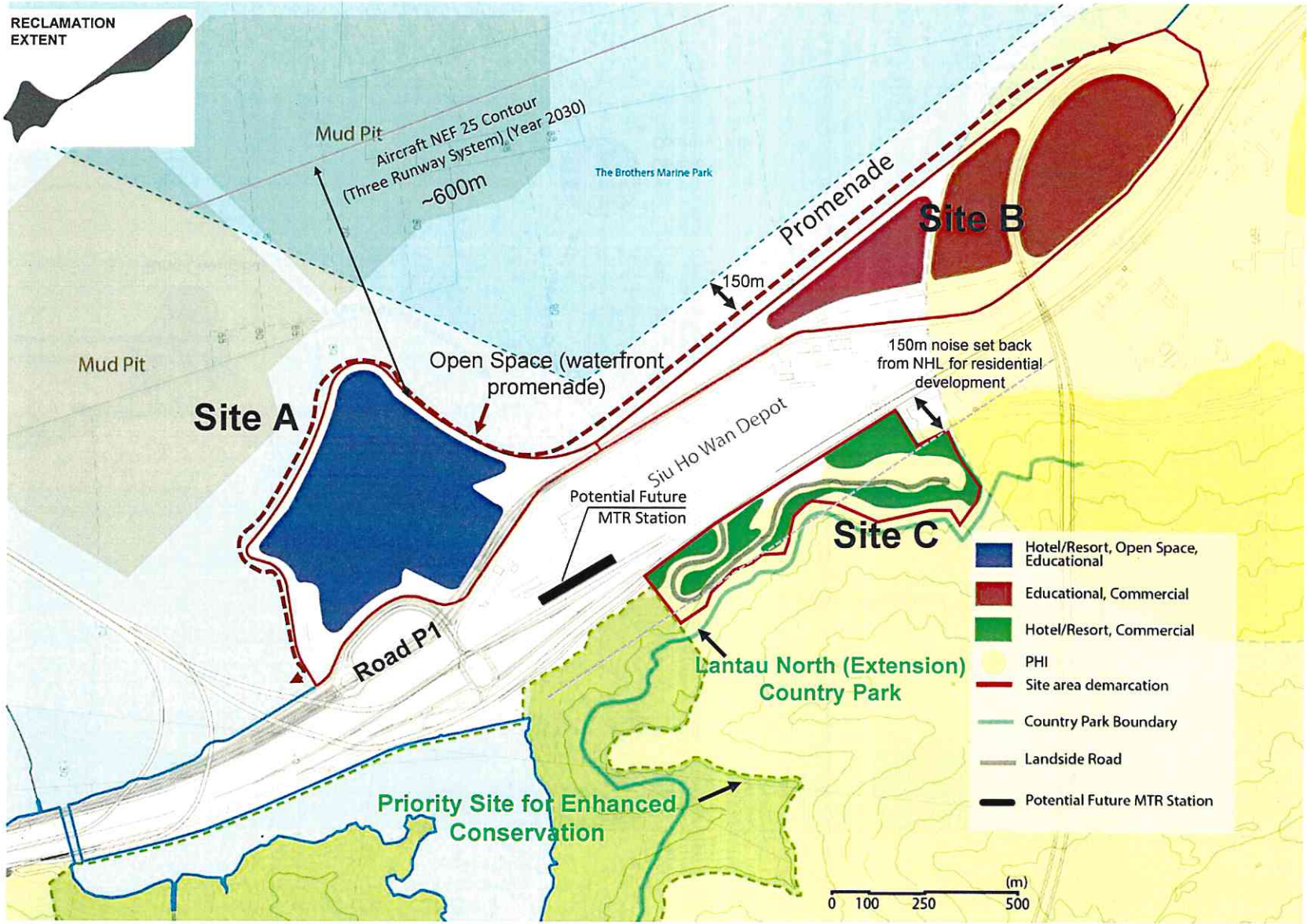

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Rev	Description	By	Date

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Drawing title
Theme 3 Enhanced Tourism and Training

Drawing no. Figure 3.6 Rev.

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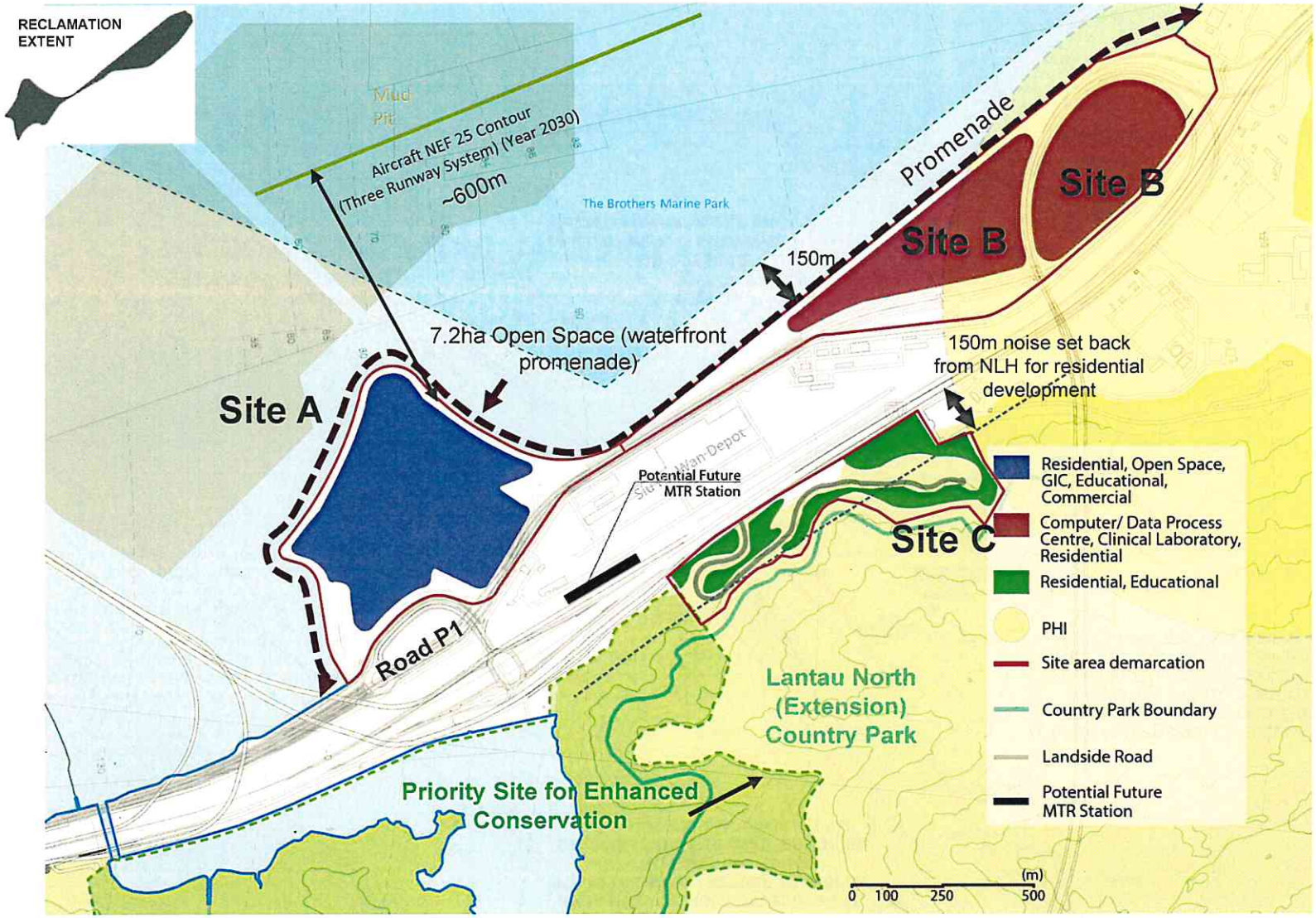

Note: This initial land use theme does not represent that the land use theme has been confirmed, and shall not pre-empt other possible land uses options for the site when the Government considers necessary to carry out a detailed planning and engineering study in future.

Rev	Description	By	Date

Consultant
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Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Updated Initial Land Use Theme 2

Drawing no. Figure 3.7 | Rev.

Drawn	Date	Checked	Approved

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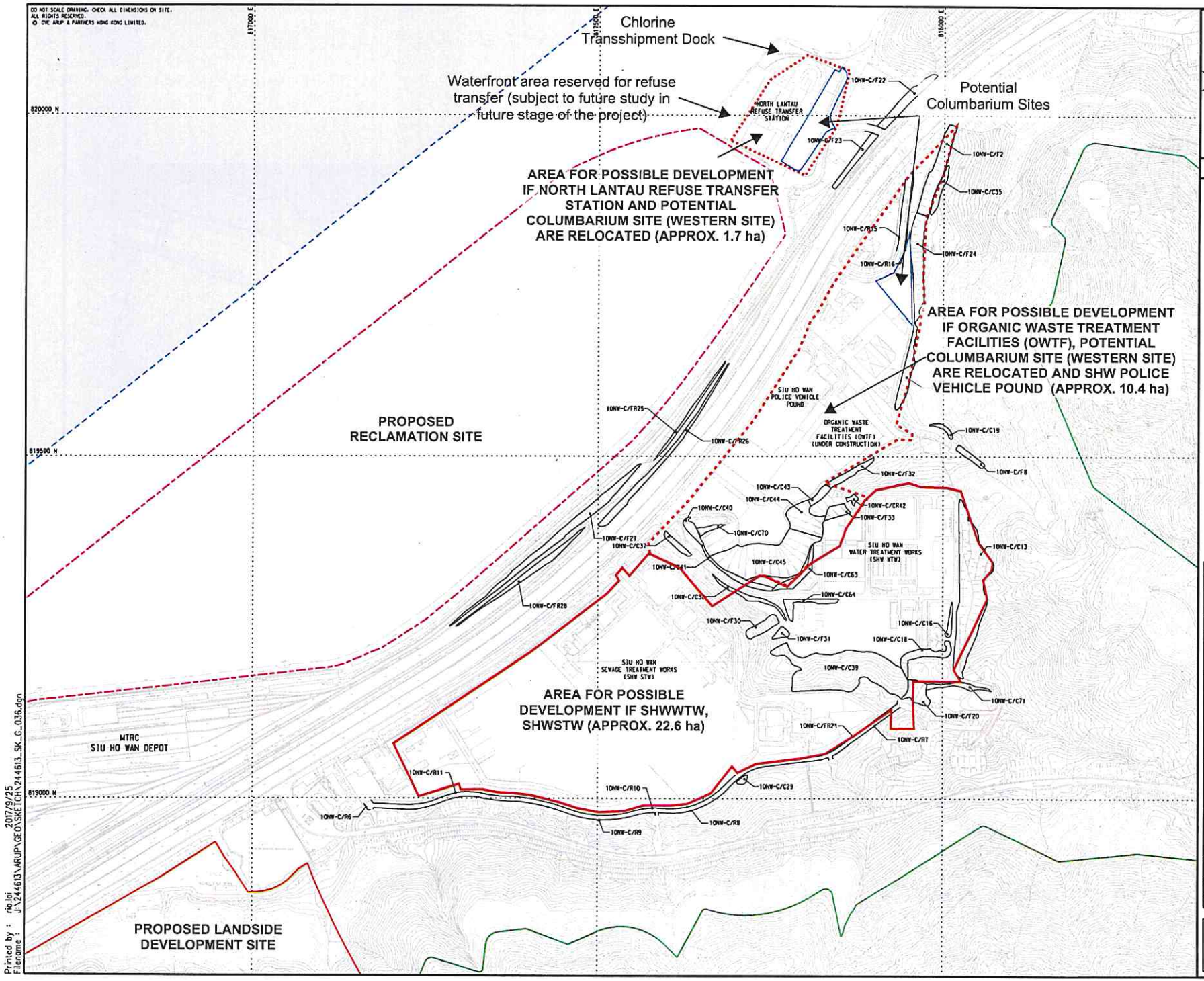

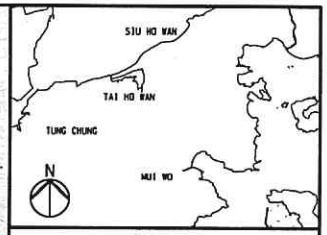

KEY PLAN

LEGEND

- AREA FOR POSSIBLE DEVELOPMENT IF SHWWTW, SHWSTW POUND ARE RELOCATED
- ADDITIONAL AREA FOR POSSIBLE DEVELOPMENT IF OWTF, POTENTIAL COLUMBARIUM SITES ARE and AND SHW POLICE VEHICLE RELOCATED
- PROPOSED DEVELOPMENT EXTENT FOR RECLAMATION SITE
- THE BROTHERS MARINE PARK
- GAZETTED COUNTRY PARK

Rev	Description	By	Date
A	DRAFT ISSUE	JS	09/17

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: LONG TERM DEVELOPMENT AREA

Drawing no. Figure 3.8 | Rev. A

Drawn	Date	Checked	Approved
RL	06/16	KL	HS

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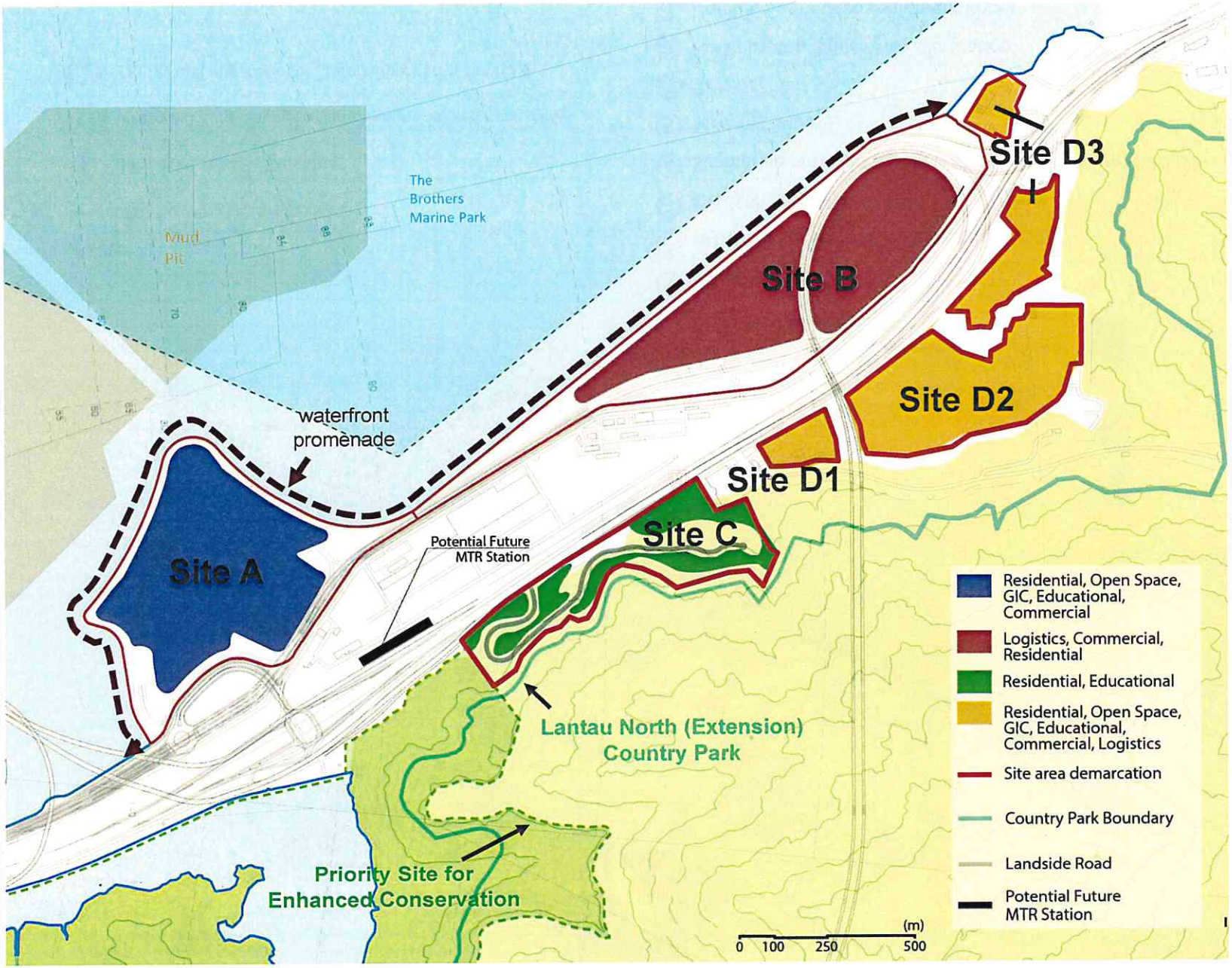


Note: This long term land use theme does not represent that the land use theme has been confirmed, and shall not pre-empt other possible land uses options for the site when the Government considers necessary to carry out a detailed planning and engineering study in future.

Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Long Term Land Use Theme

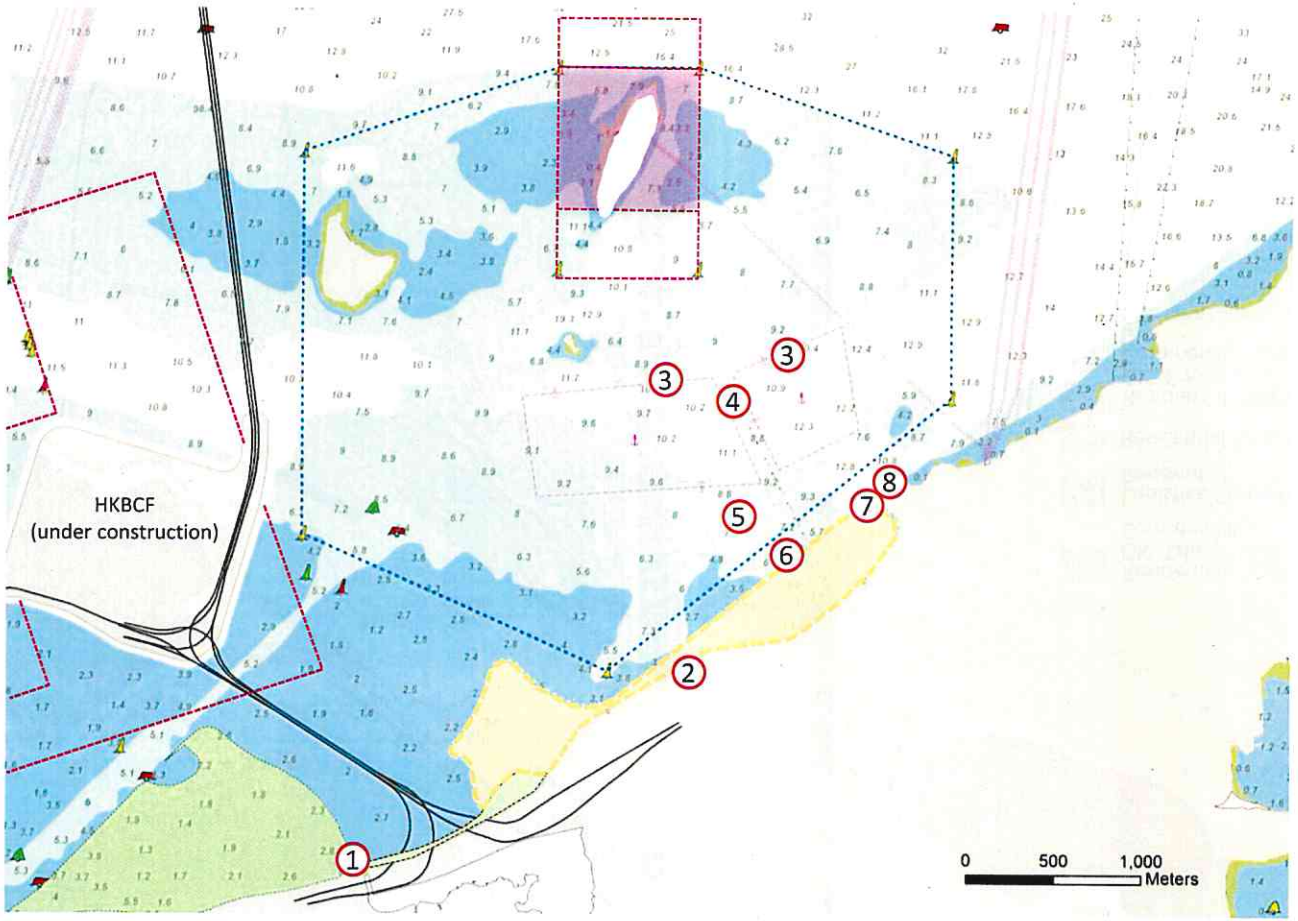
Drawing no. Figure 3.9 Rev.

Drawn | Date | Checked | Approved

Scale | Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : $DATE$
Filename : $FILE$



LEGEND

- The Brothers Marine Park
- Proposed SHW Reclamation
- Proposed Tung Chung Reclamation (under separate study)
- Hong Kong International Airport Approach Area No.4

1. Pak Mong Pier
2. MTRC Siu Ho Wan Depot Berthing Facility
3. Sham Shui Kok Anchorages No. 1 & No. 2
4. Submarine outfall of Siu Ho Wan Sewage Treatment Works
5. Mooring Buoys
6. Cardinal mark
7. North Lantau Refuse Transfer Station
8. Liquid Chlorine Trans-shipment dock

Rev	Description	By	Date

Consultant: ARUP

Project title: Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: Existing Key Marine Facilities

Drawing no.: Figure 4.1

Rev.

Drawn | Date | Checked | Approved

Scale | Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

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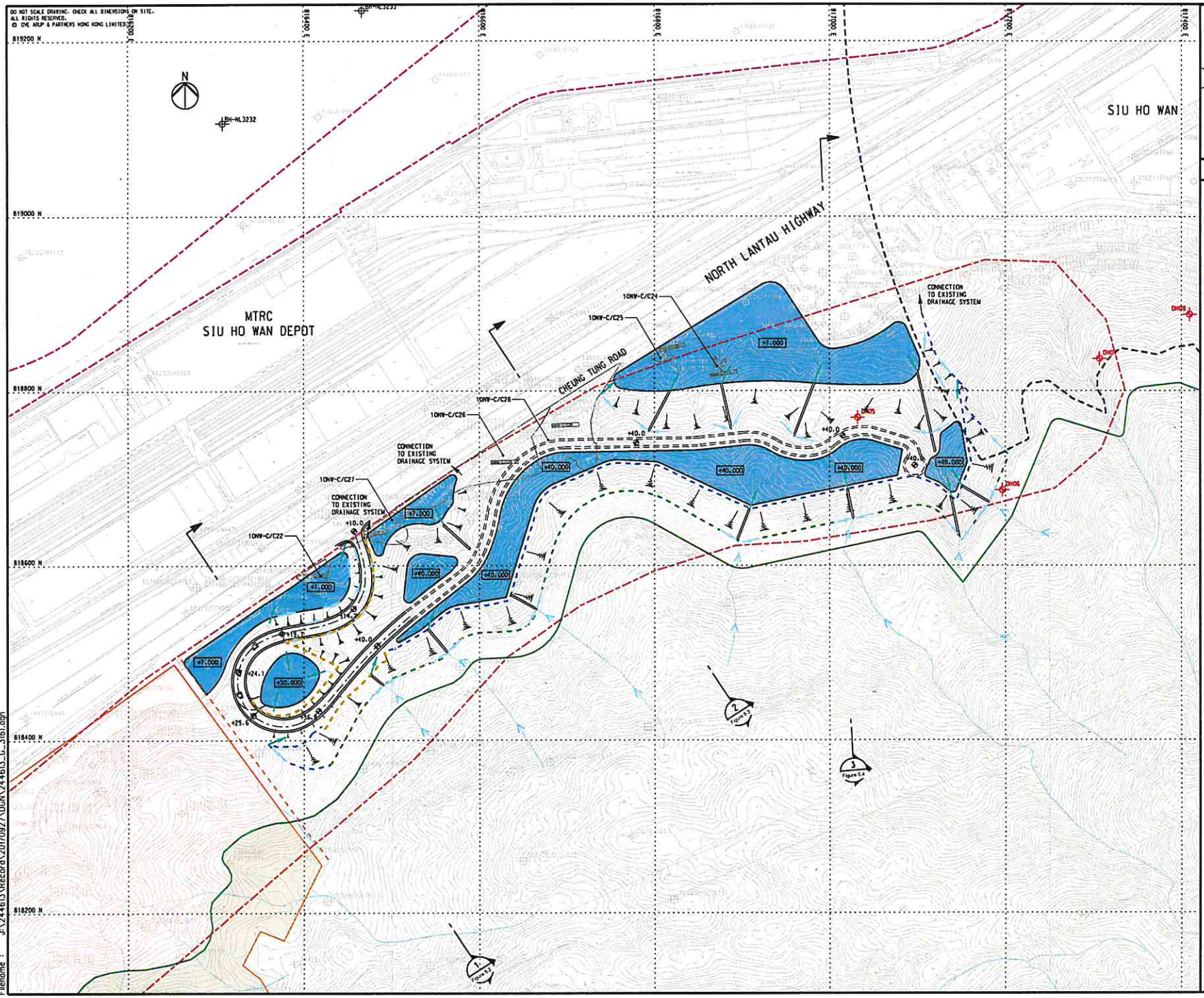
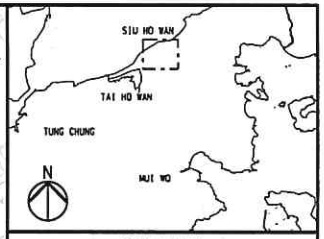
Filename : $FILE$





KEY PLAN

LEGEND

- POTENTIAL DEVELOPMENT SITE UNDER STUDY BRIEF
- DEVELOPMENT EXTENT FOR RECLAMATION SIDE
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- PROPOSED CUT PLATFORM
- EXISTING BOREHOLES
- PROJECT SPECIFIC BOREHOLES
- PROPOSED CUT SLOPE WITH STABILIZATION MEASURES
- CREST / TOE OF CUT SLOPE
- 30m OFFSET FROM COUNTRY PARK BOUNDARY (WITH 10m NO WORK ZONE)
- 10m OFFSET FROM PRIORITY SITE FOR ENHANCED CONSERVATION
- PROPOSED RETAINING WALL
- +18.000 PROPOSED SITE FORMATION LEVEL
- +40.0 PROPOSED ROAD LEVEL
- ACCESS ROAD (DOTTED LINE INDICATES DESIGNED SUBJECT TO FUTURE DEVELOPMENT)
- STREAM COURSE WITH FLOW DIRECTION
- DRAINAGE FLOW
- DOWNPIPE / STEPPED CHANNEL
- STORMWATER TO BE DISCHARGED TO PROPOSED BUILDING DRAINAGE SYSTEMS
- REGISTERED MAN-MADE FEATURES

Rev	Description	By	Date
D	FOURTH ISSUE	HC	09/17
C	THRID ISSUE	HC	06/17
B	SECOND ISSUE	AYL	12/16
A	FIRST ISSUE	HC	06/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 1 SITE FORMATION LAYOUT PLAN

Drawing no.	Rev.
Figure 5.1	D

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale: 1:2000 @A1

Status: PRELIMINARY

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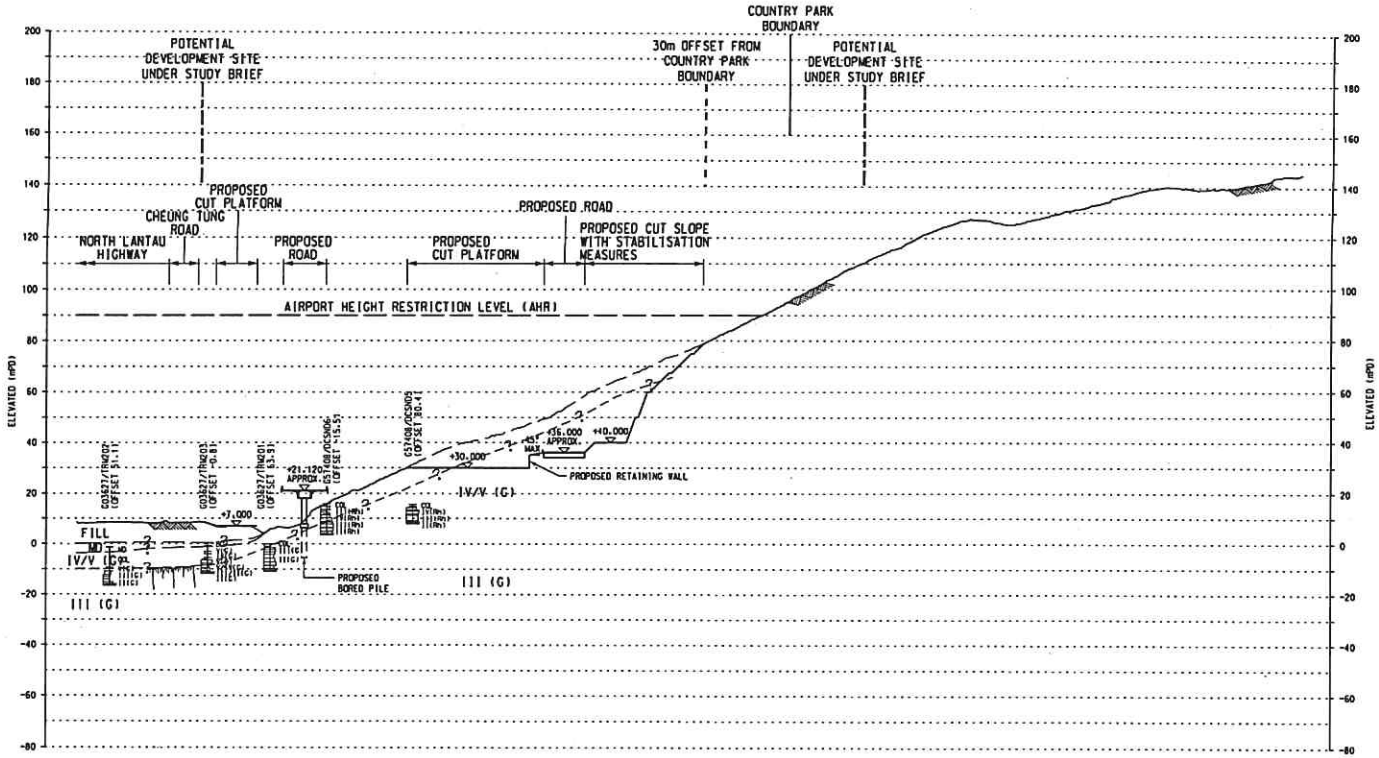

SECTION 1
SCALE 1:1000 Figure 5.1

0 10 20 30 40 50
METRES
1 : 1000

D	FOURTH ISSUE	HC	09/17
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 1 SITE FORMATION SECTION (SHEET 1 OF 3)

Drawing no.	Rev.
Figure 5.2	D

Drawn	Date	Checked	Approved
WTC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

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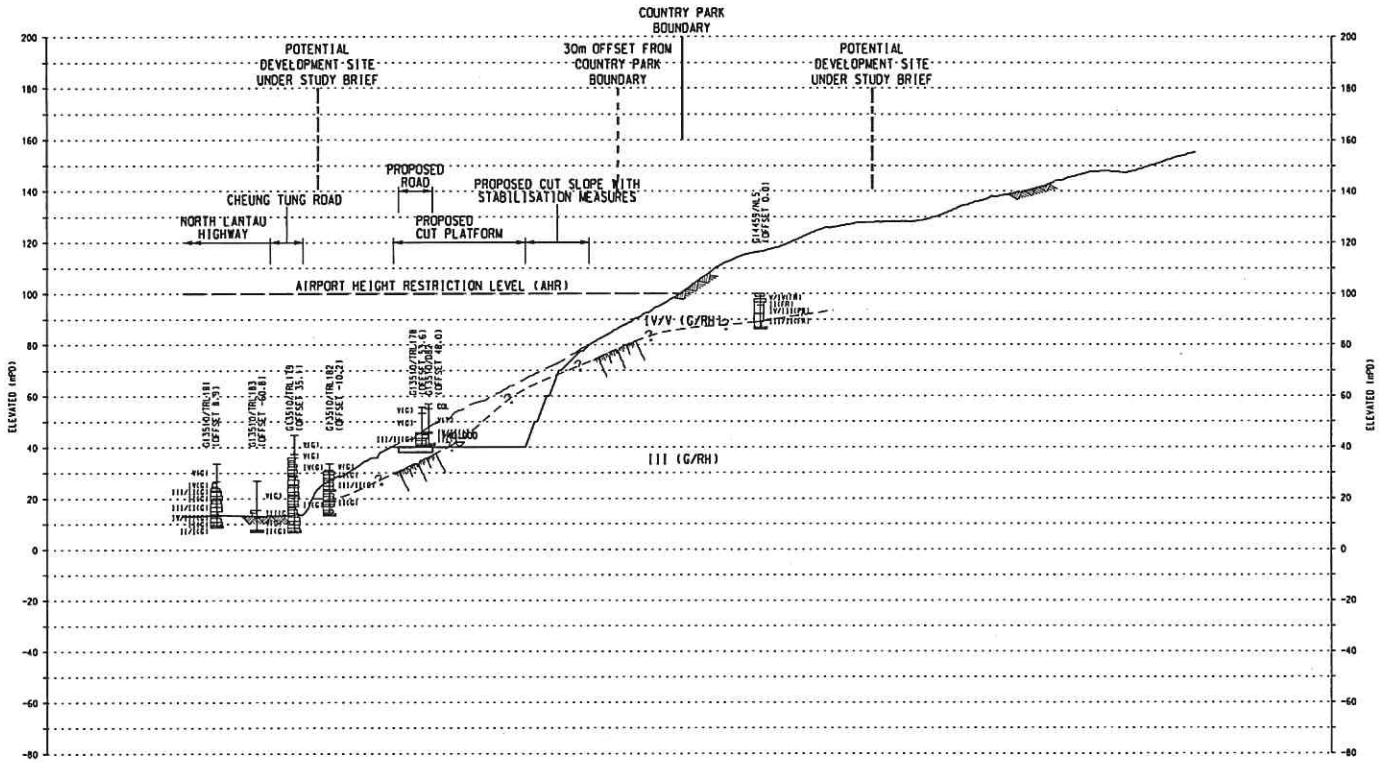

SECTION 2
SCALE 1:1000 Figure 5.1

0 10 20 30 40 50
METRES
1 : 1000

Rev	Description	By	Date
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT
AT SIU HO WAN - OPTION 1
SITE FORMATION SECTION
(SHEET 2 OF 3)

Drawing no.	Rev.
Figure 5.3	C

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

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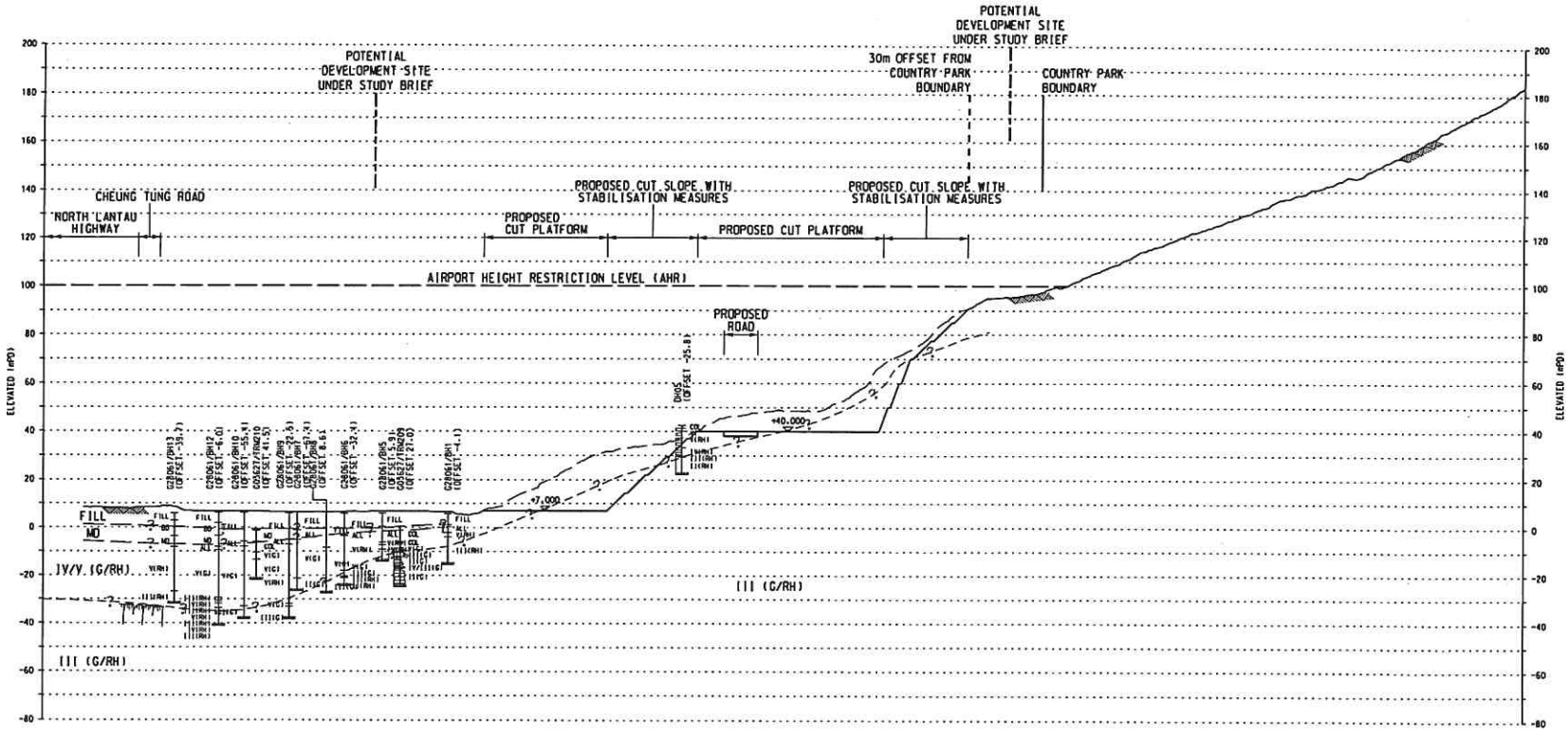

SECTION 3
SCALE 1:1000 (Figure 5.1)

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METRES
1 : 1000

C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT
AT SIU HO WAN - OPTION 1
SITE FORMATION SECTION
(SHEET 3 OF 3)

Drawing no. Figure 5.4 Rev. C

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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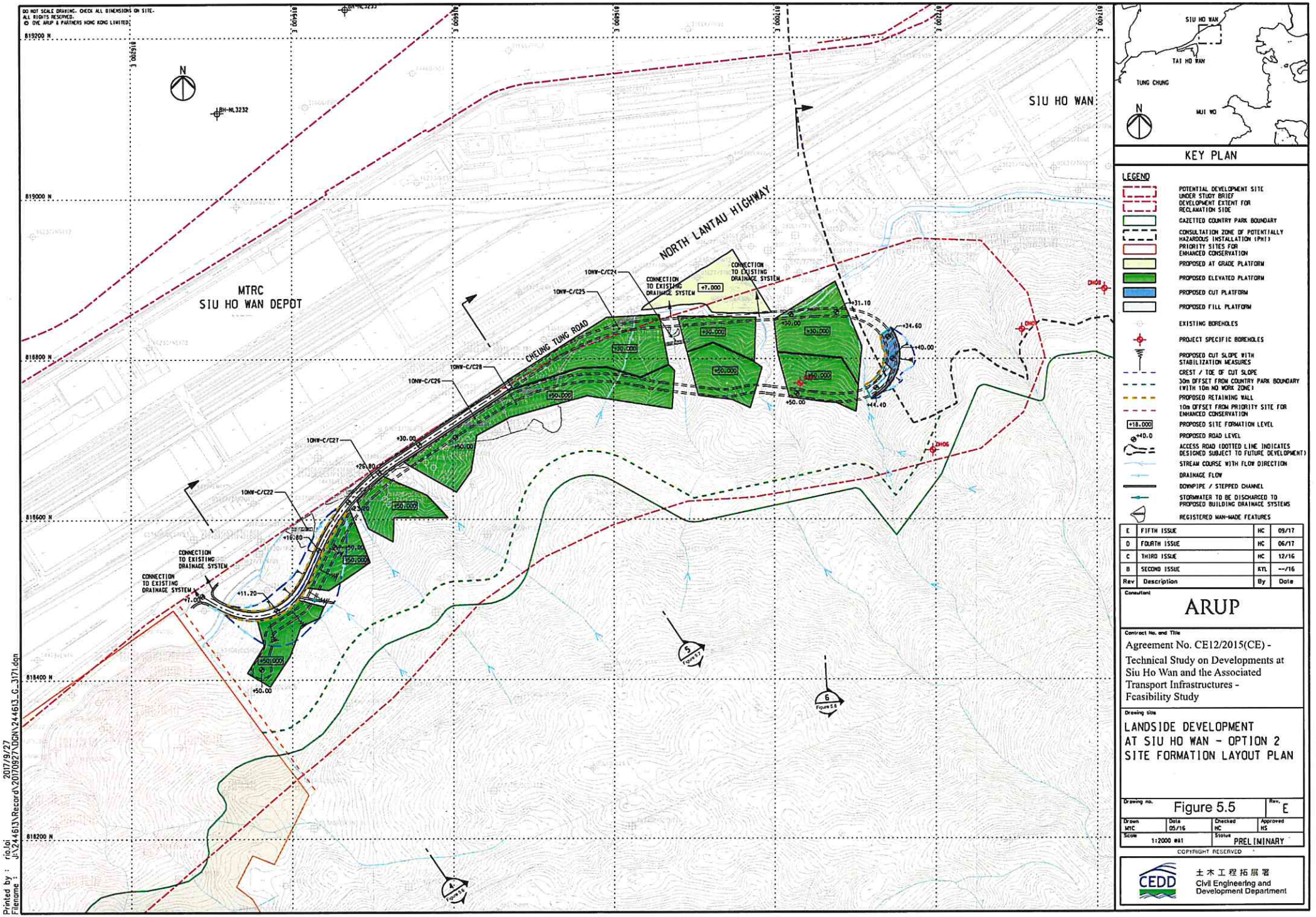

KEY PLAN

LEGEND

- POTENTIAL DEVELOPMENT SITE UNDER STUDY BRIEF DEVELOPMENT EXTENT FOR RECLAMATION SIDE
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- PROPOSED AT GRADE PLATFORM
- PROPOSED ELEVATED PLATFORM
- PROPOSED CUT PLATFORM
- PROPOSED FILL PLATFORM
- EXISTING BOREHOLES
- PROJECT SPECIFIC BOREHOLES
- PROPOSED CUT SLOPE WITH STABILIZATION MEASURES
- CREST / TOE OF CUT SLOPE
- 30m OFFSET FROM COUNTRY PARK BOUNDARY (WITH 10m NO WORK ZONE)
- PROPOSED RETAINING WALL
- 10m OFFSET FROM PRIORITY SITE FOR ENHANCED CONSERVATION
- +18.000 PROPOSED SITE FORMATION LEVEL
- +40.0 PROPOSED ROAD LEVEL
- ACCESS ROAD (DOTTED LINE INDICATES DESIGNED SUBJECT TO FUTURE DEVELOPMENT)
- STREAM COURSE WITH FLOW DIRECTION
- DRAINAGE FLOW
- DOWNPIPE / STEPPED CHANNEL
- STORMWATER TO BE DISCHARGED TO PROPOSED BUILDING DRAINAGE SYSTEMS
- REGISTERED MAN-MADE FEATURES

Rev	Description	By	Date
E	FIFTH ISSUE	HC	09/17
D	FOURTH ISSUE	HC	06/17
C	THIRD ISSUE	HC	12/16
B	SECOND ISSUE	KYL	--/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing Title: LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 2 SITE FORMATION LAYOUT PLAN

Drawing no.	Rev.
Figure 5.5	E

Drawn	Date	Checked	Approved
MTC	05/16	HC	HS

Scale: 1:2000 @A1 — Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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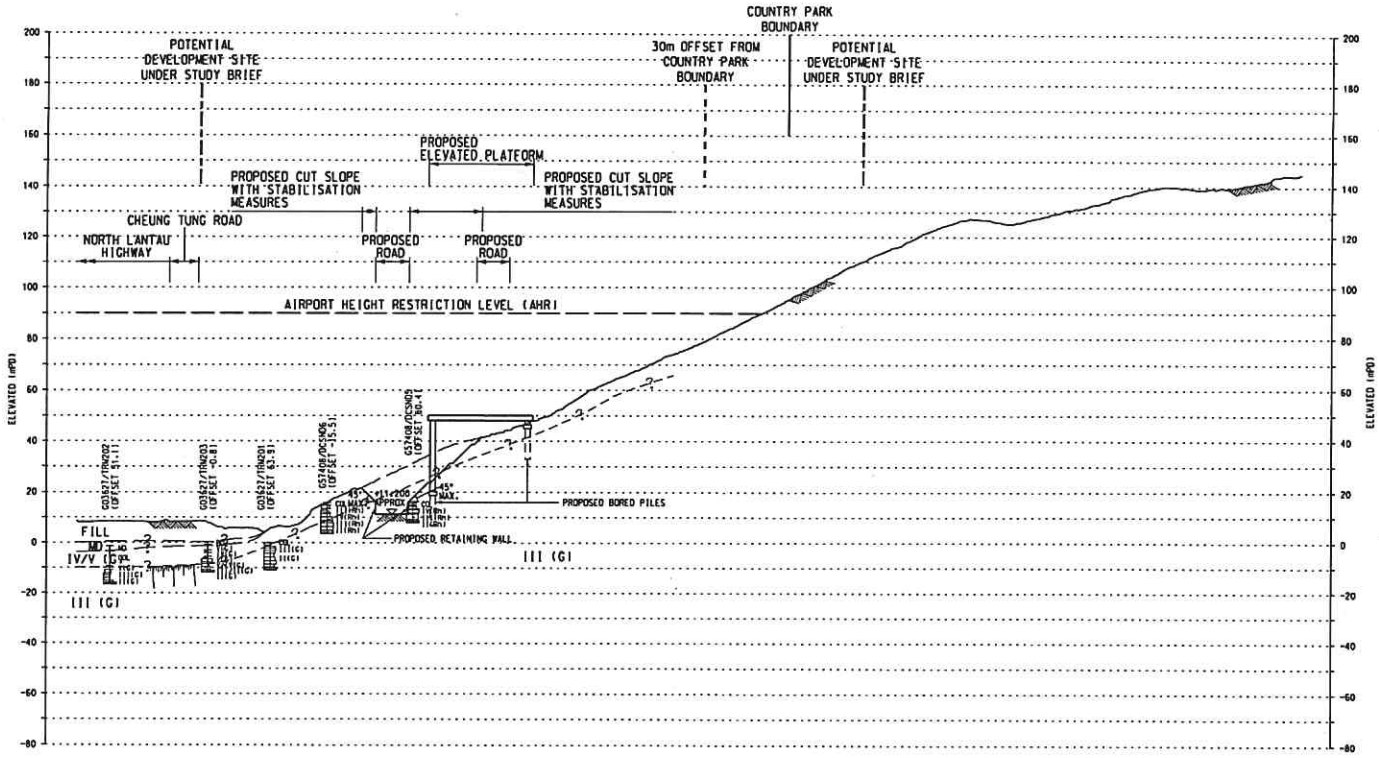

SECTION 4
SCALE 1:1000

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METRES
1 : 1000

D	FOURTH ISSUE	HC	09/17
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 2 SITE FORMATION SECTION (SHEET 1 OF 3)

Drawing no. Figure 5.6 Rev. D

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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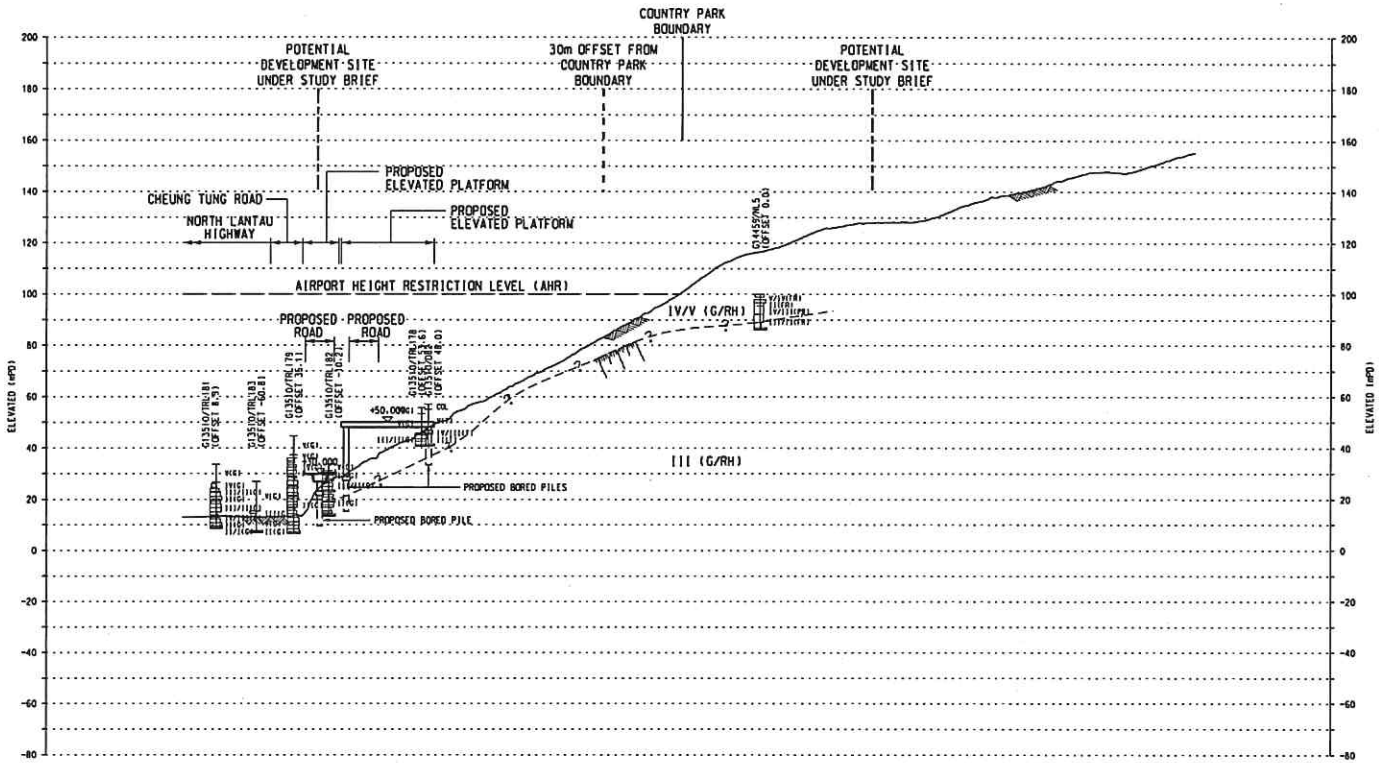

SECTION 5
SCALE 1:1000 Figure 5.5

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METRES
1 : 1000

Rev	Description	By	Date
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT
AT SIU HO WAN - OPTION 2
SITE FORMATION SECTION
(SHEET 2 OF 3)

Drawing no. Figure 5.7 Rev. C

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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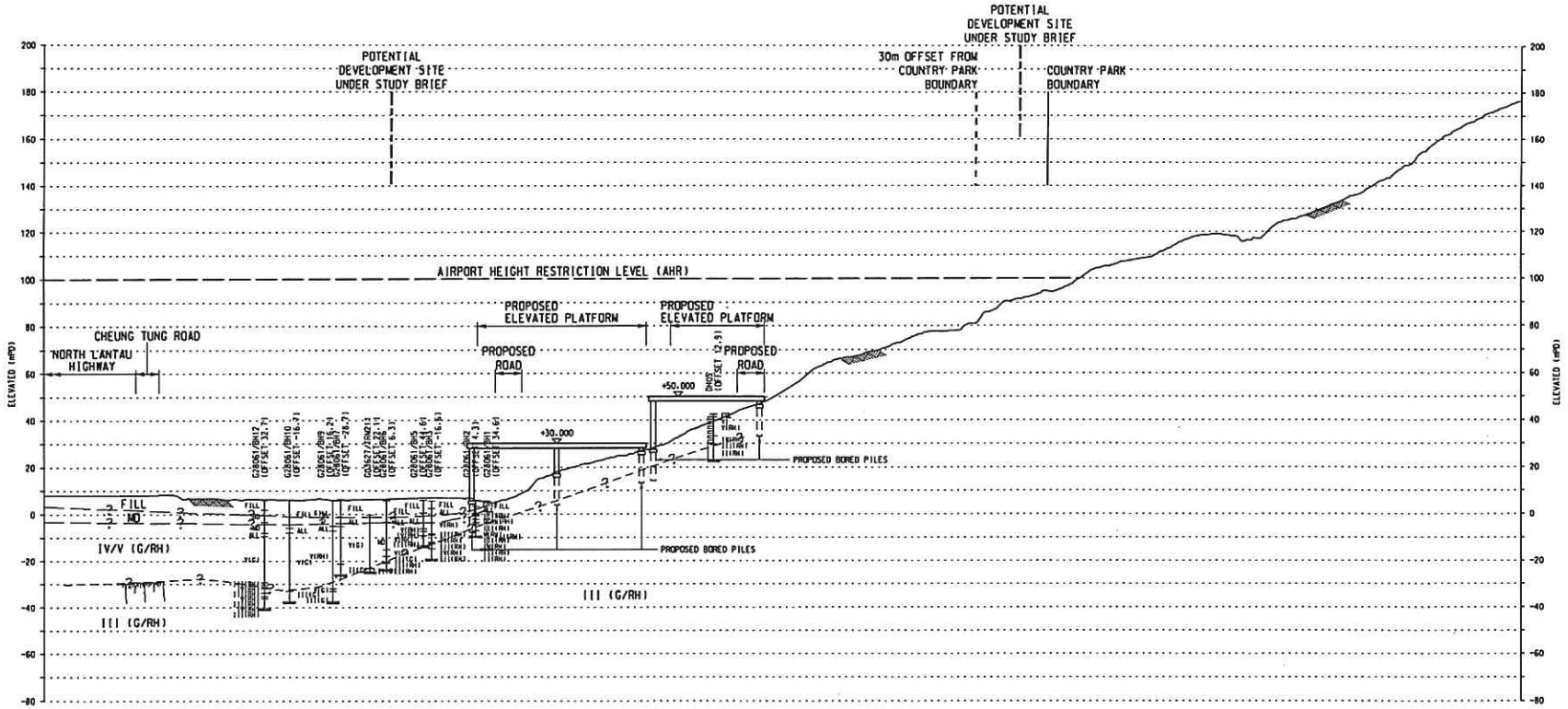

SECTION 6
SCALE 1:1000 Figure 5.5

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METRES
1 : 1000

Rev	Description	By	Date
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT
AT SIU HO WAN - OPTION 2
SITE FORMATION SECTION
(SHEET 3 OF 3)

Drawing no. Figure 5.8 Rev. C

Drawn	Date	Checked	Approved
WYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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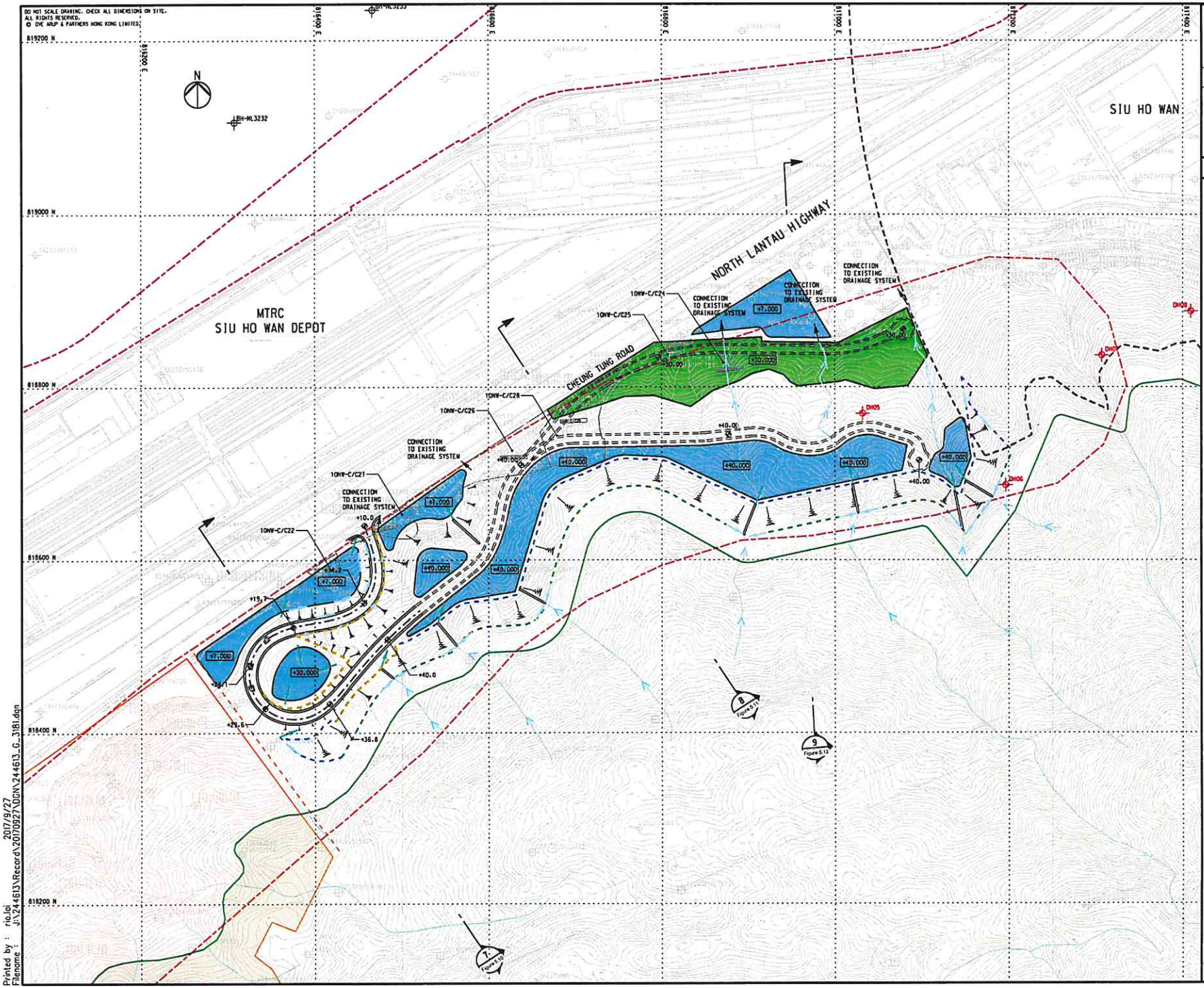
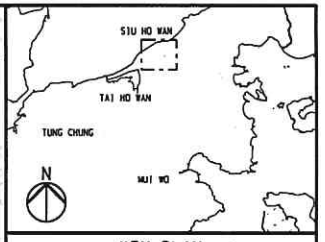




KEY PLAN

LEGEND

- POTENTIAL DEVELOPMENT SITE UNDER STUDY BRIEF
- DEVELOPMENT EXTENT FOR RECLAMATION SIDE
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- PROPOSED ELEVATED PLATFORM
- PROPOSED CUT PLATFORM
- EXISTING BOREHOLES
- PROJECT SPECIFIC BOREHOLES
- PROPOSED CUT SLOPE WITH STABILIZATION MEASURES
- CREST / TOE OF CUT SLOPE
- 30m OFFSET FROM COUNTRY PARK BOUNDARY (WITH 10m NO WORK ZONE)
- PROPOSED RETAINING WALL
- 10m OFFSET FROM PRIORITY SITE FOR ENHANCED CONSERVATION
- +18.000 PROPOSED SITE FORMATION LEVEL
- +40.0 PROPOSED ROAD LEVEL
- ACCESS ROAD (DOTTED LINE INDICATES DESIGNED SUBJECT TO FUTURE DEVELOPMENT)
- STREAM COURSE WITH FLOW DIRECTION
- DRAINAGE FLOW
- DOWNPIPE / STEPPED CHANNEL
- STORMWATER TO BE DISCHARGED TO PROPOSED BUILDING DRAINAGE SYSTEMS
- REGISTERED MAN-MADE FEATURES

Rev	Description	By	Date
E	FIFTH ISSUE	HC	09/17
D	FOURTH ISSUE	HC	01/16
C	THIRD ISSUE	HC	12/16
B	SECOND ISSUE	KYL	XX/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 3 SITE FORMATION LAYOUT PLAN

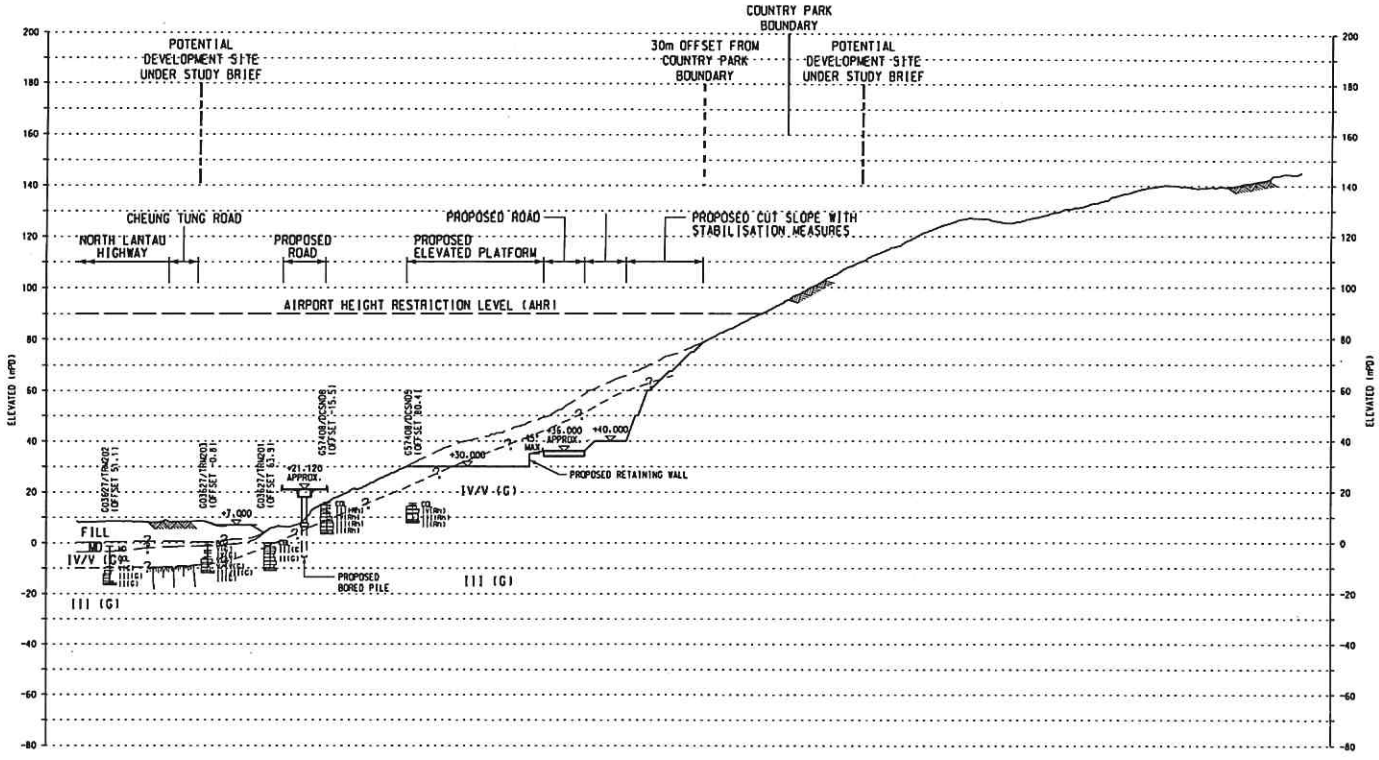
Drawing no.	Rev.
Figure 5.9	E

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale: 1:2000 @A1 | Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.loi 2017/9/27
Filename : J:\244613\Record\20170927\DGN\244613_G_3181.dgn



SECTION 7
SCALE 1:1000 Figure 5.9

0 10 20 30 40 50
METRES
1 : 1000

D	FOURTH ISSUE	HC	09/17
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 3 SITE FORMATION SECTION (SHEET 1 OF 3)

Drawing no. Figure 5.10 Rev. D

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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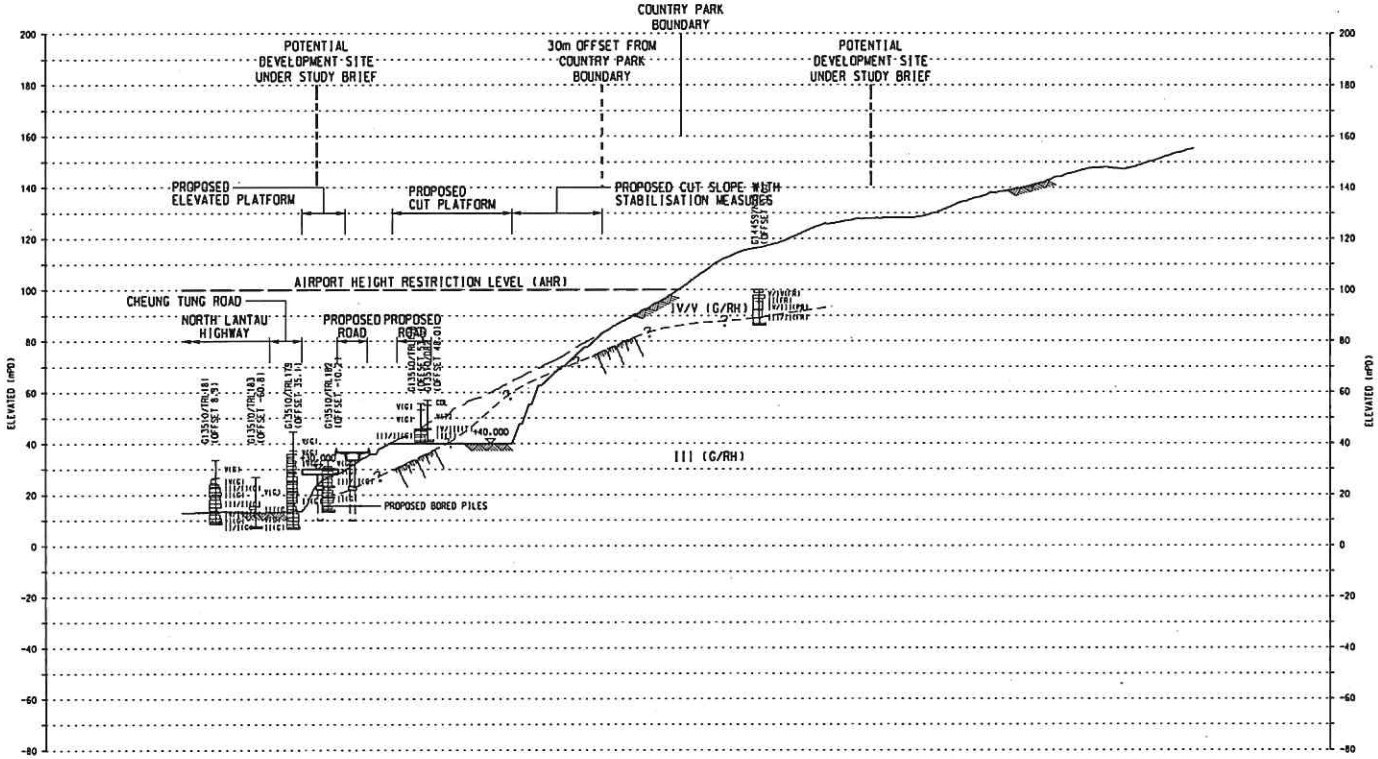

SECTION 8 (Figure 5.9)
SCALE 1:1000

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METRES
1 : 1000

Rev	Description	By	Date
C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT
AT SIU HO WAN - OPTION 3
SITE FORMATION SECTION
(SHEET 2 OF 3)

Drawing no. Figure 5.11 Rev. C

Drawn	Date	Checked	Approved
WYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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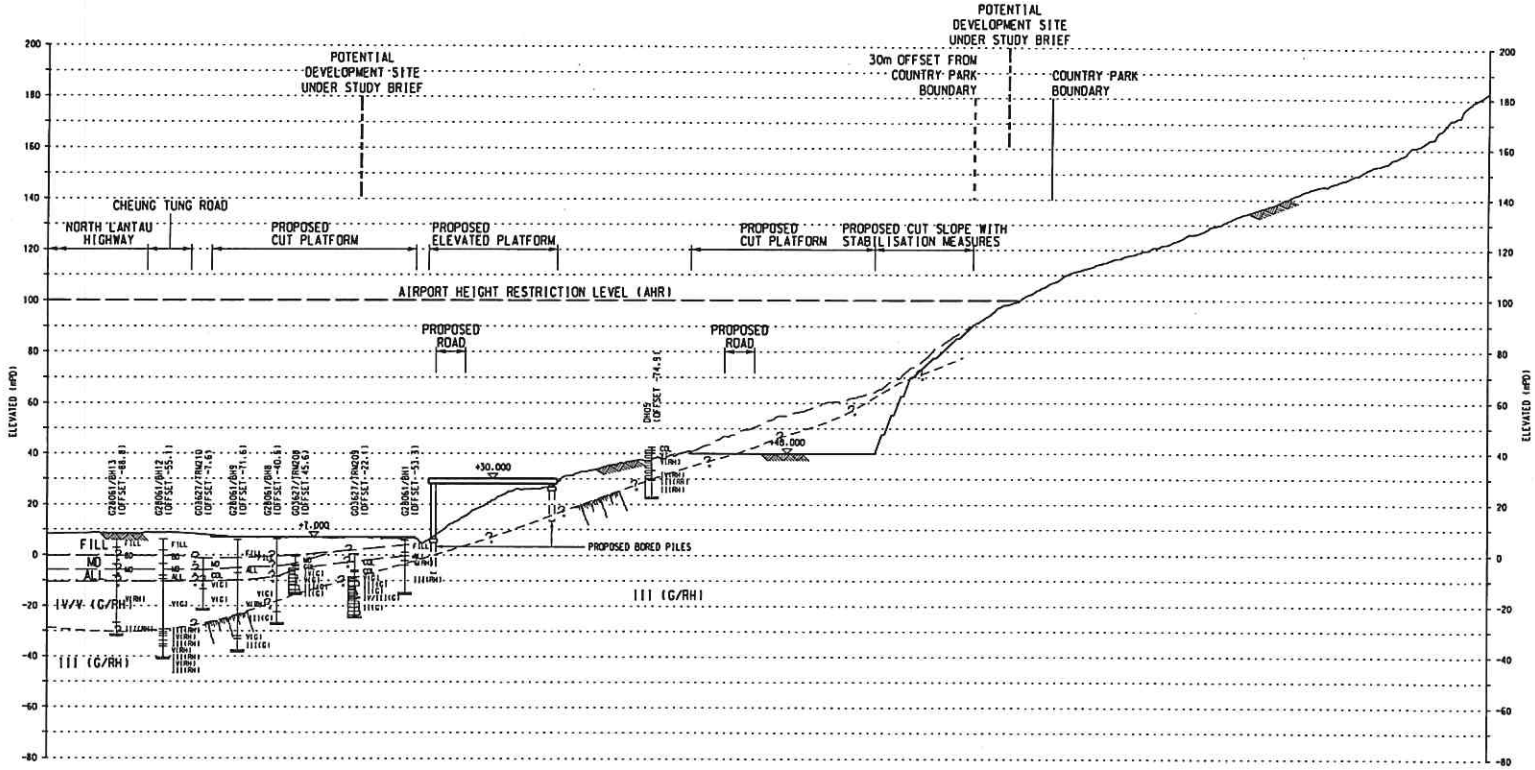

SECTION 9
SCALE 1:1000 Figure 5.9

0 10 20 30 40 50
METRES
1 : 1000

C	THIRD ISSUE	HC	05/17
B	SECOND ISSUE	KYL	12/16
A	FIRST ISSUE	HC	06/16
Rev	Description	By	Date

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
LANDSIDE DEVELOPMENT AT SIU HO WAN - OPTION 3 SITE FORMATION SECTION (SHEET 3 OF 3)

Drawing no. Figure 5.12 Rev. C

Drawn	Date	Checked	Approved
MYC	05/16	HC	HS

Scale 1:1000 @A1
Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.loi 5/31/2017
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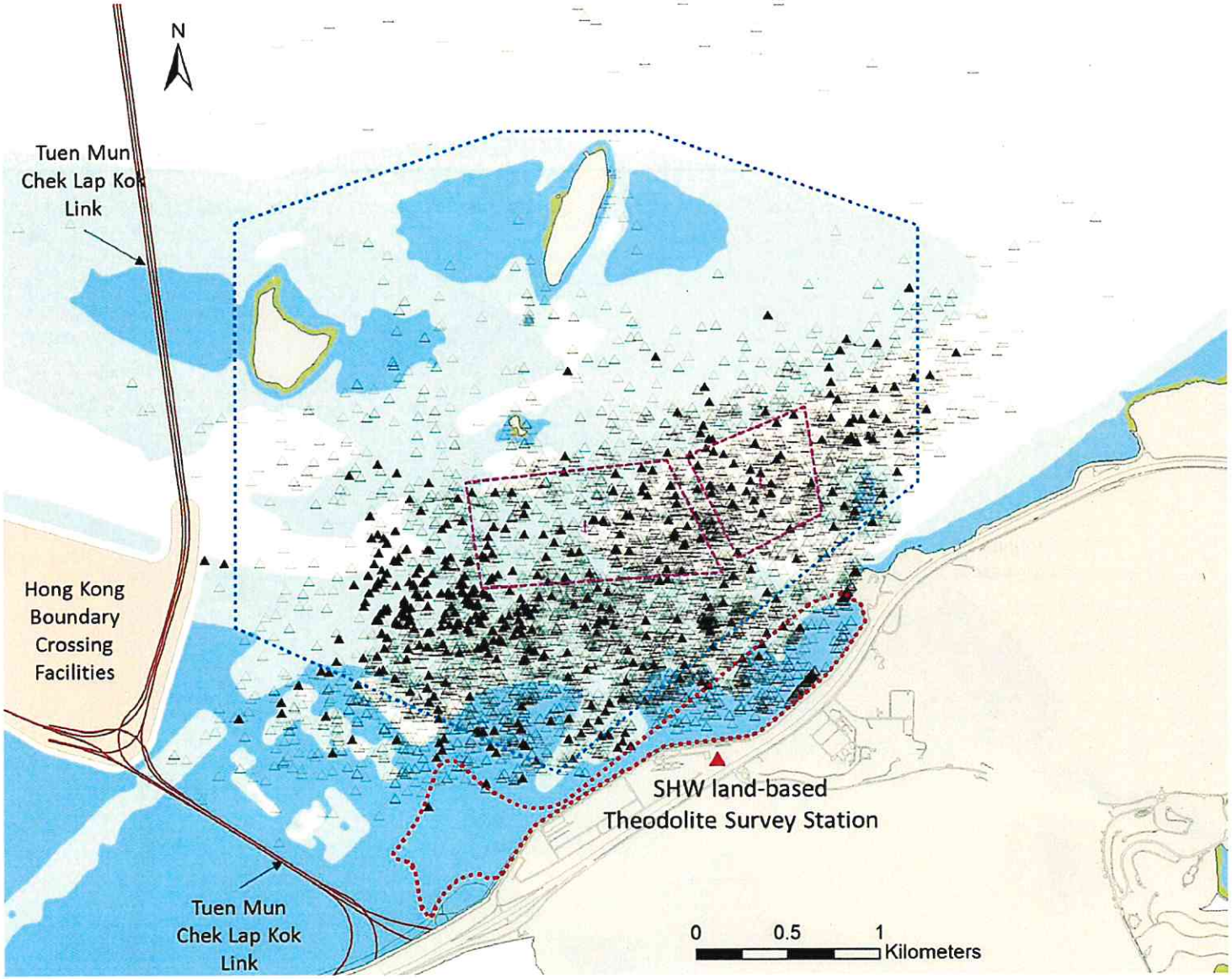


Seabed Level (mCD)

- Above 0
- 0.1 - 5.1
- 5.1 – 10.0
- Below 10

LEGEND

- ▲ Positional fix for construction vessels observed from Siu Ho Wan land-based theodolite Survey Station
- △ Positional fix for non construction vessels observed from Siu Ho Wan land-based theodolite Survey Station
- Siu Ho Wan Reclamation extent
- Boundary of The Brothers Marine Park
- Sham Shui Kok Anchorages No.1 and 2

Rev	Description	By	Date

Consultant: ARUP

Project title: Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

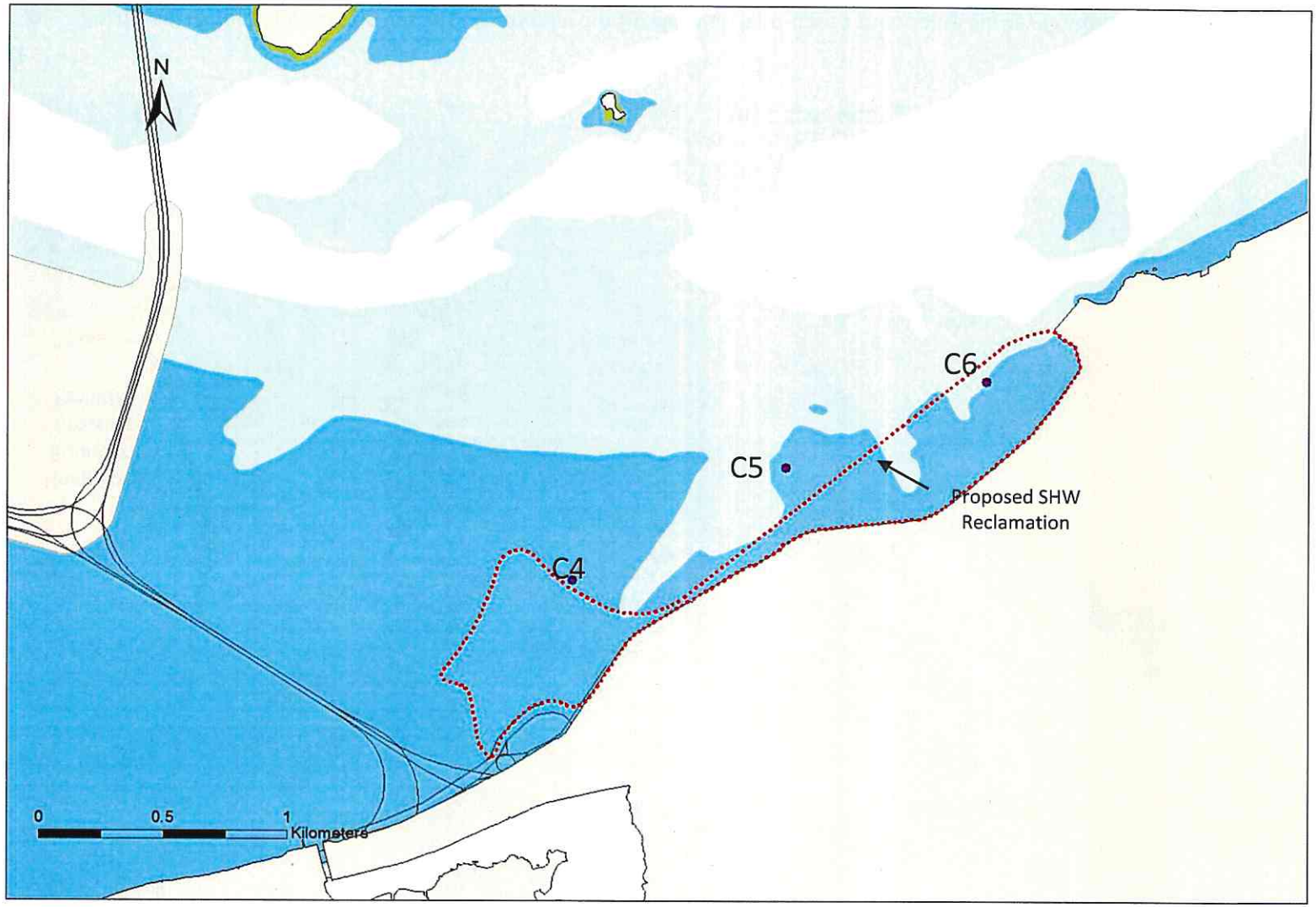
Drawing title: Positional fixes of vessels observed from SHW land based theodolite survey station (Feb – Jul 2016, Sep 2016 – Feb 2017)

Drawing no.: Figure 6.1 | Rev.

Drawn	Date	Checked	Approved
Scale		Status	

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : $DATE$
Filename : $FILE$



Seabed Level (mCD)

- Above 0
- 0.1 - 5.1
- 5.1 – 10.0
- Below 10

LEGEND

● Locations of EARs at Siu Ho Wan

Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Locations of Ecological Acoustic Recorders at Siu Ho Wan

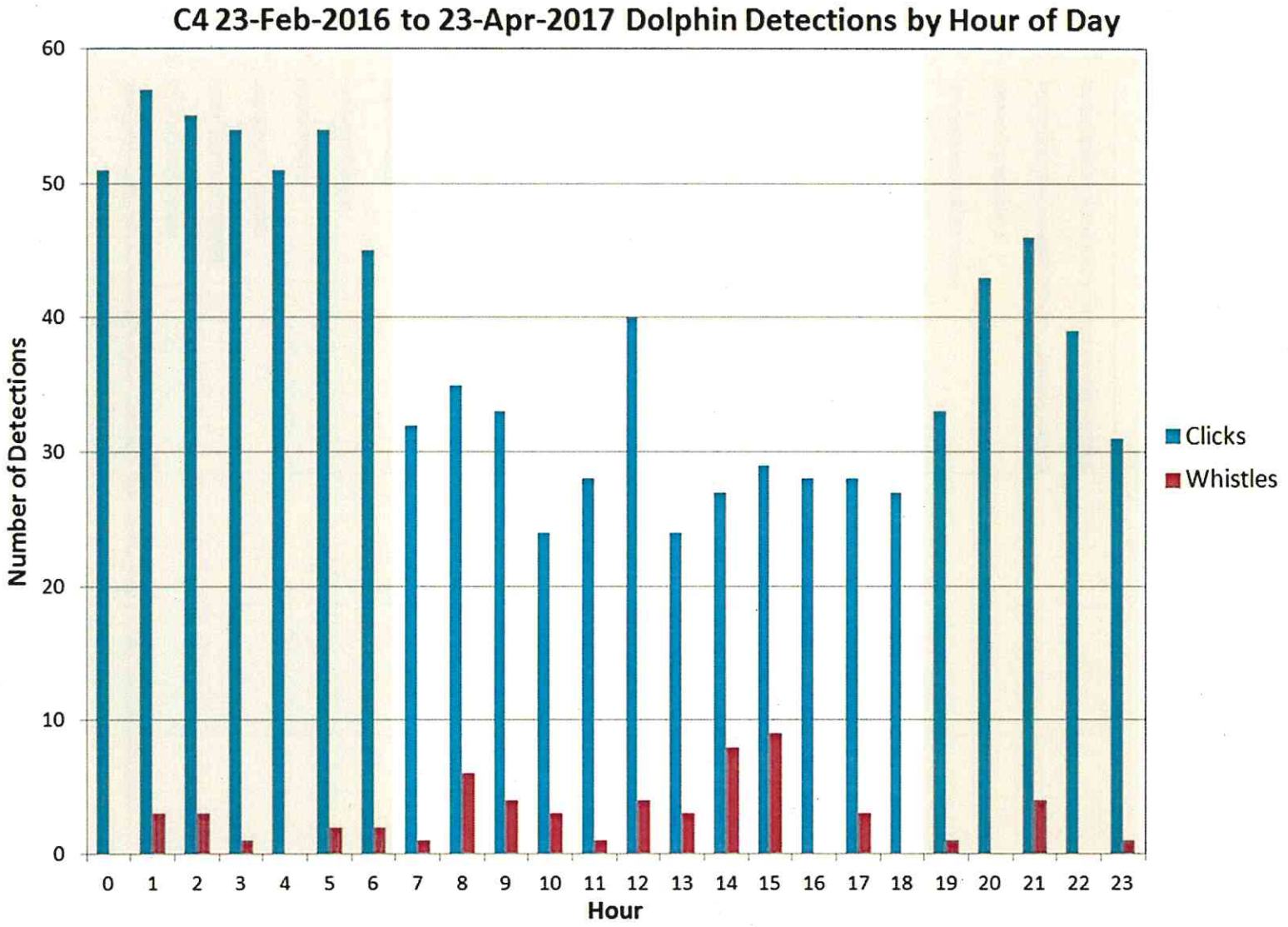
Drawing no. Figure 6.2 Rev.

Drawn	Date	Checked	Approved

Scale | Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : $DATE$
Filename : $FILE$



Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Dolphin detections by hour of day at site C4 in SHW, 23 Feb 2016 - 23 Apr 2017

Drawing no. Figure 6.3 Rev.

Drawn	Date	Checked	Approved

Scale Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : $DATE$
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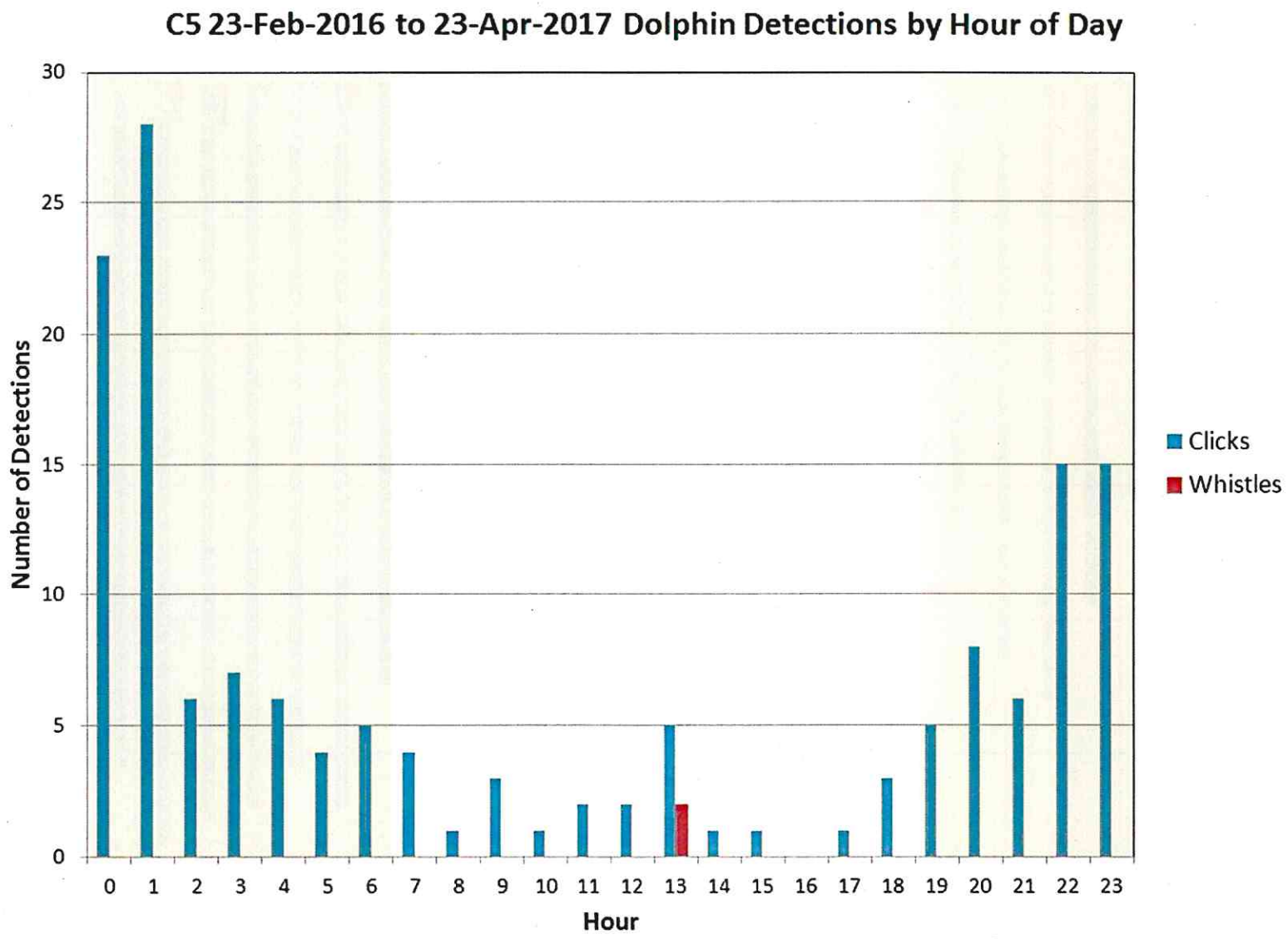

Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Dolphin detections by hour of day at site C5 in SHW, 23 Feb 2016 - 23 Apr 2017

Drawing no. Figure 6.4 Rev.

Drawn	Date	Checked	Approved

Scale | Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

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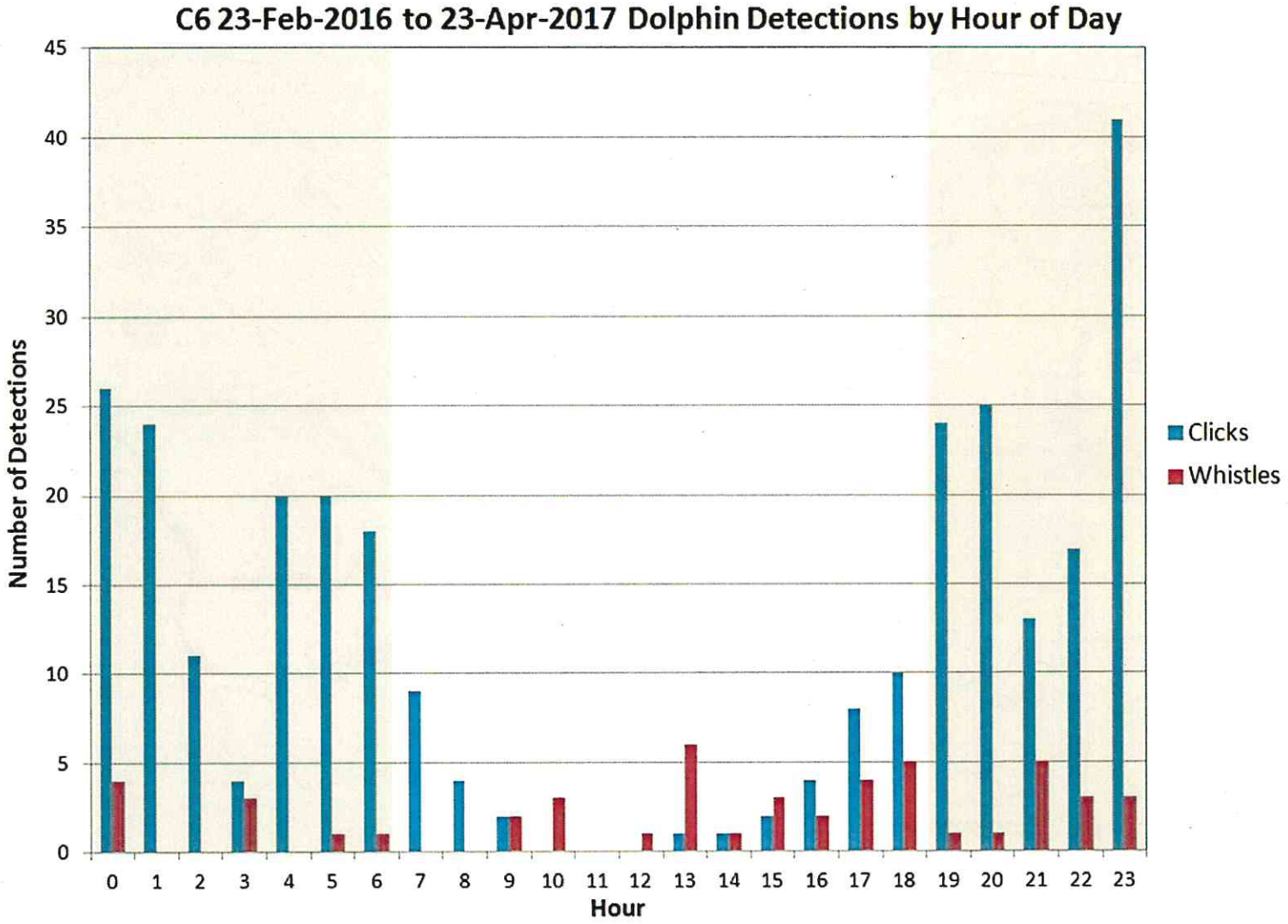

Rev	Description	By	Date

Consultant
ARUP

Project title
Agreement No. CE 12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
Dolphin detections by hour of day at site C6 in SHW, 23 Feb 2016 - 23 Apr 2017

Drawing no. Figure 6.5 Rev.

Drawn	Date	Checked	Approved

Scale | Status

CEDD 土木工程拓展署 Civil Engineering and Development Department

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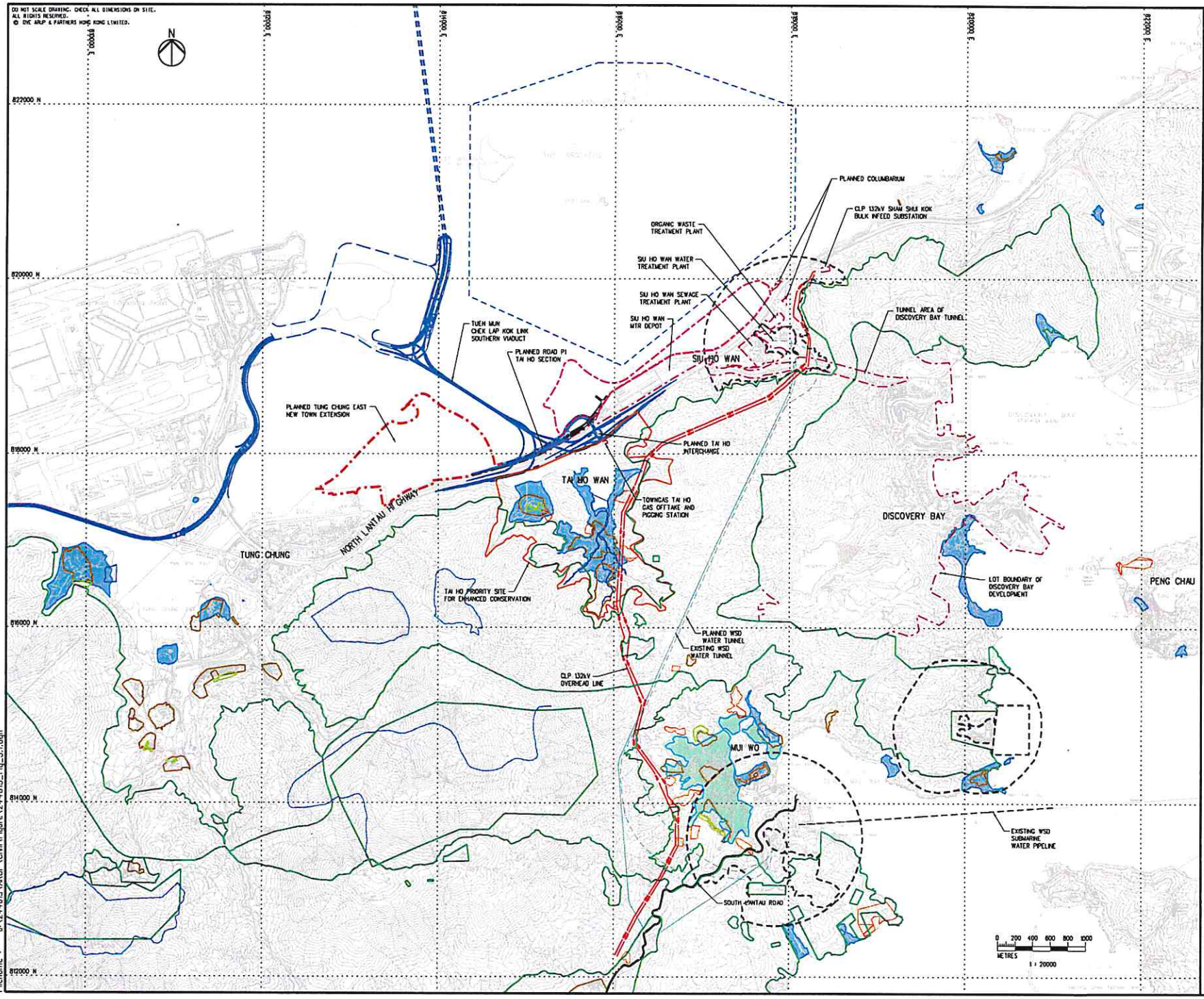

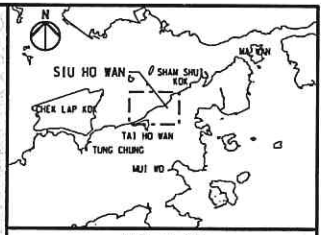

KEY PLAN

LEGEND:

- PROPOSED RECLAMATION AREA
- THE BROTHERS MARINE PARK
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF ARCHAEOLOGICAL INTEREST
- VILLAGE ENVIRONS
- SITE OF SPECIAL SCIENTIFIC INTEREST
- EXTENT OF ECOLOGICAL CONSTRAINT (INCLUDING FRESHWATER AND MARSH LAND) (REFERENCE FROM FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT - SEPT 2005 - CE49/2002 (DS))
- FUNG SHUI WOODLAND
- POTENTIAL HAZARD CONSULTATION ZONE
- BURIAL GROUND
- PLANNED WATER TUNNEL
- CLP 132kV OVERHEAD LINE

D	FINAL TP23	LFM	12/17
C	REVISED FINAL TP4	LFM	09/16
B	FINAL TP4	LFM	08/16
A	DRAFT TP3	LFM	12/15
Rev	Description	By	Date

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: CONSTRAINTS MAP FOR STRATEGIC LINK TO NORTH LANTAU

Drawing no.: Figure 7.1 | Rev.: D

Drawn	Date	Checked	Approved
STU	08/15	LFM	KW

Scale: 1:20000 @A1 | Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : pui-lam.ling 12/12/2017
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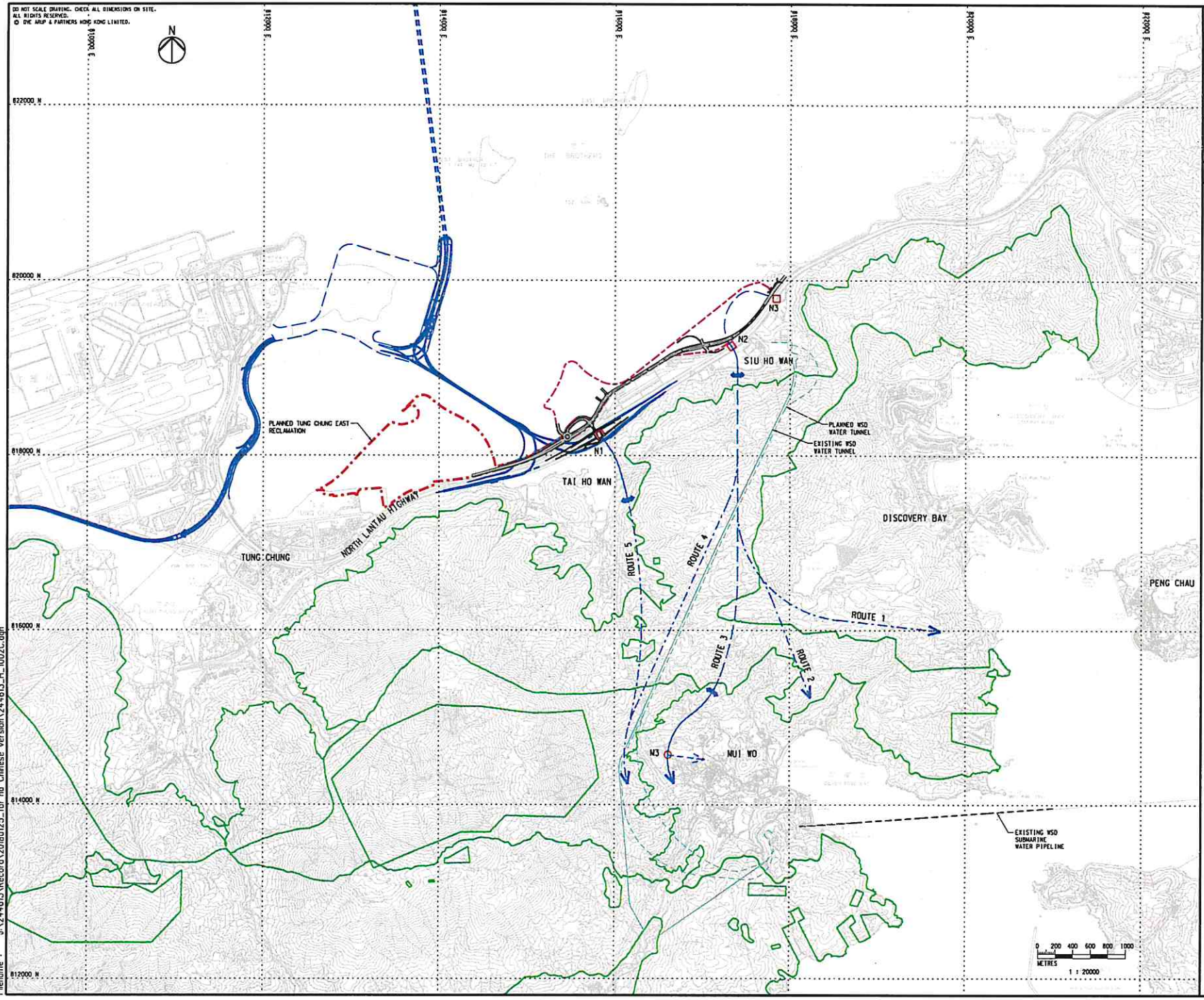

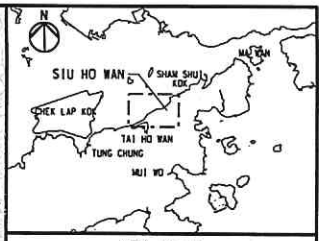

KEY PLAN

LEGEND:

- GAZETTED COUNTRY PARK BOUNDARY
- PROPOSED RECLAMATION AREA
- INTERCHANGE POINT / LANDING POINT
- AT GRADE ROAD / VIADUCT
- TUNNEL
- POSSIBLE ROAD CONNECTION TO FUTURE ELW

Rev	Description	By	Date
C	REVISED FINAL TP4	LFM	10/17
B	DRAFT TP4	SPN	05/16
A	DRAFT TP3	LFM	12/15

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ROUTING OPTIONS FOR STRATEGIC LINK FROM NORTH LANTAU TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO

Drawing no.	Rev.
Figure 7.2	C

Drawn	Date	Checked	Approved
STU	08/15	KKC	HS

Scale: 1:20000 @A1

Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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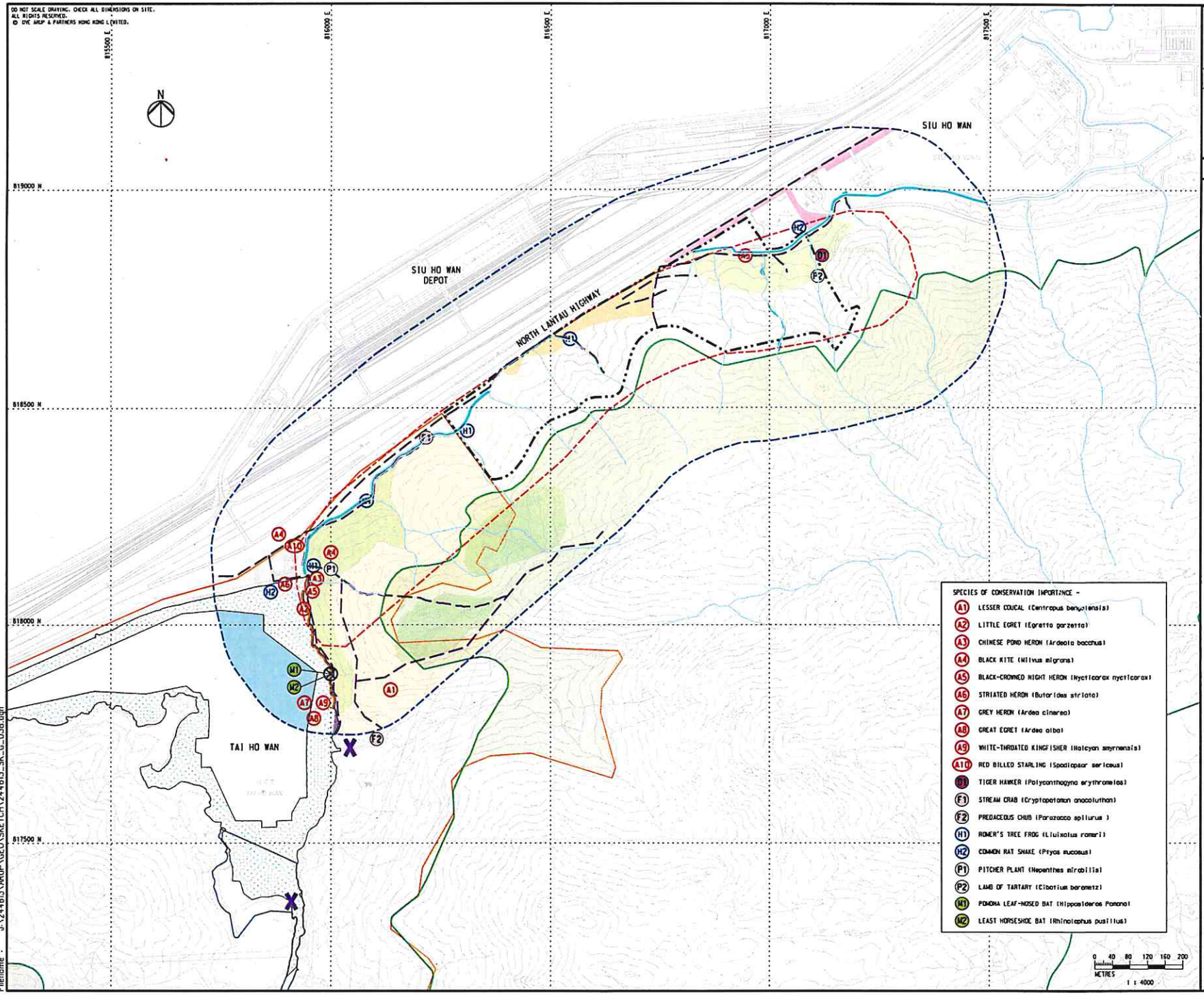
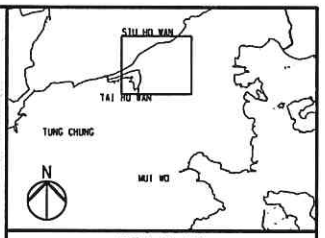
1/25/2018



SPECIES OF CONSERVATION IMPORTANCE -

- A1 LESSER COUCAL (Centropus bengalensis)
- A2 LITTLE EGRET (Egretta garzetta)
- A3 CHINESE POND HERON (Ardeola bacchus)
- A4 BLACK KITE (Milvus migrans)
- A5 BLACK-CROWNED NIGHT HERON (Nycticorax nycticorax)
- A6 STRIATED HERON (Butorides striata)
- A7 GREY HERON (Ardea cinerea)
- A8 GREAT EGRET (Ardea alba)
- A9 WHITE-THROATED KINGFISHER (Halcyon smyrnensis)
- A10 RED BILLED STARLING (Spodiopsar sericeus)
- B1 TIGER HAWKER (Polycanthagyna erythromelas)
- F1 STREAM CRAB (Cryptopotamon anacoluthon)
- F2 PREDACEOUS CHUB (Parazacco spilurus)
- H1 ROMER'S TREE FROG (Liuixalus romeri)
- H2 COMMON RAT SNAKE (Ptyas mucosus)
- P1 PITCHER PLANT (Nepenthes mirabilis)
- P2 LAMB OF TARTARY (Cibotium barometz)
- M1 PONDMA LEAF-NOSED BAT (Hipposideros Pomona)
- M2 LEAST HORSESHOE BAT (Rhinolophus pusillus)



KEY PLAN

LEGEND

- POTENTIAL DEVELOPMENT SITE UNDER STUDY BRIEF
- GAZETTED COUNTRY PARK BOUNDARY
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF SPECIAL SCIENTIFIC INTEREST
- INTERTIDAL MUDFLAT
- PROPOSED LANDSIDE DEVELOPMENT SITE
- SURVEY AREA OF ECOLOGICAL SITE WALK (200m FROM LANDSIDE DEVELOPMENT SITE)
- TRANSECT LINE FOR SURVEY
- FISH FAUNA SURVEY POINTS OF TAI HO STREAM SSSI AND ITS ESTUARY
- BAT CAVE
- WOODLAND
- SHRUBLAND
- SHRUBBY GRASSLAND
- PLANTATION
- MANGROVE
- MARINE WATER
- DEVELOPED AREA
- ROCKY SHORE
- STREAM / CHANNEL

Rev	Description	By	Date
A	FIRST ISSUE	JS	09/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: HABITAT MAP AND LOCATION OF CONSERVATION IMPORTANCE RECORDED IN DRY AND WET SEASON SITE WALK

Drawing no.	Rev.
Figure 7.3	A

Drawn	Date	Checked	Approved
WYC	08/16	KL	MS

Scale: 1:4000 @A1 | Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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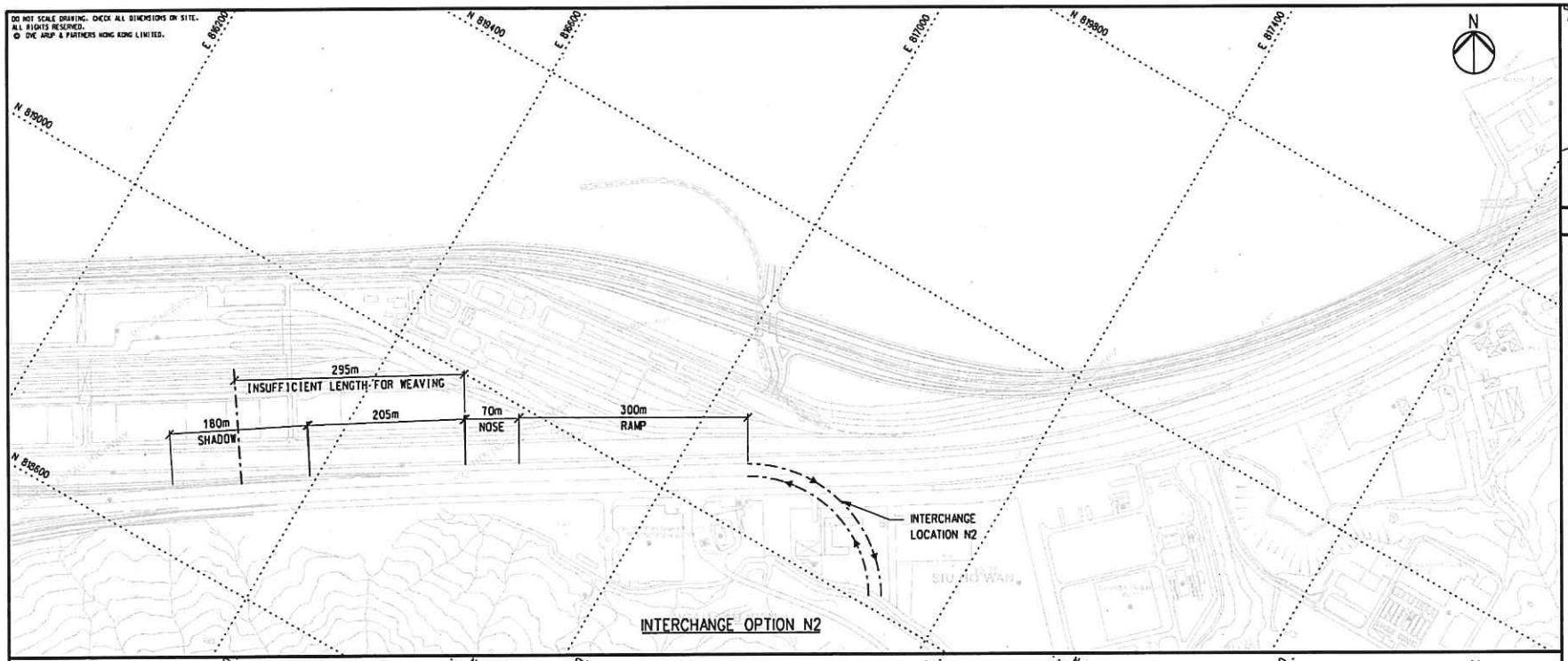
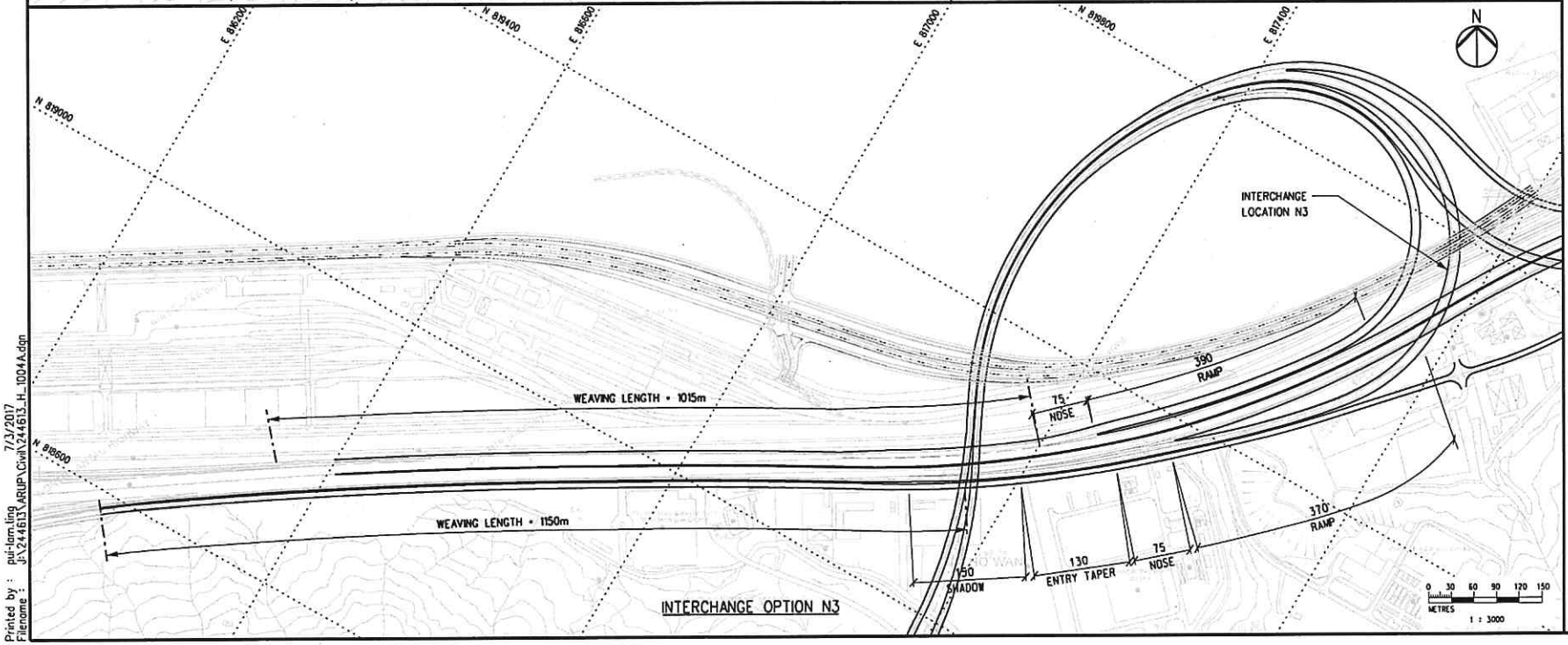
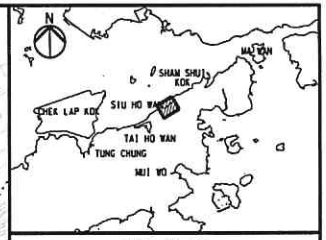


INTERCHANGE OPTION N2



INTERCHANGE OPTION N3



KEY PLAN

Rev	Description	By	Date
A	DRAFT TP3	LFM	12/15

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

LOCATION OF SIU HO WAN INTERCHANGE & WEAVING LENGTH (OPTION N2 & N3)

Drawing no.	Rev.
Figure 7.4	A

Drawn	Date	Checked	Approved
TINC	APR 2016	KKC	HS

Scale: 1:3000 @A1

Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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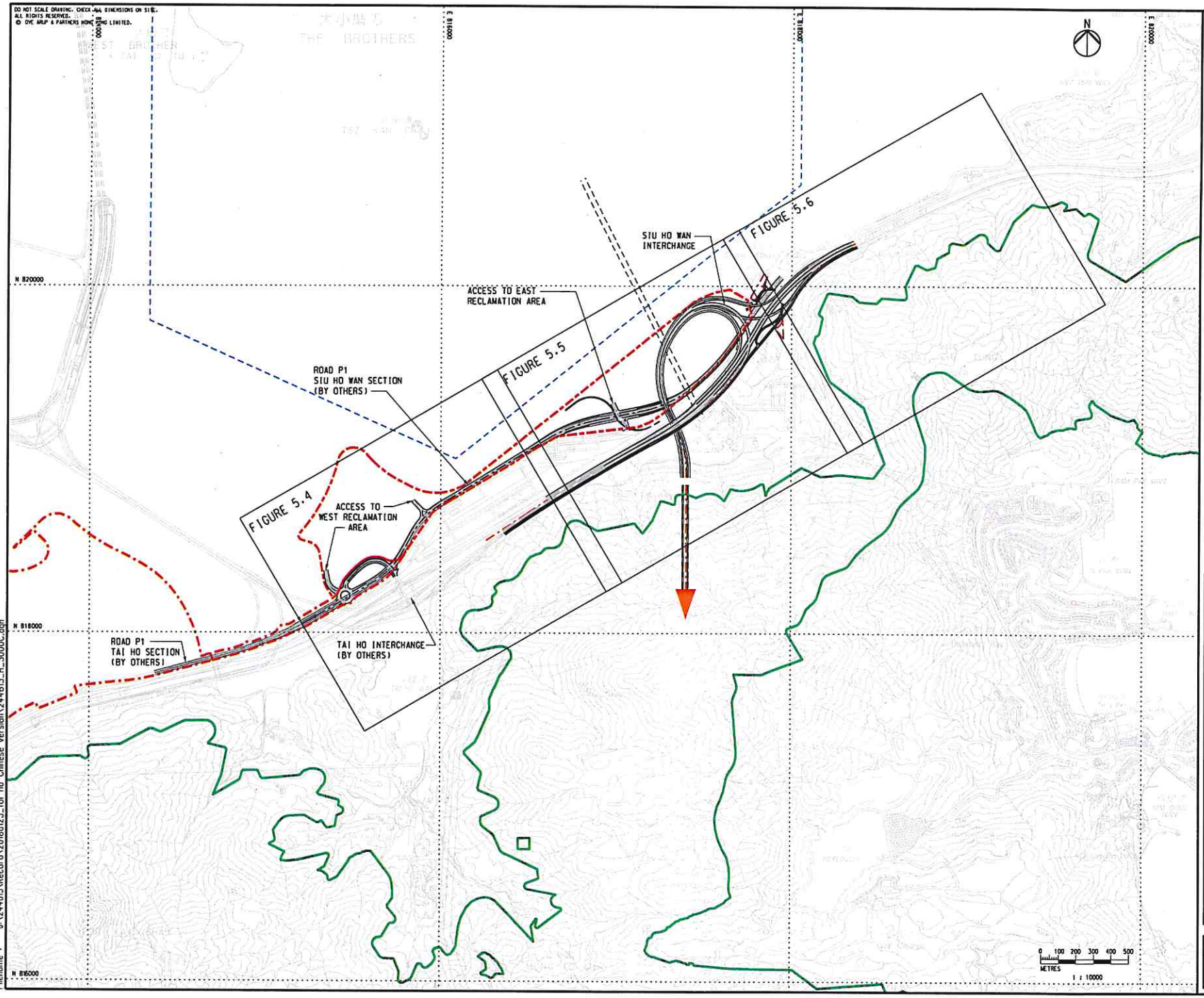


Rev	Description	By	Date
C	FINAL TP23	LFM	12/17
B	FINAL TP4	LFM	08/16
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ROAD NETWORK IN SIU HO WAN OVERALL PLAN

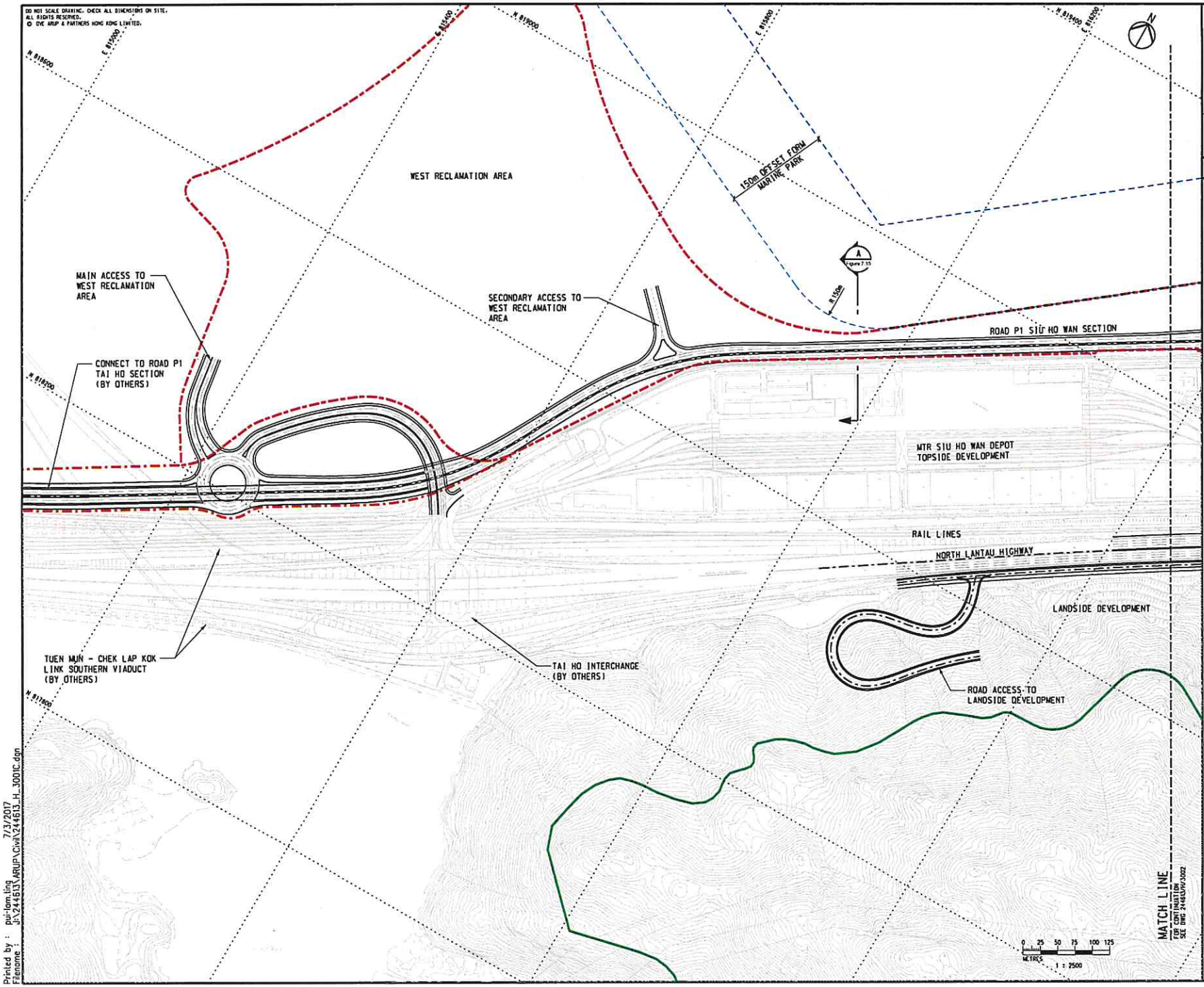
Drawing no. Figure 7.5 Rev. C

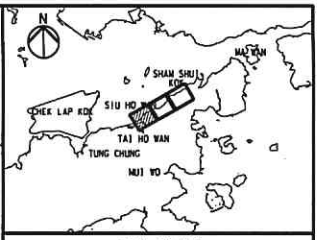
Drawn	Date	Checked	Approved
SYU	09/15	LFM	RF

Scale 1:10000 @A1 Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : simon.yu 1/25/2018
Filename : J:\244613\Record\20180125_for no Chinese version\244613_H_3000C.dgn





KEY PLAN

LEGEND

- RECLAMATION EXTENT
- GAZETTED COUNTRY PARK BOUNDARY
- THE BROTHERS MARINE PARK
- PROPOSED HIGHWAY ALIGNMENT
- PROPOSED CARRIAGEWAY

Rev	Description	By	Date
C	-	LFM	-
B	FINAL TP4	LFM	08/16
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

PROPOSED ROAD NETWORK FOR SIU HO WAN DEVELOPMENT (SHEET 1)

Drawing no.	Rev.
Figure 7.6	C

Drawn	Date	Checked	Approved
STU	09/15	LFM	KW

Scale: 1:2500 @A1 — Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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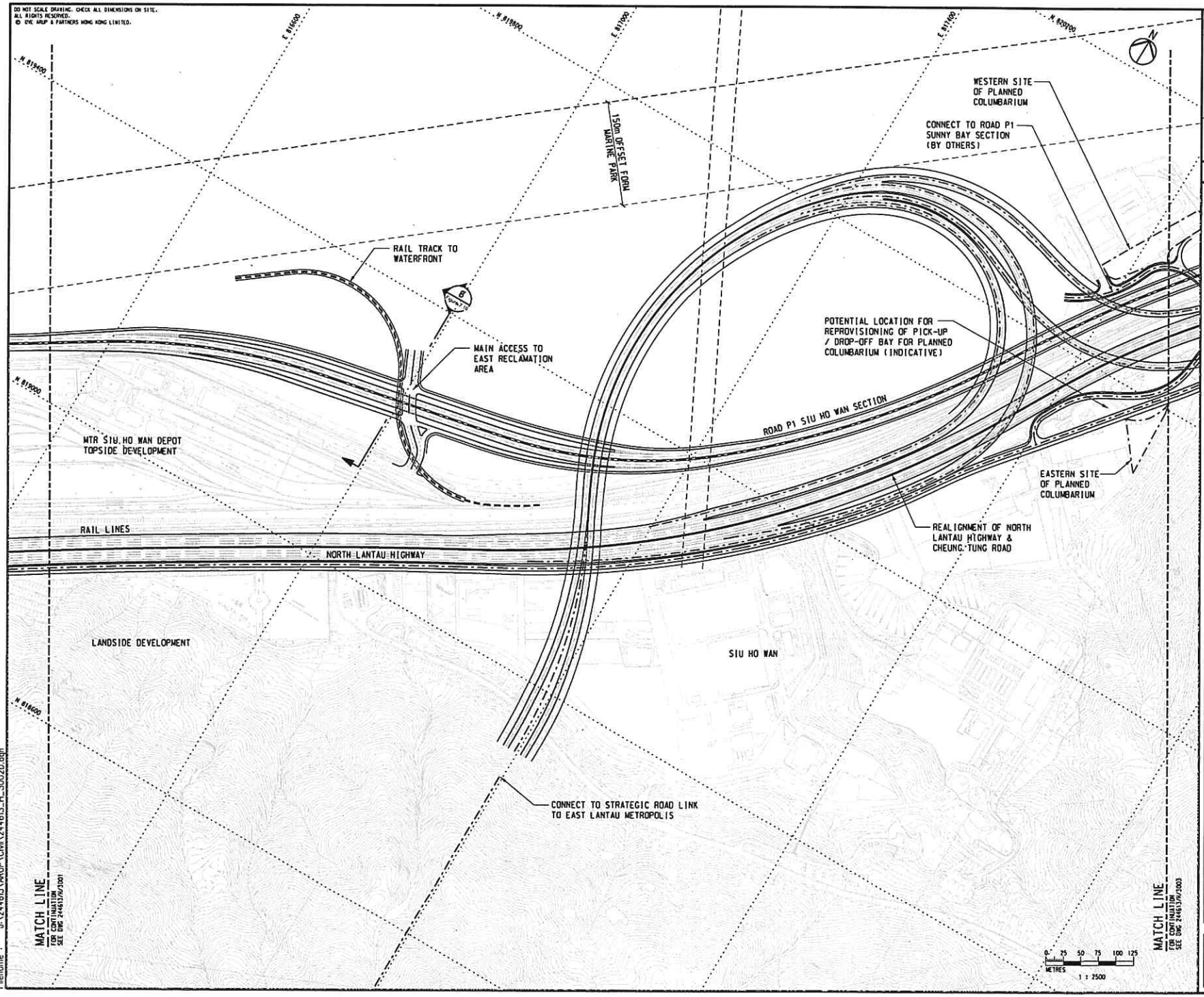

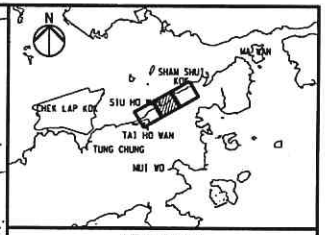

KEY PLAN

NOTES:

1. FOR LEGEND, REFER TO DRAWING NO. 244613/H/3001.
2. PLANNED COLUMBARIUM SITE INDICATED FROM DISTRICT COUNCIL PAPER 85/16-17.

Rev	Description	By	Date
D	FINAL TP4	LFM	07/17
C	FINAL TP4	LFM	07/17
B	FINAL TP4	LFM	08/16
A	DRAFT TP4	SPN	05/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
PROPOSED ROAD NETWORK FOR SIU HO WAN DEVELOPMENT (SHEET 2)

Drawing no.	Rev.
Figure 7.7	D

Drawn	Date	Checked	Approved
SYU	09/15	LFM	KW

Scale: 1:2500 @A1
Status: PRELIMINARY

CEDD
土木工程拓展署
Civil Engineering and Development Department

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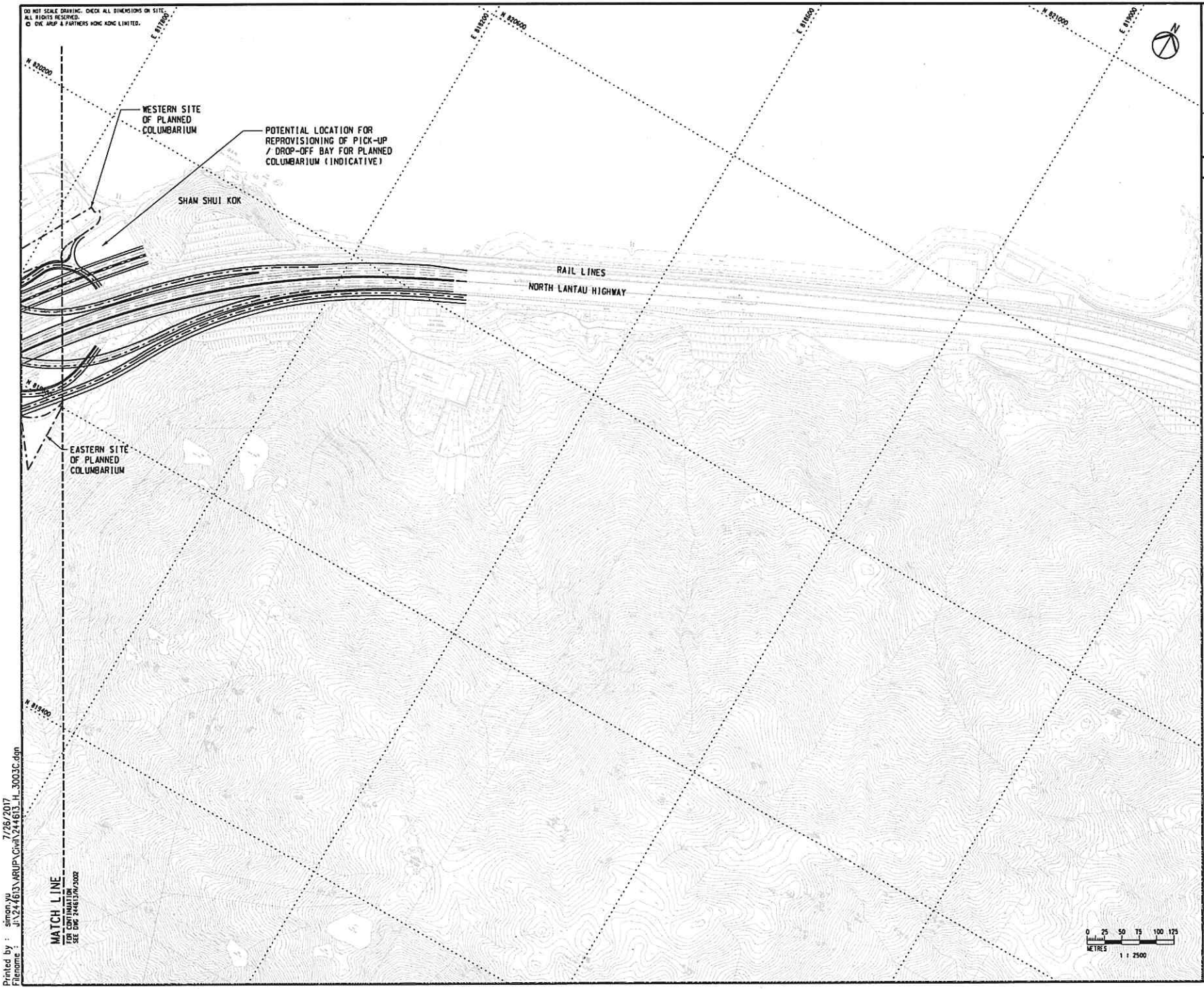

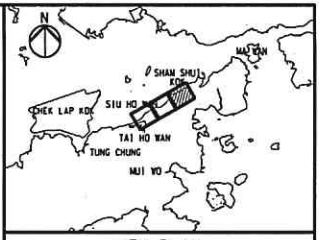

KEY PLAN

LEGEND

1. FOR LEGEND, REFER TO DRAWING NO. 244613/H/3001.
2. PLANNED COLUMBARIUM SITE INDICATED FROM DISTRICT COUNCIL PAPER 85/16-17.

Rev	Description	By	Date
C	FINAL TP4	LTM	07/17
B	FINAL TP4	LTM	07/17
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

PROPOSED ROAD NETWORK FOR SIU HO WAN DEVELOPMENT (SHEET 3)

Drawing no.	Figure 7.8	Rev. C
Drawn STU	Date 09/15	Checked LFH	Approved KY
Scale 1:2500 @A1		Status PRELIMINARY	

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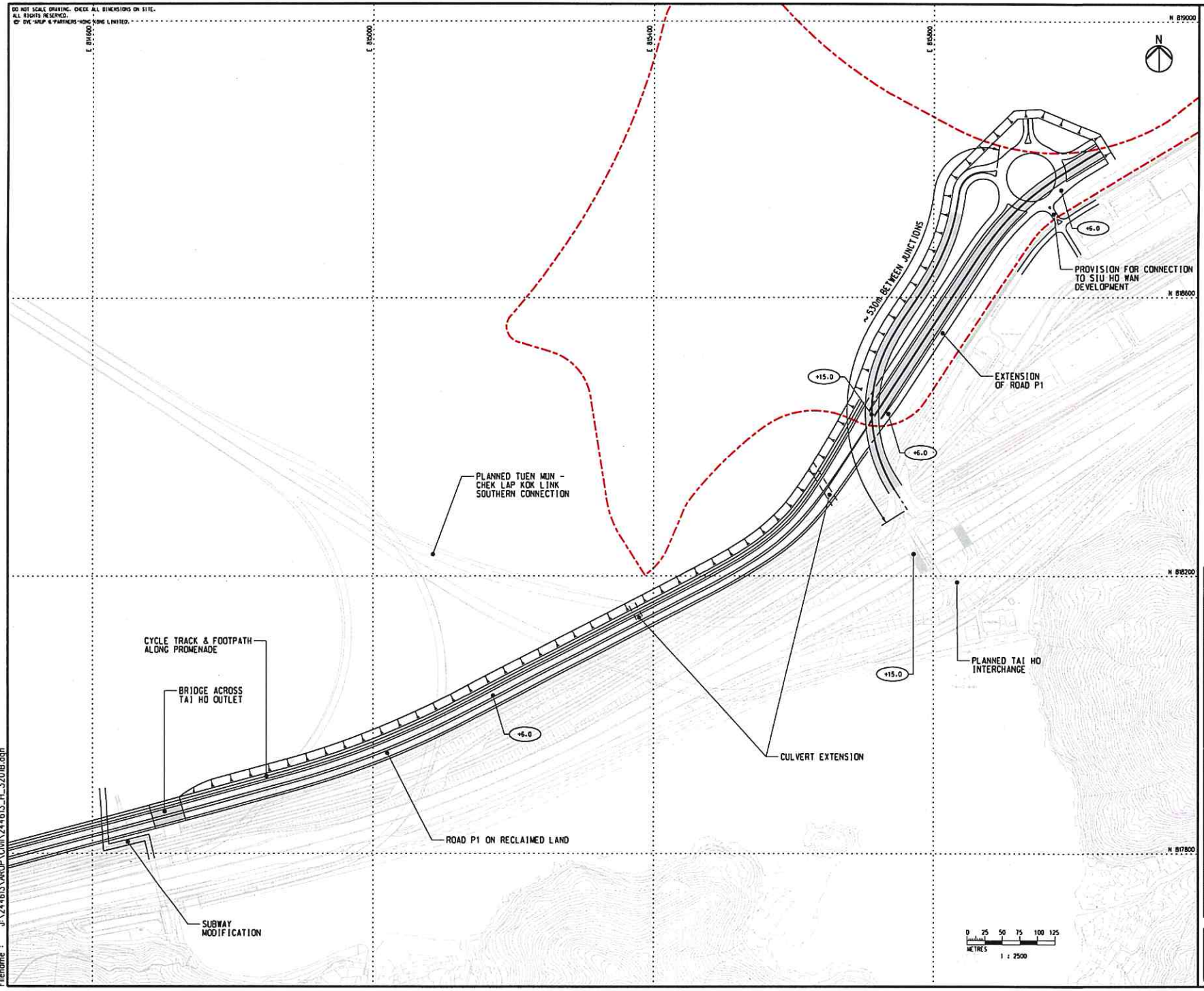

LEGEND

- PLANNED TMCLK LINK SOUTHERN CONNECTION
- PROPOSED ROAD NETWORK
- PROPOSED VIADUCT
- PROPOSED RECLAMATION AREA

Rev	Description	By	Date
B	FINAL TP4	LFM	08/16
A	DRAFT TP4	SPN	05/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: ACCESS TO WEST RECLAMATION AREA OPTION 1

Drawing no. Figure 7.9 Rev. B

Drawn	Date	Checked	Approved
TING	05/16	ET	TL

Scale: 1:2500 @A1 Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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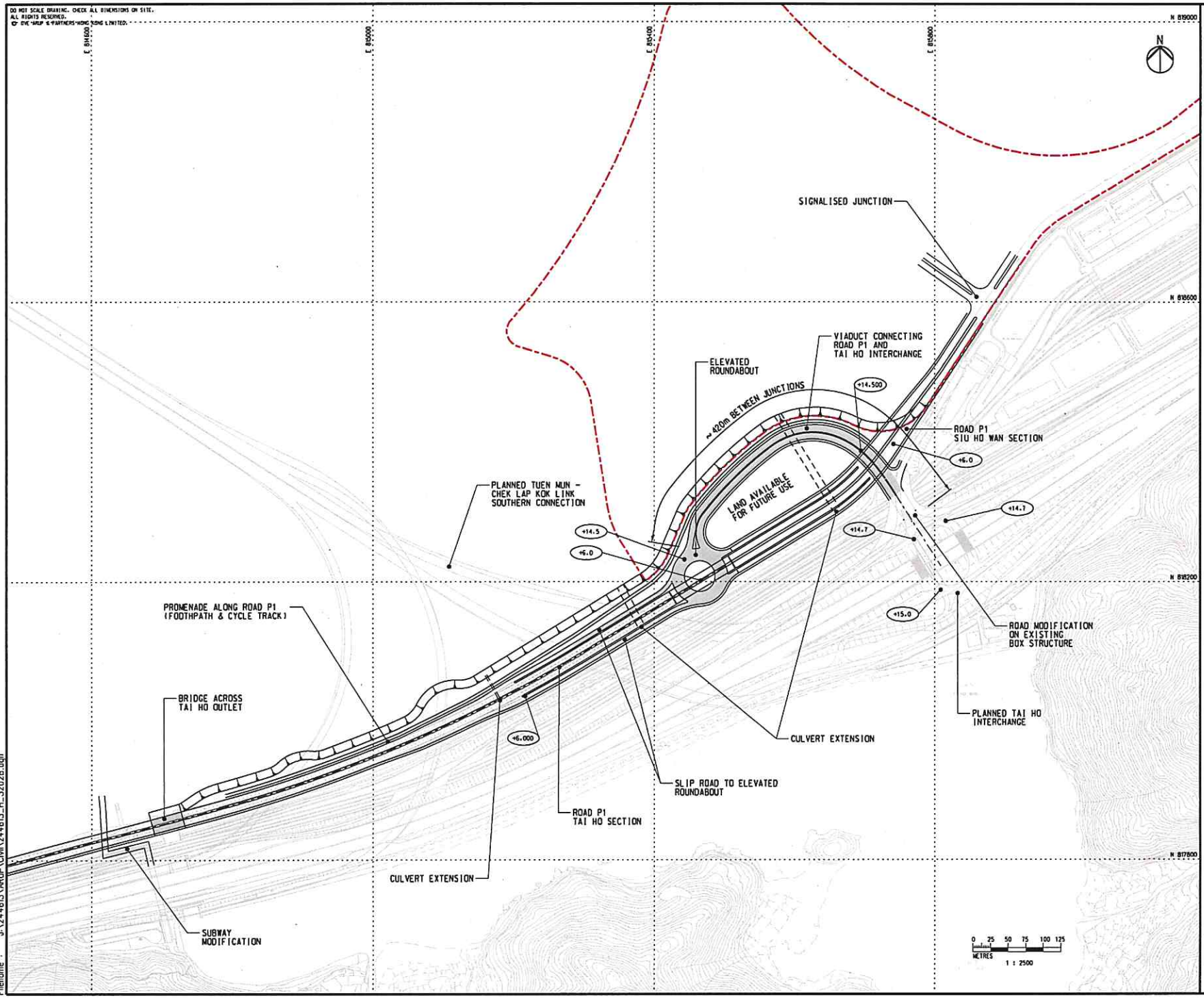

LEGEND

- PLANNED TMCLK LINK SOUTHERN CONNECTION
- PROPOSED ROAD NETWORK
- PROPOSED VIADUCT
- PROPOSED RECLAMATION AREA

Rev	Description	By	Date
B	FINAL TP4	LFW	05/16
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ACCESS TO WEST RECLAMATION AREA
OPTION 2

Drawing no.	Rev.
Figure 7.10	B

Drawn	Date	Checked	Approved
TJNG	05/16	ET	TL

Scale: 1:2500 @A1

Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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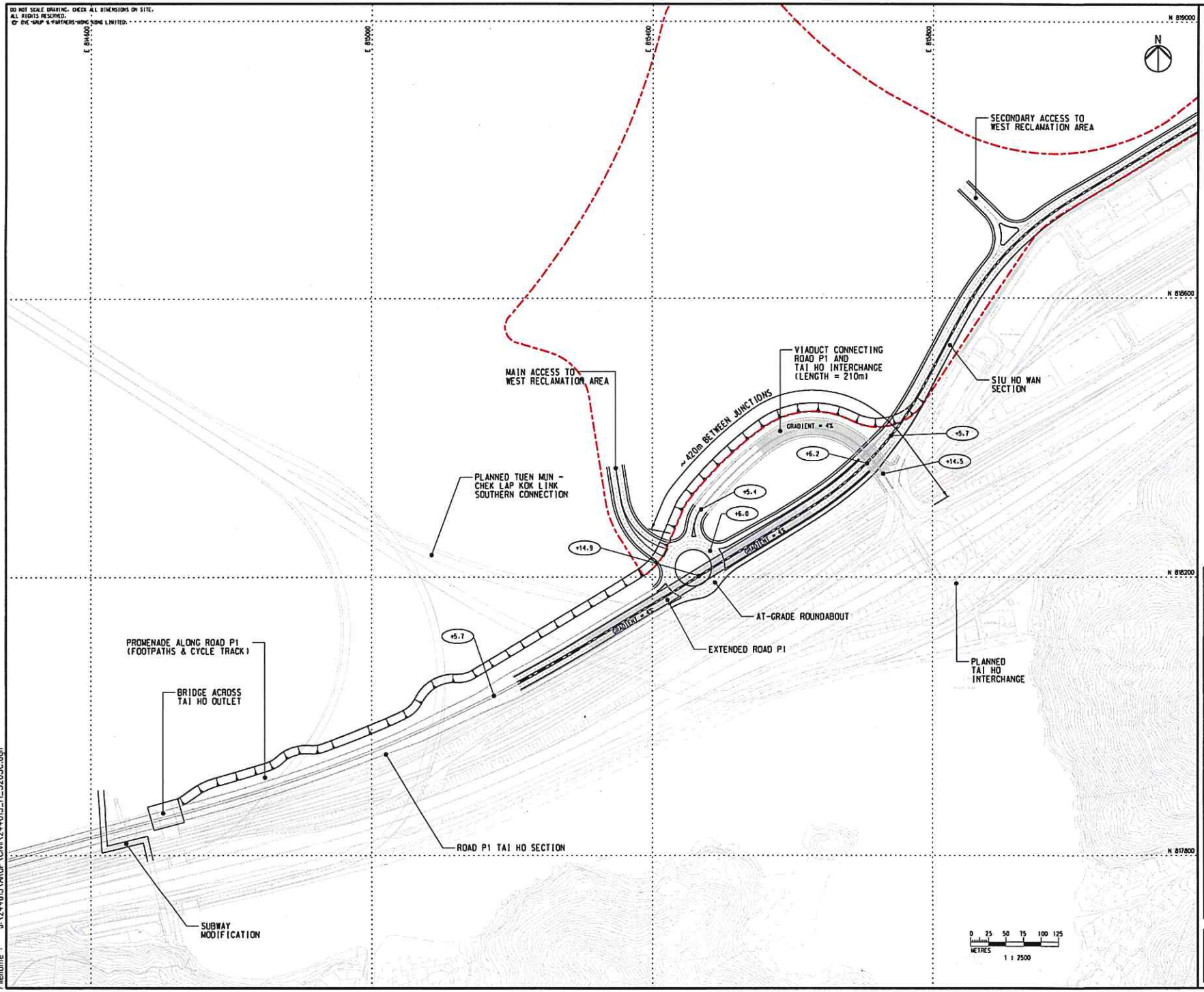

LEGEND

PROPOSED VIADUCT

PROPOSED RECLAMATION AREA

Rev	Description	By	Date
C	REVISED FINAL TP4	LFM	09/16
B	FINAL TP4	LFM	08/16
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ACCESS TO WEST RECLAMATION AREA
OPTION 3

Drawing no. Figure 7.11 Rev. C

Drawn	Date	Checked	Approved
TING	05/16	ET	TL

Scale 1:2500 @A1

Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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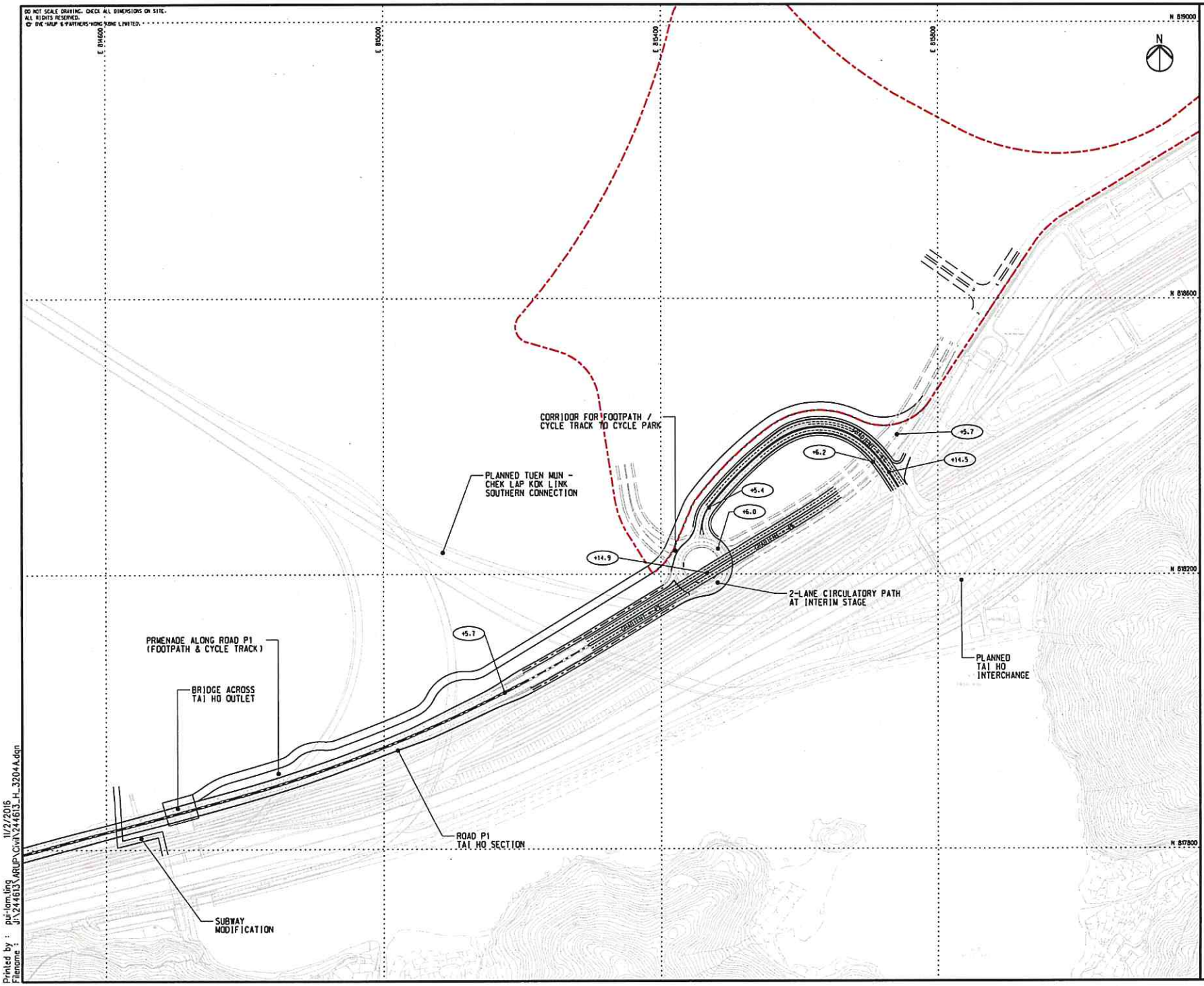

LEGEND

- PROPOSED VIADUCT
- PROPOSED RECLAMATION AREA

Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: ACCESS TO WEST RECLAMATION AREA
OPTION 3 (INTERIM STAGE)

Drawing no.	Rev.
Figure 7.12	A

Drawn	Date	Checked	Approved
TING	APR 2016	ET	TL

Scale: 1:2500 @A1 | Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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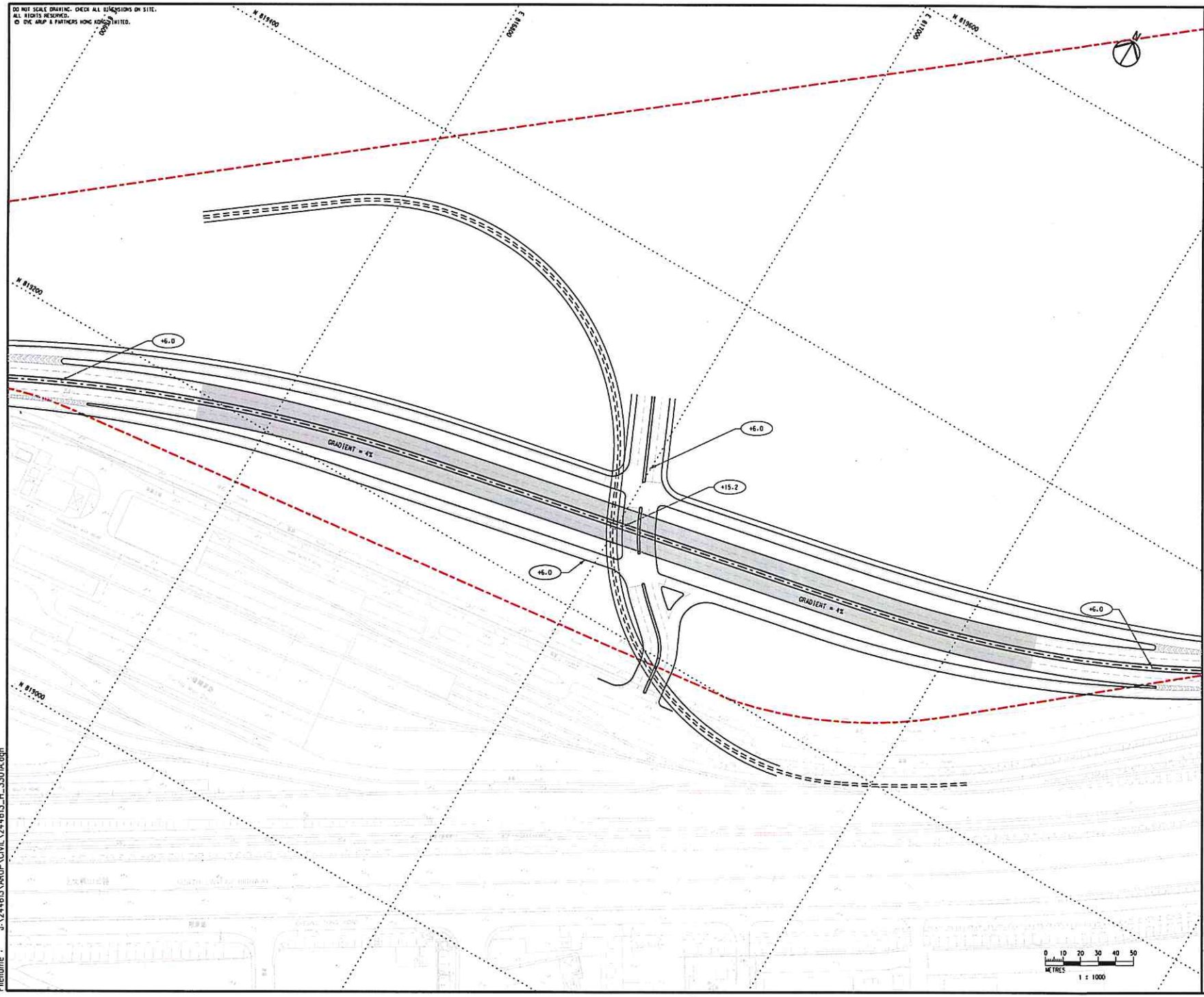

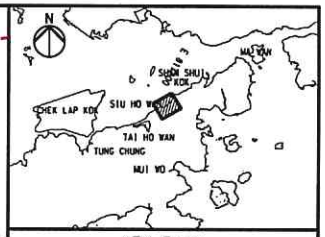

KEY PLAN

LEGEND:

PROPOSED VIADUCT

Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ACCESS TO EAST RECLAMATION AREA OPTION 1

Drawing no. Figure 7.13 Rev. A

Drawn	Date	Checked	Approved
SYU	12/15	LFM	KW

Scale 1:1000 @ A1

Status PRELIMINARY

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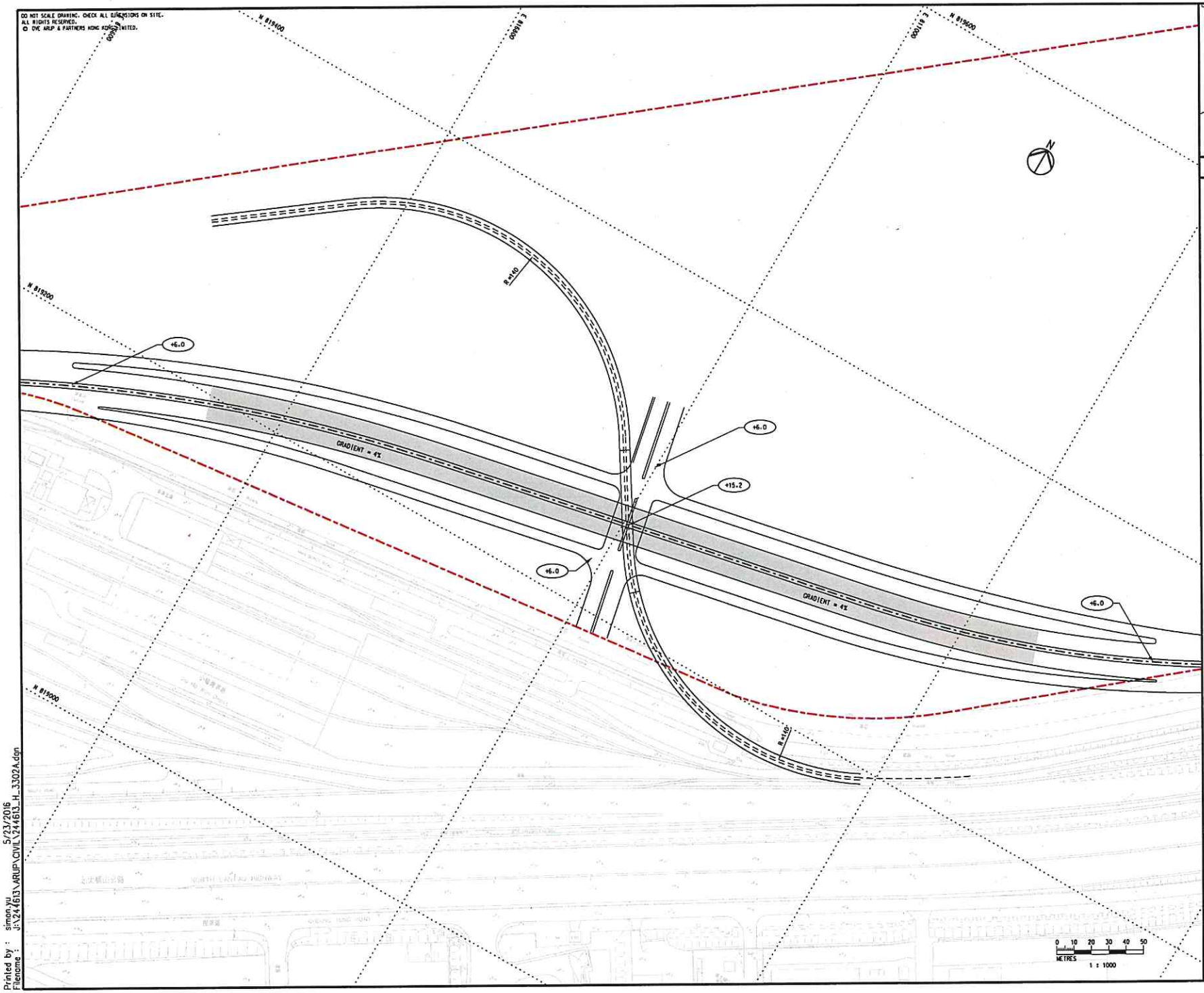

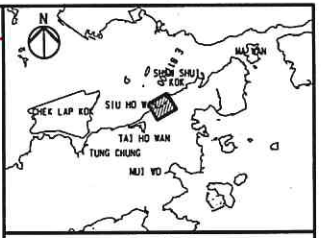

KEY PLAN

LEGEND:

PROPOSED VIADUCT

Rev	Description	By	Date
A	DRAFT TP4	SPK	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ACCESS TO EAST RECLAMATION AREA OPTION 2

Drawing no.	Rev.
Figure 7.14	A

Drawn	Date	Checked	Approved
STU	12/15	LFM	KW

Scale: 1:1000 @A1

Status: PRELIMINARY

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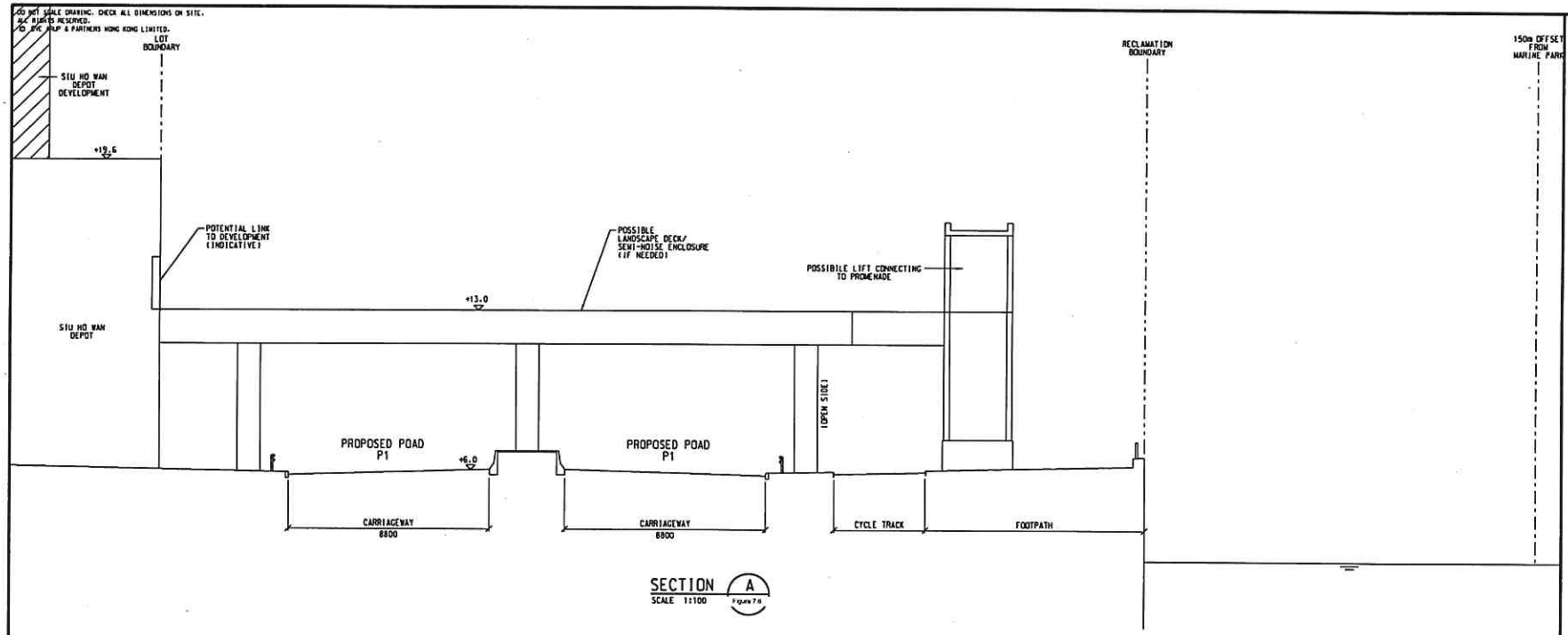

SECTION A (Figure 7.6)
SCALE 1:100

0 1 2 3 4 5 METRES
1 : 100

Rev	Description	By	Date
A	FINAL TP4	LFM	08/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
ROAD CROSS SECTION FOR SIU HO WAN DEVELOPMENT

Drawing no.	Rev.
Figure 7.15	A

Drawn	Date	Checked	Approved
TJNG	08/16	LFM	TL

Scale: 1:100 @ A1
Status: PRELIMINARY

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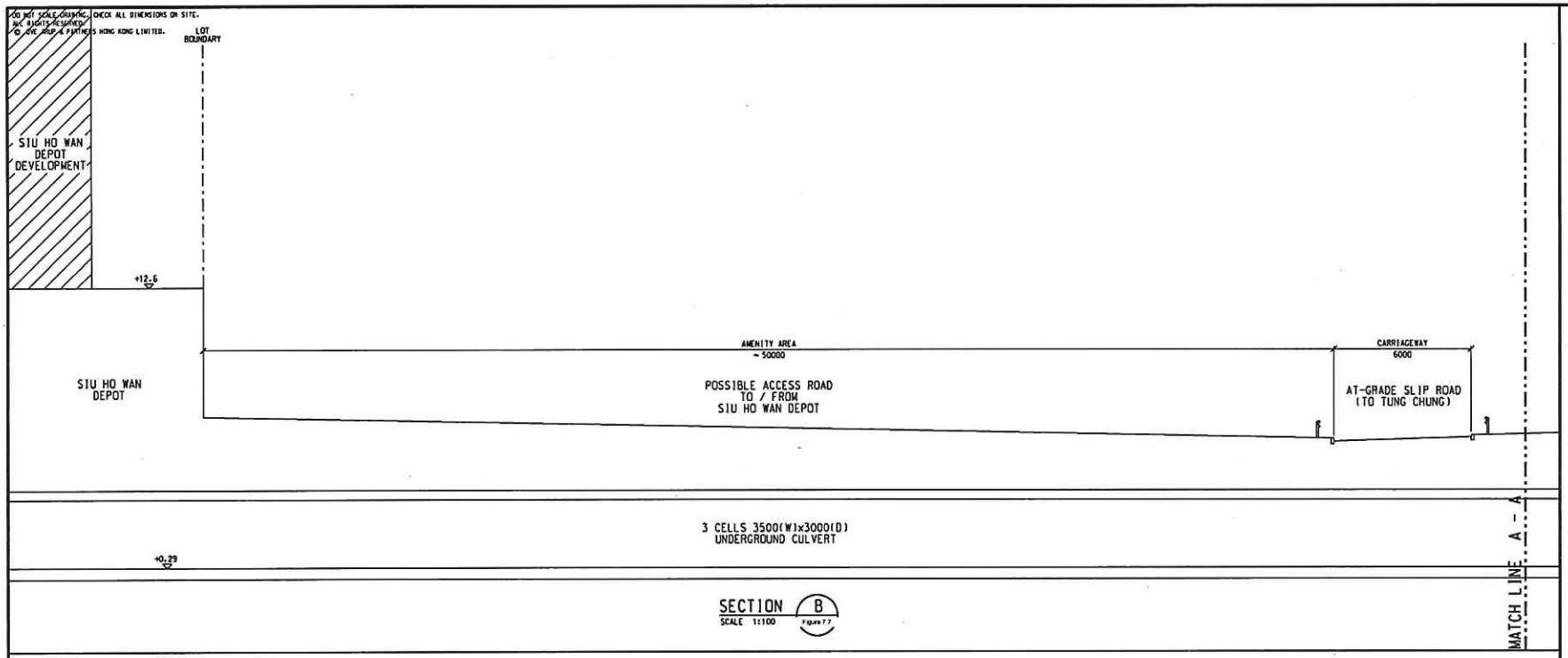

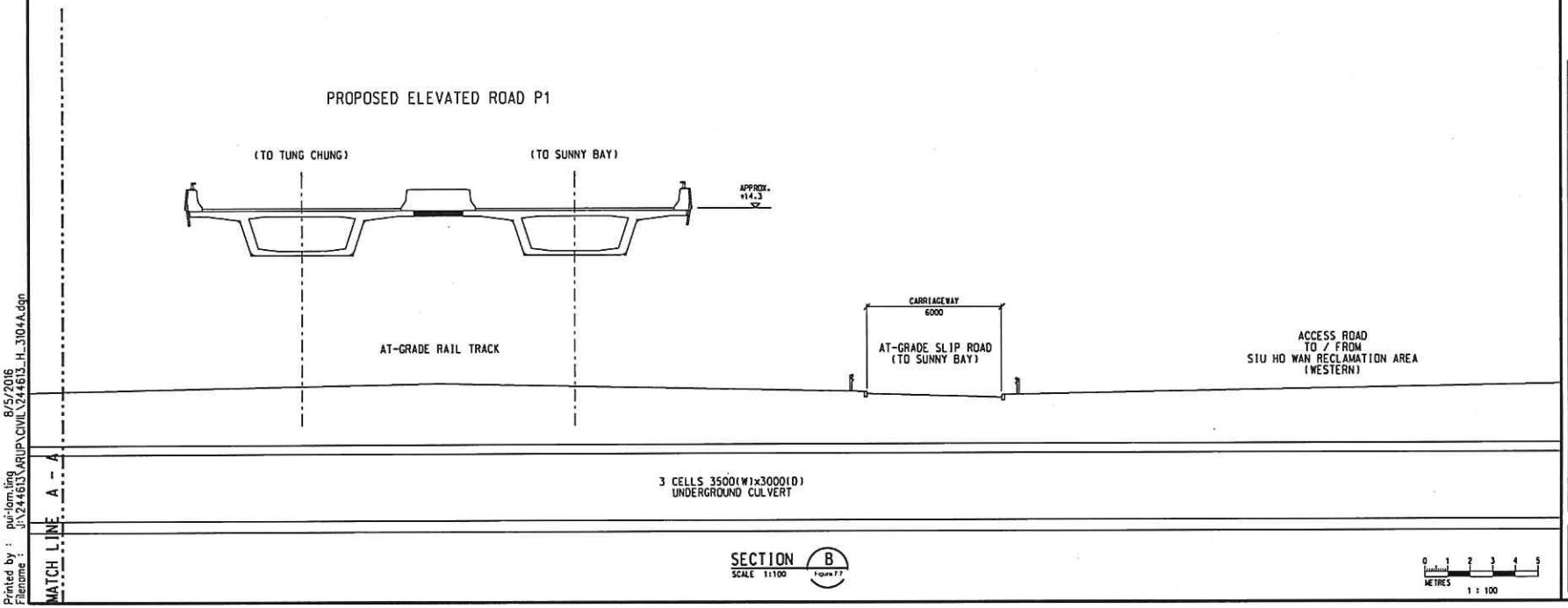

Rev	Description	By	Date
A	FINAL TP4	LFM	08/16

Consultant
ARUP

Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
ROAD CROSS SECTION FOR SIU HO WAN DEVELOPMENT

Drawing no. Figure 7.16 Rev. A

Drawn	Date	Checked	Approved
TJNG	08/16	LFM	TL

Scale 1:100 @ A1
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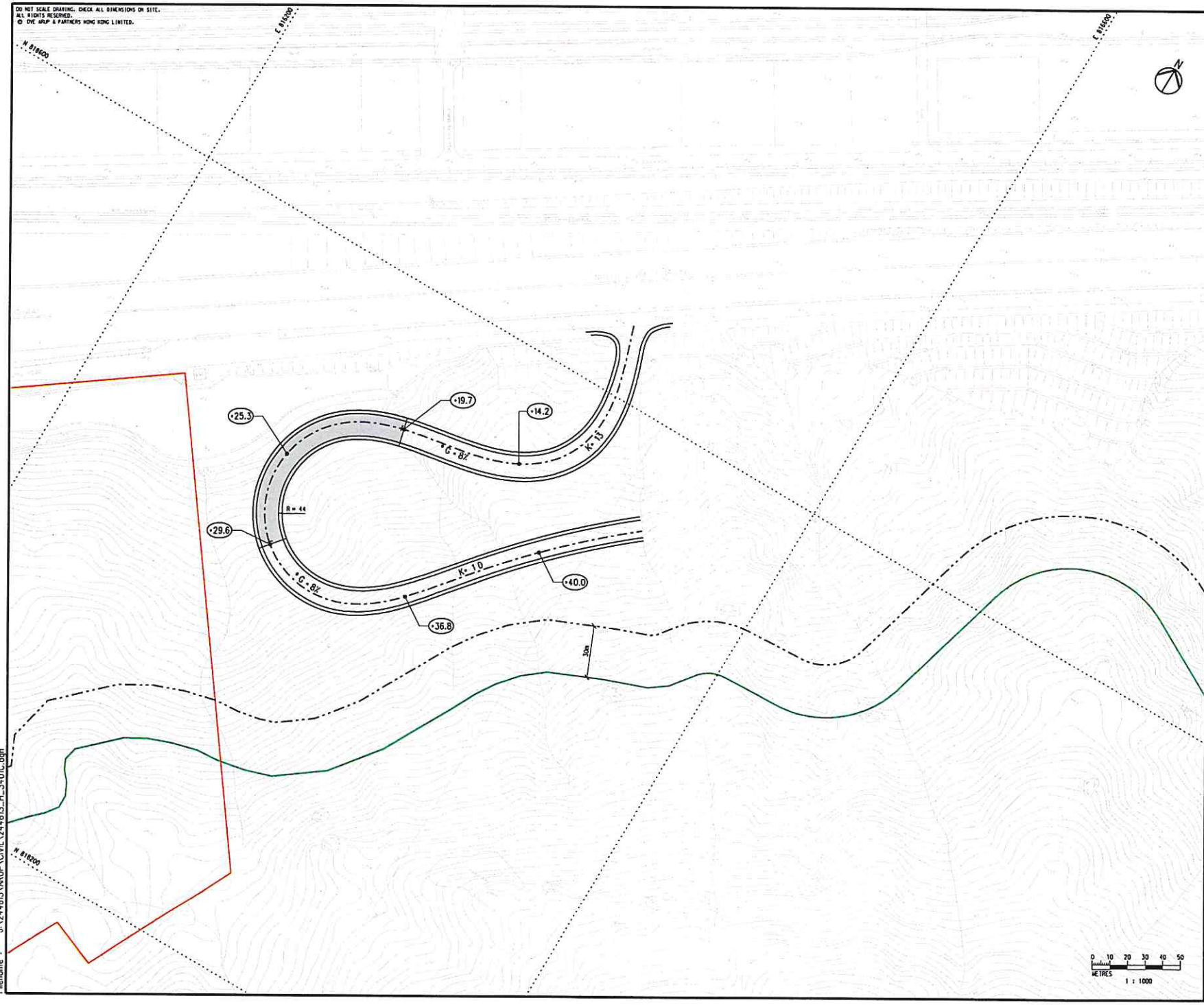

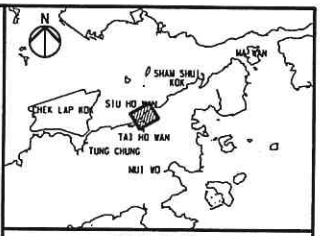

KEY PLAN

LEGEND

- GAZETTED COUNTRY PARK BOUNDARY
- PRIORITY SITES FOR ENCHANCED CONSERVATION
- 30m LINE FROM COUNTRY PARK BOUNDARY
- PROPOSED VIADUCT

0 10 20 30 40 50
METRES
1 : 1000

Rev	Description	By	Date
C	REVISED FINAL TP4	SPN	09/16
B	FINAL TP4	LTM	08/16
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ACCESS TO LANDSIDE DEVELOPMENT

Drawing no. Figure 7.17 Rev. C

Drawn	Date	Checked	Approved
TING	05/16	LFM	KW

Scale 1:1000 @A1

Status PRELIMINARY

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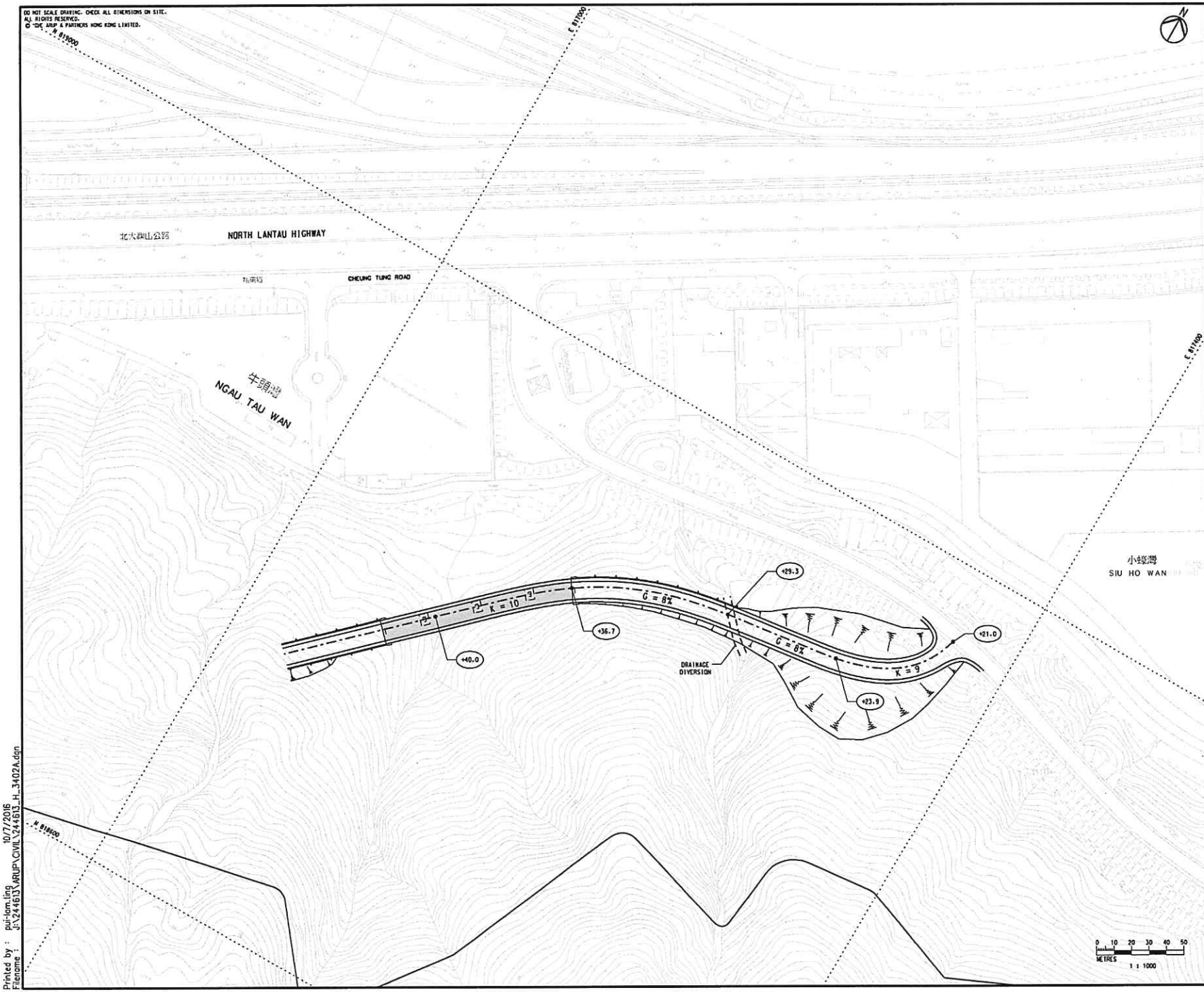

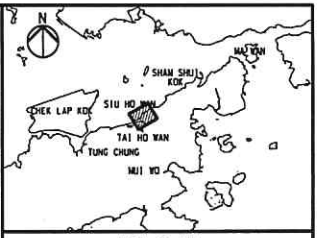

KEY PLAN

LEGEND

- GAZETTED COUNTRY PARK BOUNDARY
- PROPOSED RETAINING WALL
- 30m LINE FROM COUNTRY PARK BOUNDARY
- PROPOSED VIADUCT

Rev	Description	By	Date
A	REVISED FINAL IP4	SPN	09/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ALTERNATIVE ACCESS TO LANDSIDE DEVELOPMENT

Drawing no.	Rev.
Figure 7.18	A

Drawn	Date	Checked	Approved
TING	10/16	LFM	KW

Scale: 1:1000 @A1

Status: PRELIMINARY

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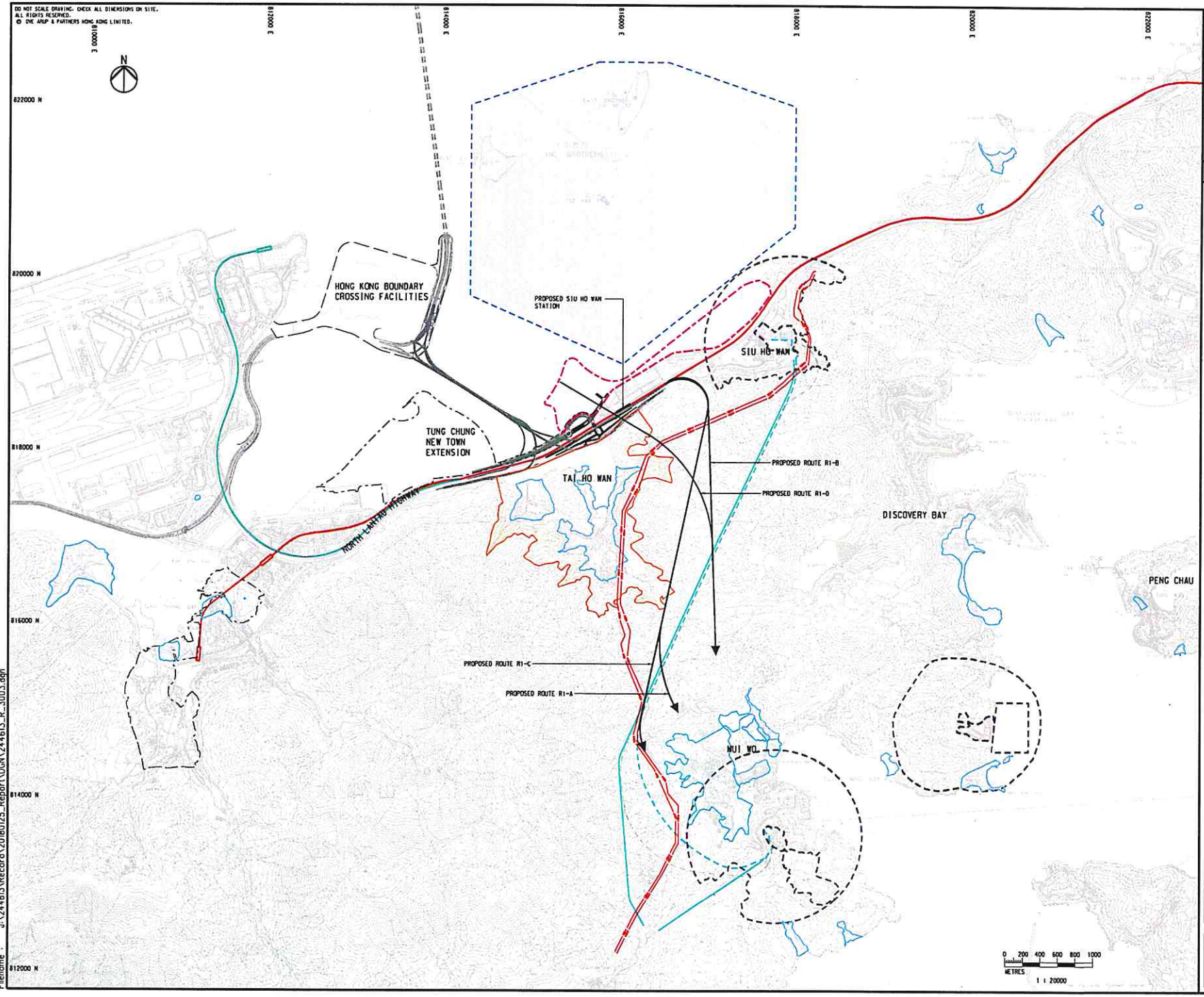
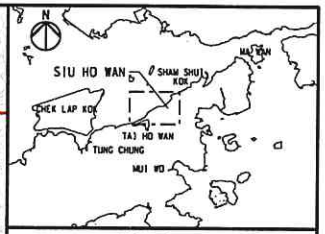
1. FOR NOTES AND LEGEND, REFER TO DWG. NO. XXX/X/XXX/XXX





KEY PLAN

LEGEND:

- PROPOSED RECLAMATION AREA
- THE BROTHERS MARINE PARK
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF ARCHAEOLOGICAL INTEREST
- VILLAGE ENVIRONS
- EXTENT OF ECOLOGICAL CONSTRAINT (INCLUDING FRESHWATER AND MARSHLAND) (REFERENCE FROM FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT - SEPT 2005 - CE49/2002 (DS))
- PROPOSED RAILWAY TUNNEL
- PROPOSED RAILWAY ALIGNMENT FOR POSSIBLE CONNECTION TO ELW (UNDER SEPARATE STUDY)
- AS-BUILT SIU HO WAN / SILVERMINE BAY AQUEDUCT
- PROPOSED WATER TUNNEL
- CLP 132kV OVERHEAD LINE
- EXISTING TUNG CHUNG LINE
- EXISTING AIRPORT EXPRESS LINE

Rev	Description	By	Date
B	SECOND ISSUE	JS	11/17
A	FIRST ISSUE	JS	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

PROPOSED RAILWAY ALIGHNEMNT BETWEEN SIU HO WAN AND SOUTHEAST LANTAU, POSSIBLY VIA MUI WO

Drawing no. Figure 8.1 Rev. B

Drawn	Date	Checked	Approved
AC	12/15	JW	HS

Scale 1:20000 @A1

Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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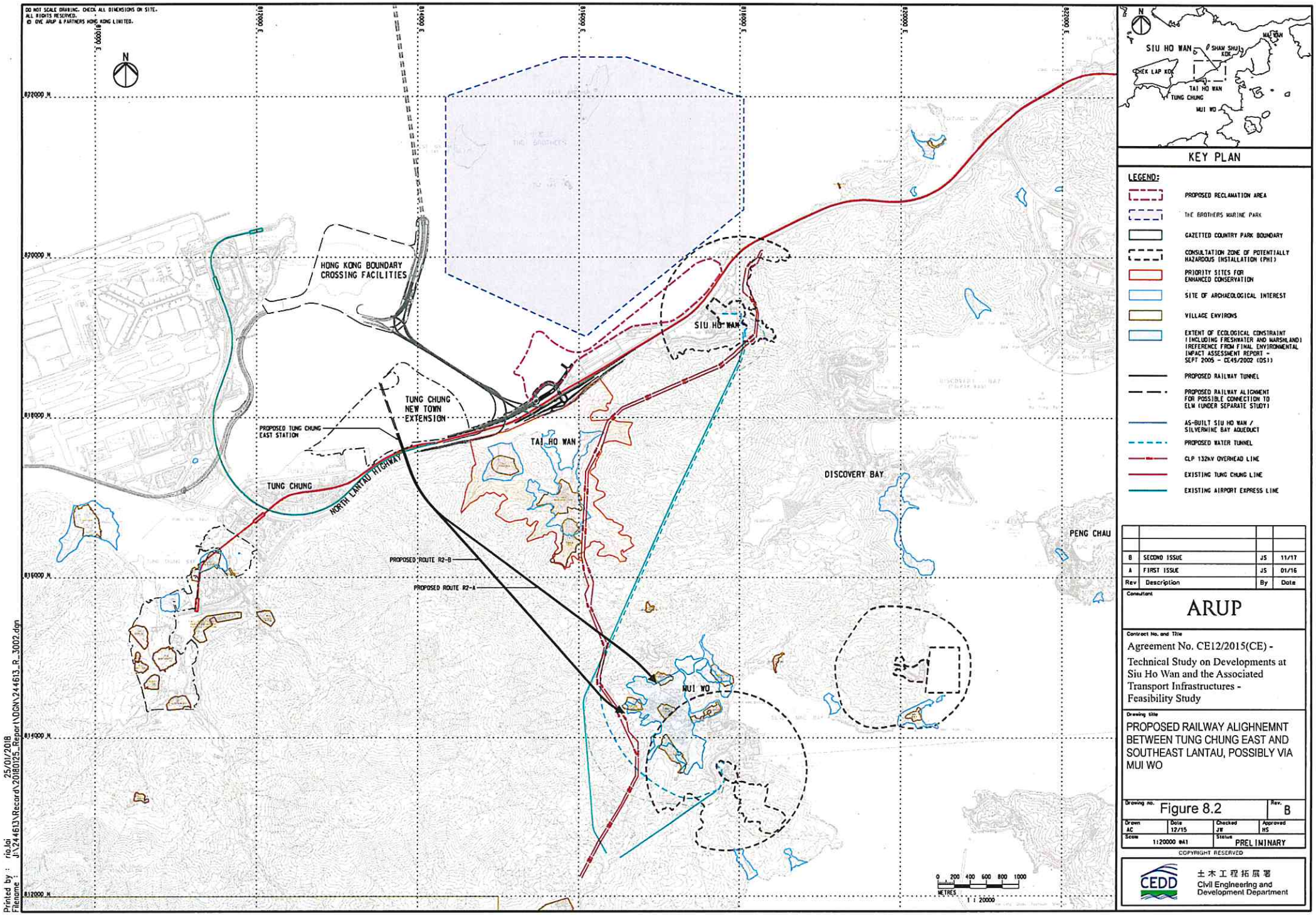

KEY PLAN

LEGEND:

- PROPOSED RECLAMATION AREA
- THE BROTHERS MARINE PARK
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF ARCHAEOLOGICAL INTEREST
- VILLAGE ENVIRONS
- EXTENT OF ECOLOGICAL CONSTRAINT (INCLUDING FRESHWATER AND MARSHLAND) (REFERENCE FROM FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT - SEPT 2005 - CE45/2002 (DS1))
- PROPOSED RAILWAY TUNNEL
- PROPOSED RAILWAY ALIGNMENT FOR POSSIBLE CONNECTION TO ELW (UNDER SEPARATE STUDY)
- AS-BUILT SIU HO WAN / SILVERMINE BAY AQUEDUCT
- PROPOSED WATER TUNNEL
- CLP 132kV OVERHEAD LINE
- EXISTING TUNG CHUNG LINE
- EXISTING AIRPORT EXPRESS LINE

Rev	Description	By	Date
B	SECOND ISSUE	JS	11/17
A	FIRST ISSUE	JS	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

PROPOSED RAILWAY ALIGHNEMNT BETWEEN TUNG CHUNG EAST AND SOUTHEAST LANTAU, POSSIBLY VIA MUI WO

Drawing no. Figure 8.2 Rev. B

Drawn	Date	Checked	Approved
AC	12/15	JW	HS

Scale 1:20000 @A1

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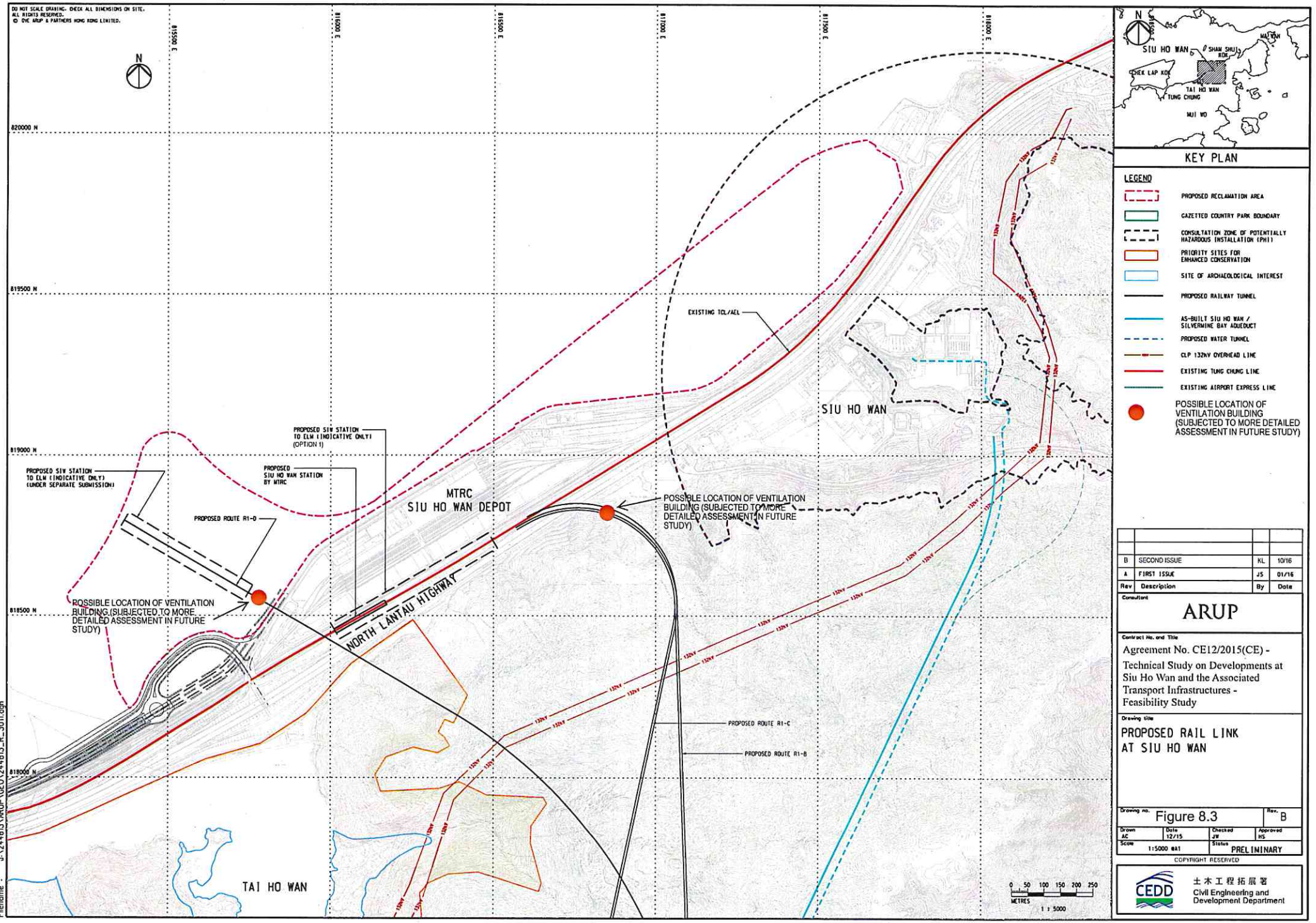

KEY PLAN

LEGEND

- PROPOSED RECLAMATION AREA
- GAZETTED COUNTRY PARK BOUNDARY
- CONSULTATION ZONE OF POTENTIALLY HAZARDOUS INSTALLATION (PHI)
- PRIORITY SITES FOR ENHANCED CONSERVATION
- SITE OF ARCHAEOLOGICAL INTEREST
- PROPOSED RAILWAY TUNNEL
- AS-BUILT SIU HO WAN / SILVERMINE BAY AQUEDUCT
- PROPOSED WATER TUNNEL
- CLP 132kV OVERHEAD LINE
- EXISTING TUNG CHUNG LINE
- EXISTING AIRPORT EXPRESS LINE
- POSSIBLE LOCATION OF VENTILATION BUILDING (SUBJECTED TO MORE DETAILED ASSESSMENT IN FUTURE STUDY)

Rev	Description	By	Date
B	SECOND ISSUE	KL	10/16
A	FIRST ISSUE	JS	01/16

Consultant

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

PROPOSED RAIL LINK AT SIU HO WAN

Drawing no. Figure 8.3 Rev. B

Drawn	Date	Checked	Approved
AC	12/15	JW	HS

Scale 1:5000 @A1

Status PRELIMINARY

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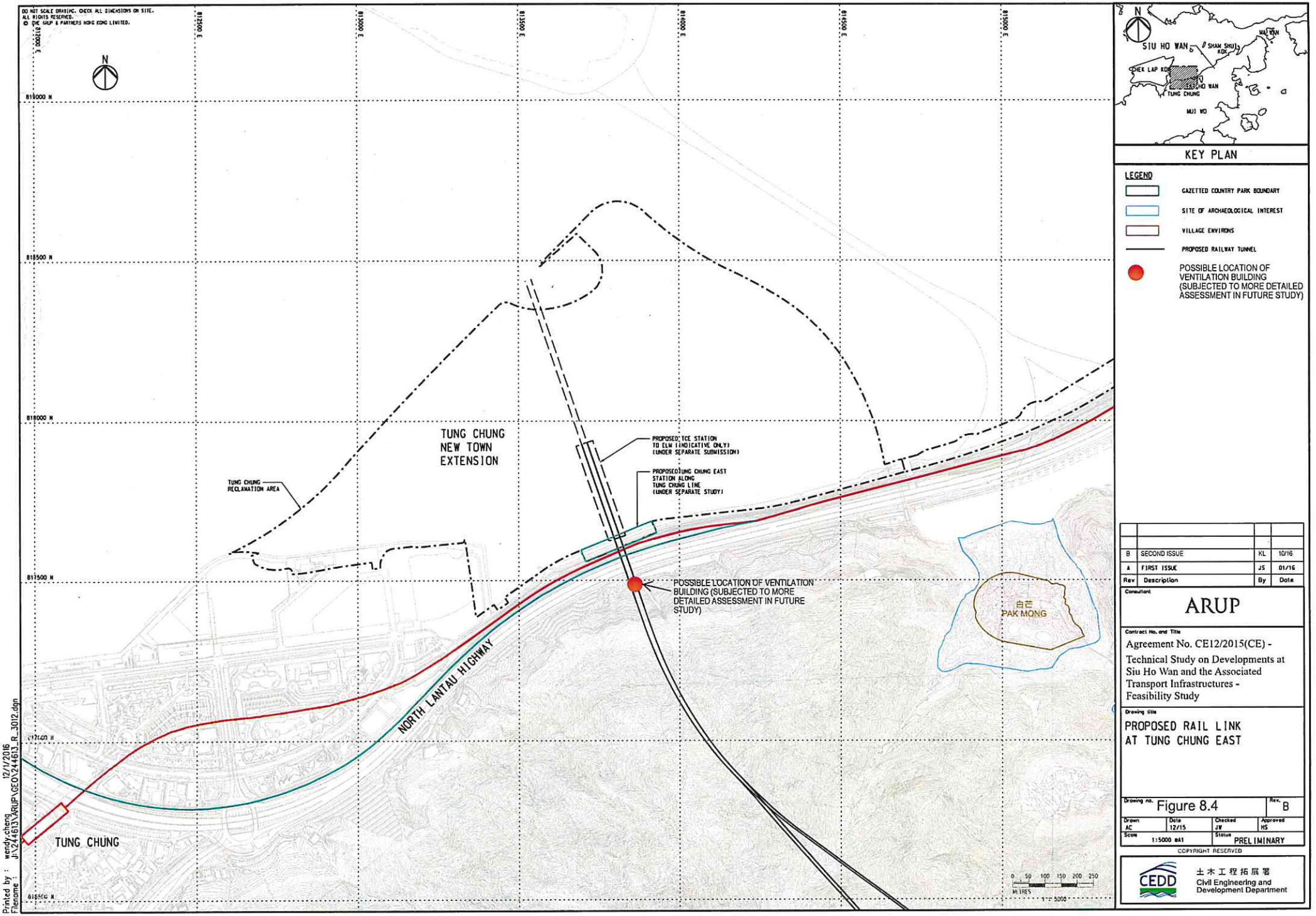
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N
813500 E
814000 E
814500 E
815000 E
819000 N
818500 N
818000 N
817500 N
817000 N
816500 N
TUNG CHUNG NEW TOWN EXTENSION
TUNG CHUNG RECLAMATION AREA
PROPOSED TCE STATION TO ELW (INDICATIVE ONLY) (UNDER SEPARATE SUBMISSION)
PROPOSED TUNG CHUNG EAST STATION ALONG TUNG CHUNG LINE (UNDER SEPARATE STUDY)
POSSIBLE LOCATION OF VENTILATION BUILDING (SUBJECTED TO MORE DETAILED ASSESSMENT IN FUTURE STUDY)
NORTH LANTAU HIGHWAY
TUNG CHUNG
白芒
PAK MONG
0 50 100 150 200 250
METRES
1 : 5000
SIU HO WAN
SHAM SHUI KOK
NGAU YIN
CHEK LAP KOK
HO WAN
TUNG CHUNG
MUI WO
KEY PLAN
LEGEND
GAZETTED COUNTRY PARK BOUNDARY
SITE OF ARCHAEOLOGICAL INTEREST
VILLAGE ENVIRONS
PROPOSED RAILWAY TUNNEL
POSSIBLE LOCATION OF VENTILATION BUILDING (SUBJECTED TO MORE DETAILED ASSESSMENT IN FUTURE STUDY)
B SECOND ISSUE KL 10/16
A FIRST ISSUE JS 01/16
Rev Description By Date
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Contract No. and Title
Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study
Drawing title
PROPOSED RAIL LINK AT TUNG CHUNG EAST
Drawing no. Figure 8.4
Rev. B
Drawn AC
Date 12/15
Checked JW
Approved HS
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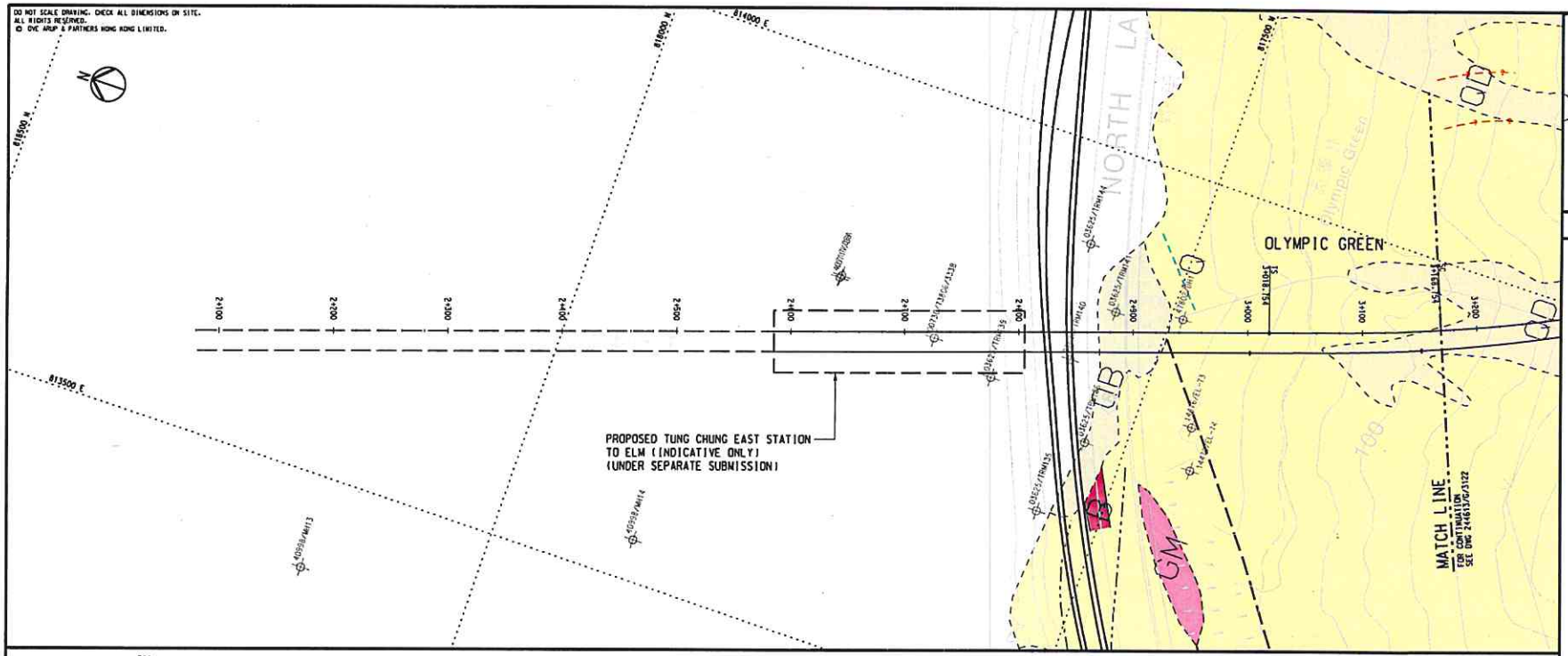

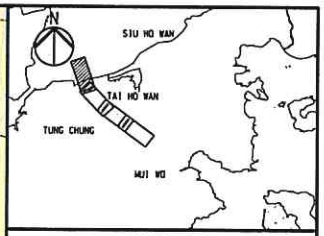

KEY PLAN

NOTES

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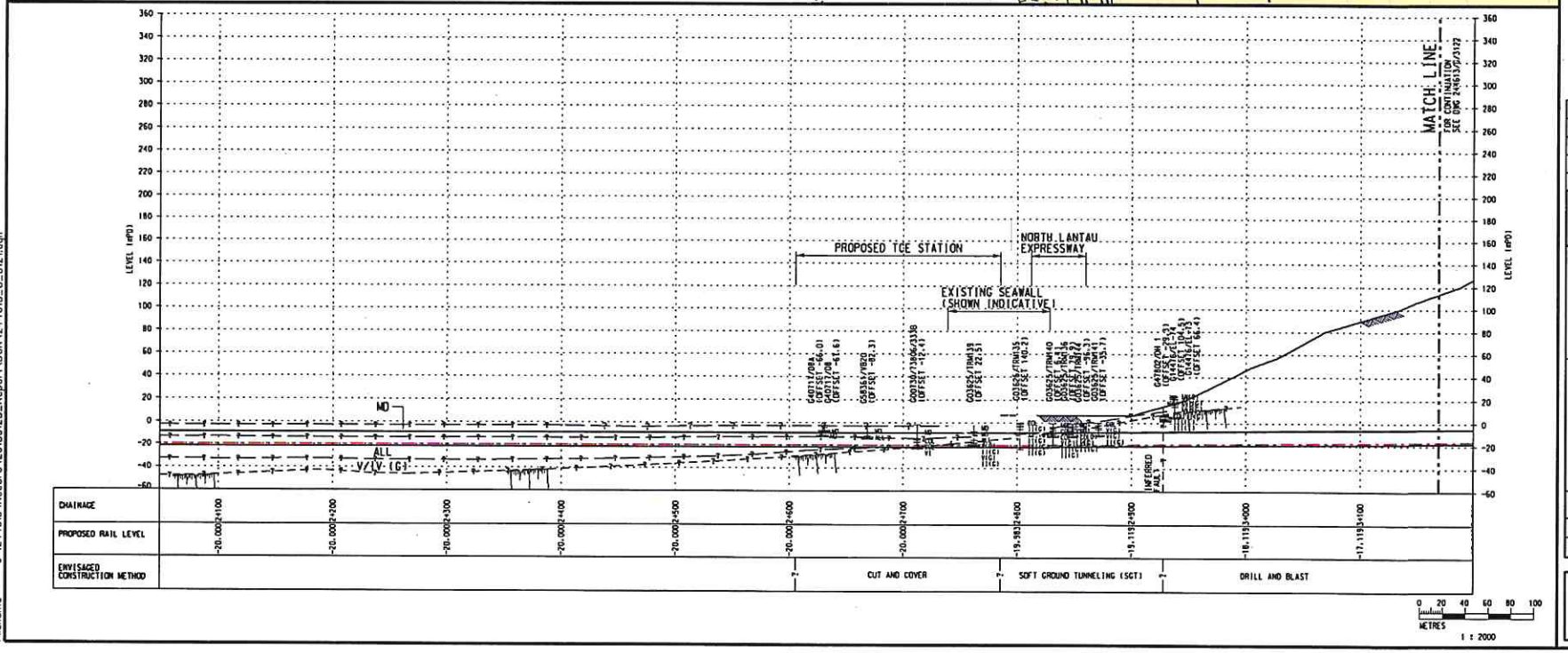

Rev	Description	By	Date
B	CHAINAGE UPDATED	JW	07/16
A	FIRST ISSUE	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION RAIL TUNNEL (ROUTE R2-A) (SHEET 1 OF 4)

Drawing no.	Rev.
Figure 8.5	B

Drawn	Date	Checked	Approved
MYC	12/15	HC	HS

Scale: 1:2000 @A1

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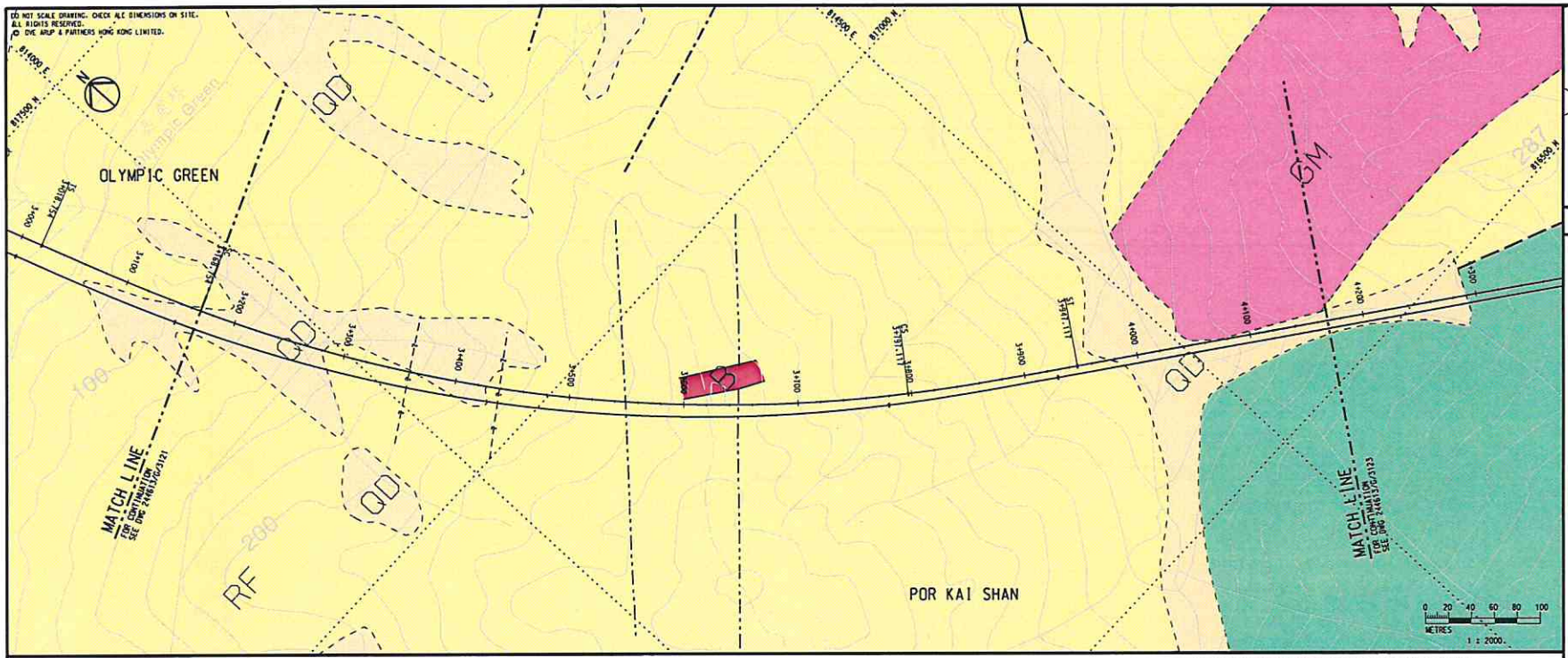

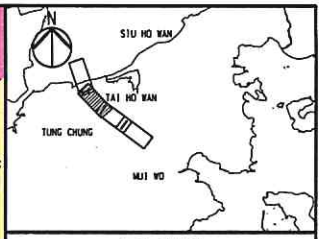

KEY PLAN

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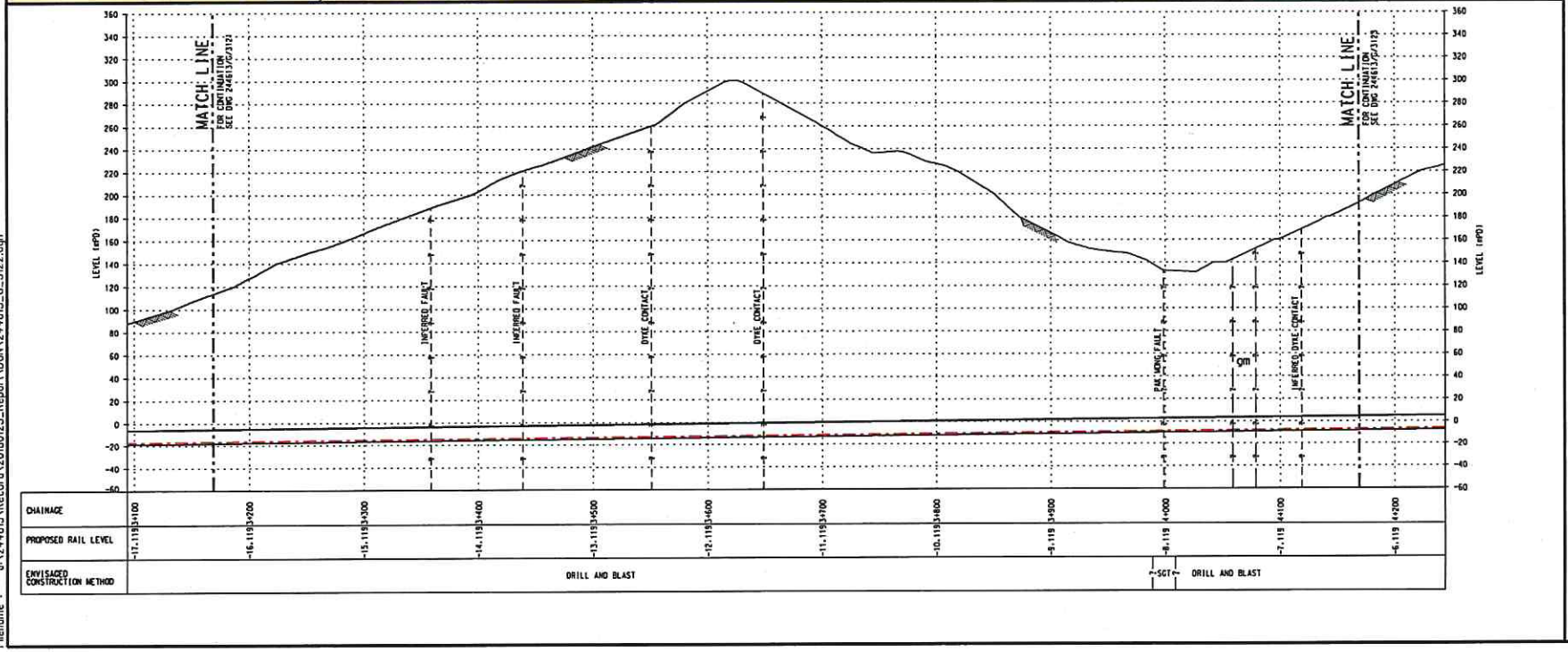

Rev	Description	By	Date
B	CHANGE UPDATED	JW	07/16
A	FIRST ISSUE	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION RAIL TUNNEL (ROUTE R2-A) (SHEET 2 OF 4)

Drawing no. Figure 8.6 Rev. B

Drawn	Date	Checked	Approved
MTC	12/15	HC	HS

Scale 1:2000 @A1 Status PRELIMINARY

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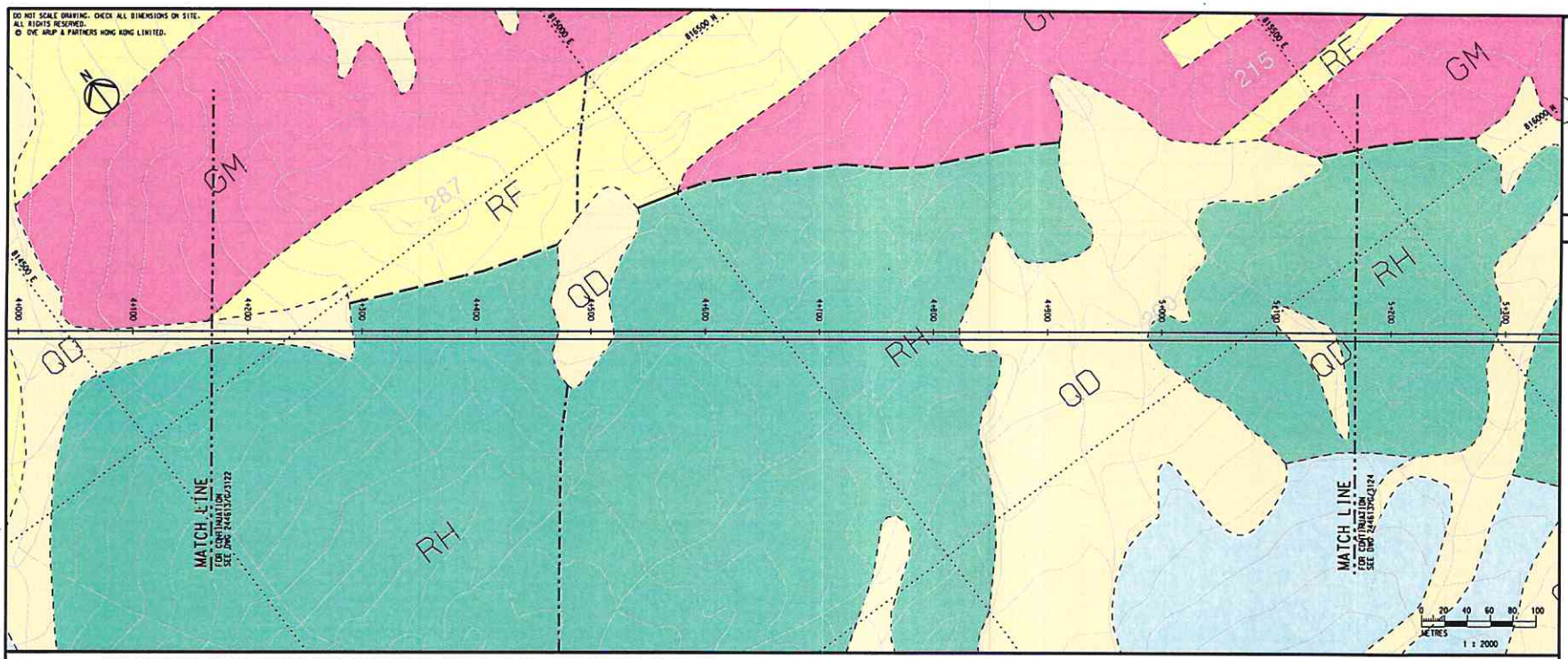

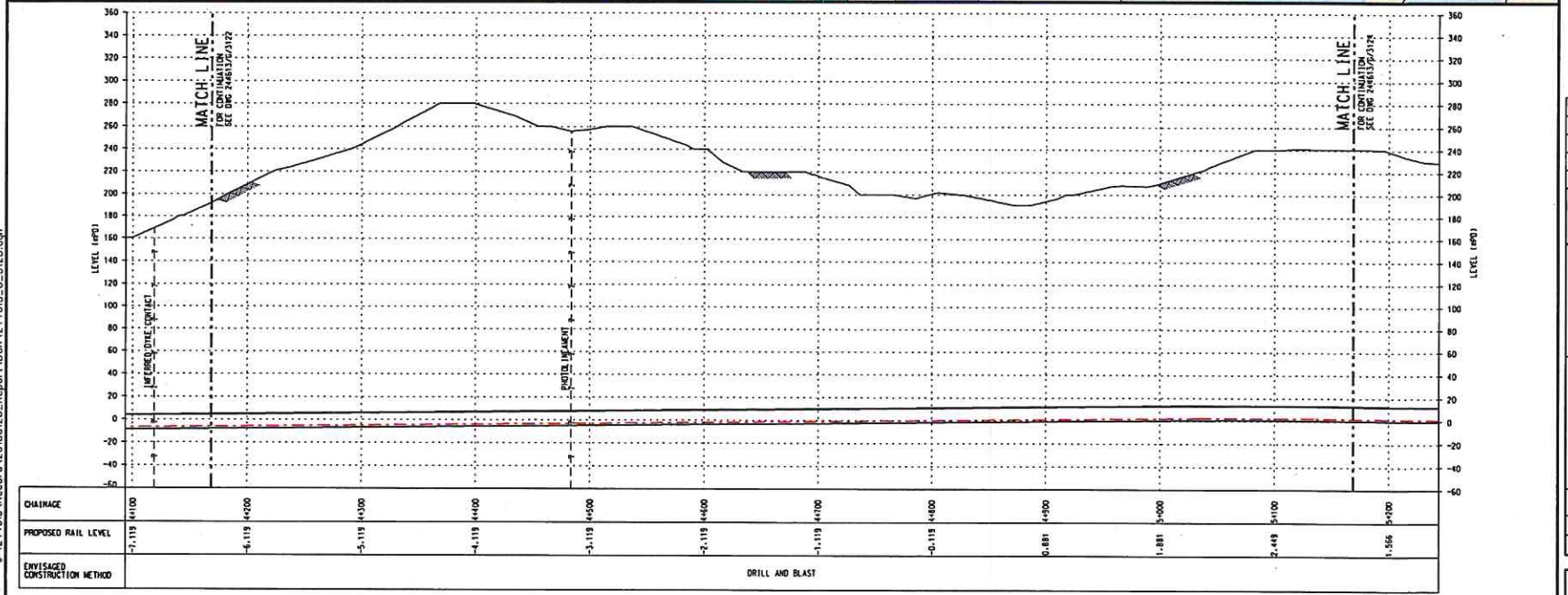

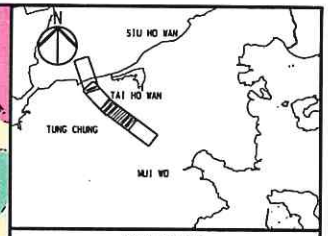

KEY PLAN

NOTES

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/G/3100.

Rev	Description	By	Date
B	CHAINAGE UPDATED	JW	07/16
A	FIRST ISSUE	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION RAIL TUNNEL (ROUTE R2-A) (SHEET 3 OF 4)

Drawing no. Figure 8.7 Rev. B

Drawn	Date	Checked	Approved
MYC	12/15	HC	NS

Scale 1:2000 @A1 Status PRELIMINARY

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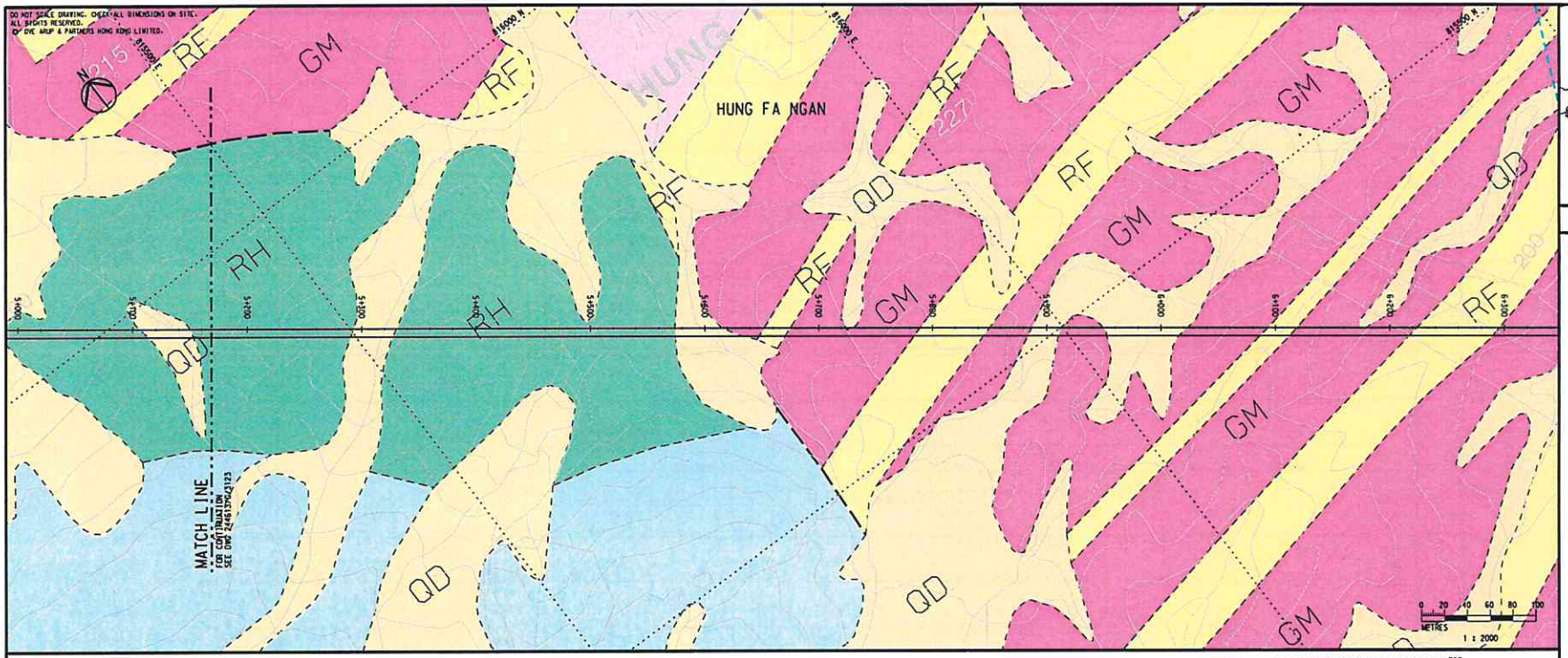

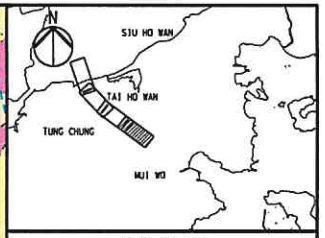

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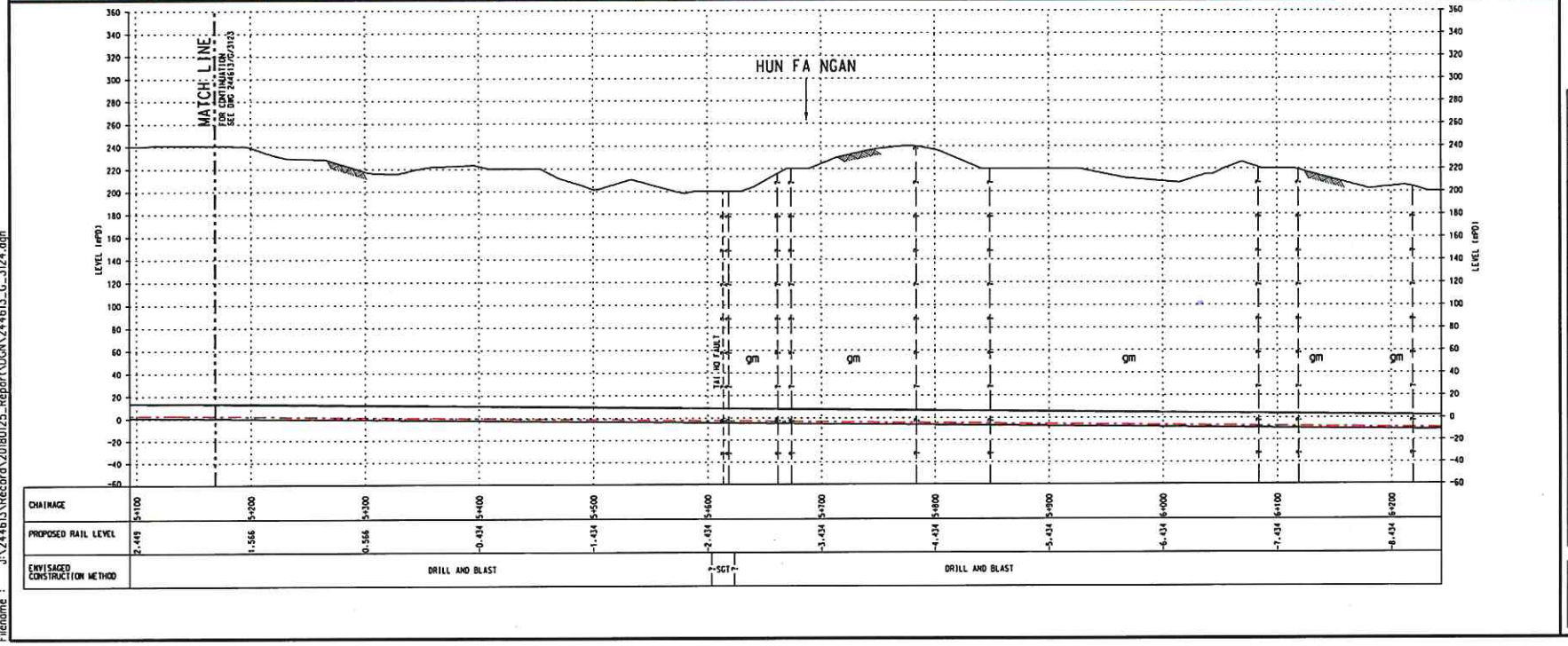

Rev	Description	By	Date
B	CHAINAGE UPDATED	JW	01/16
A	FIRST ISSUE	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION RAIL TUNNEL (ROUTE R2-A) (SHEET 4 OF 4)

Drawing no.	Rev.
Figure 8.8	B

Drawn	Date	Checked	Approved
MYC	12/15	HC	HS

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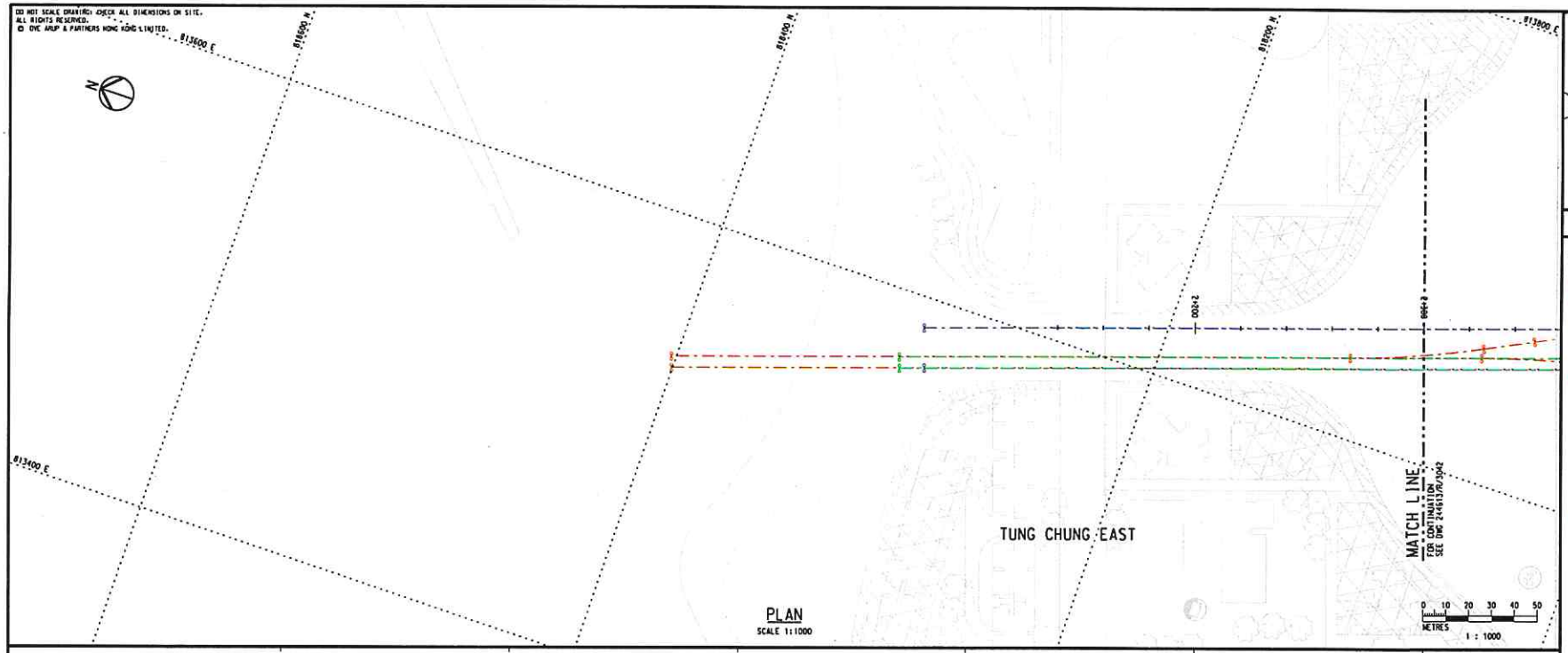

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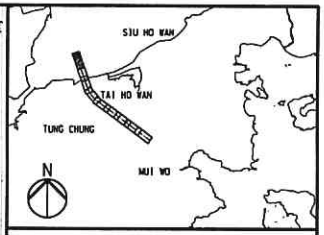
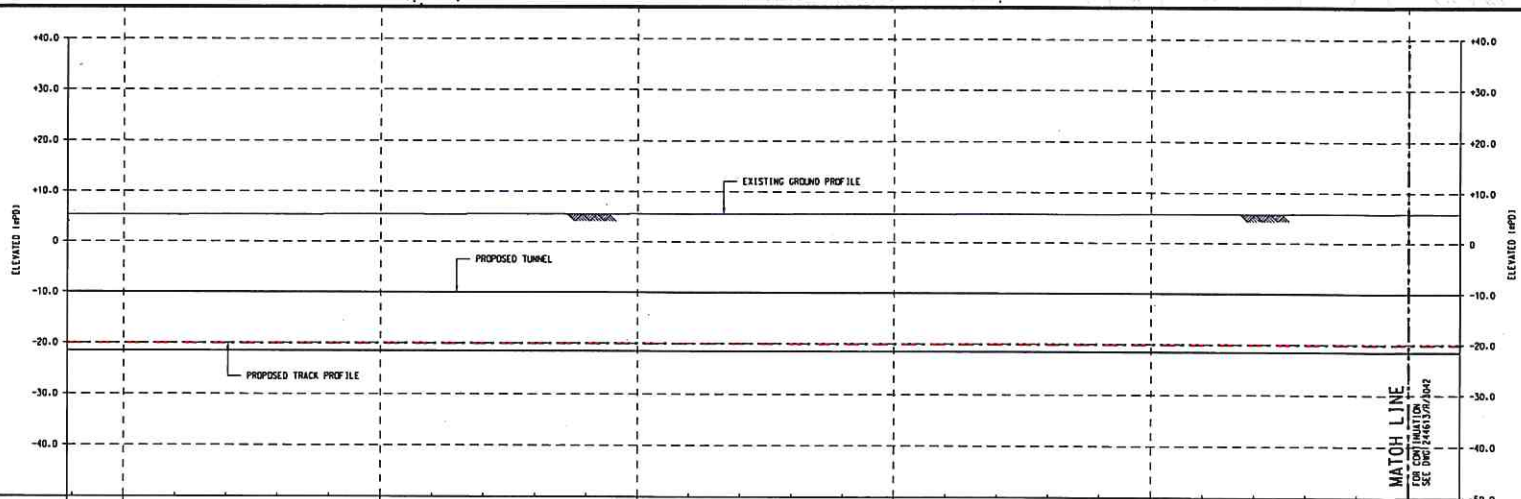


KEY PLAN

LEGEND

- PROPOSED PLATFORM AND TRACKS FOR TCE (ELM) STATION OPTION 1
- PROPOSED PLATFORM AND TRACKS FOR TCE (ELM) STATION OPTION 2
- PROPOSED PLATFORM AND TRACKS FOR TCE (ELM) STATION OPTION 3
- PROPOSED ALIGNMENT FOR ALL OPTIONS
- PROPOSED ROAD LINK (ROUTE 3A, 3B, 4A, 4B AND 4C)
- PLANNED WATER TUNNEL
- EXISTING WATER TUNNEL



ELEVATION
SCALE 1:1000 (HORI.)
1:500 (VERT.)

CHAINAGE	1+800	1+850	1+900	1+950	2+000	2+050	2+100	2+150	2+200	2+250	2+300
EXISTING GROUND LEVEL	5.3	5.4	5.4	5.5	5.5	5.5	5.6	5.6	5.7	5.7	5.8
PROPOSED RAIL LEVEL	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0	-20.0

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

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Contract No. and Title
Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 1 OF 9)

Drawing no. Figure 8.9 Rev. A

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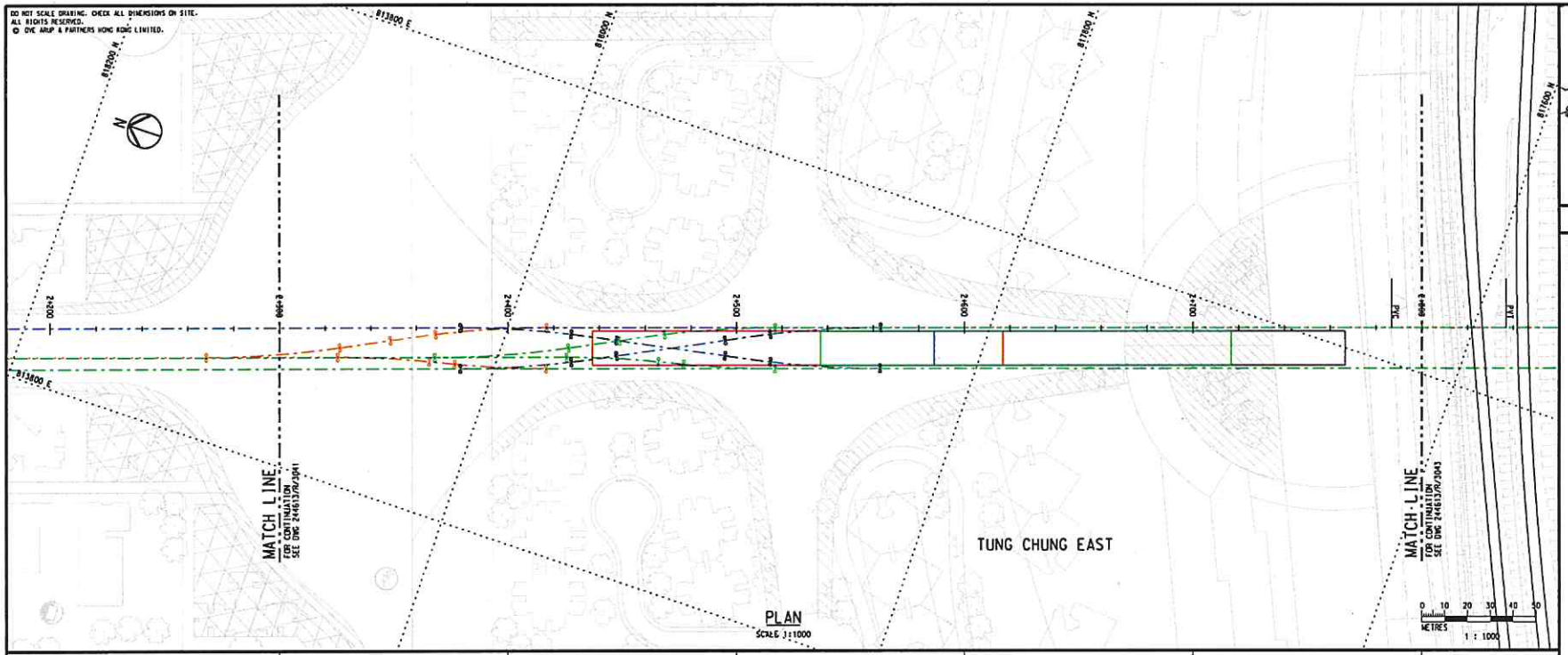

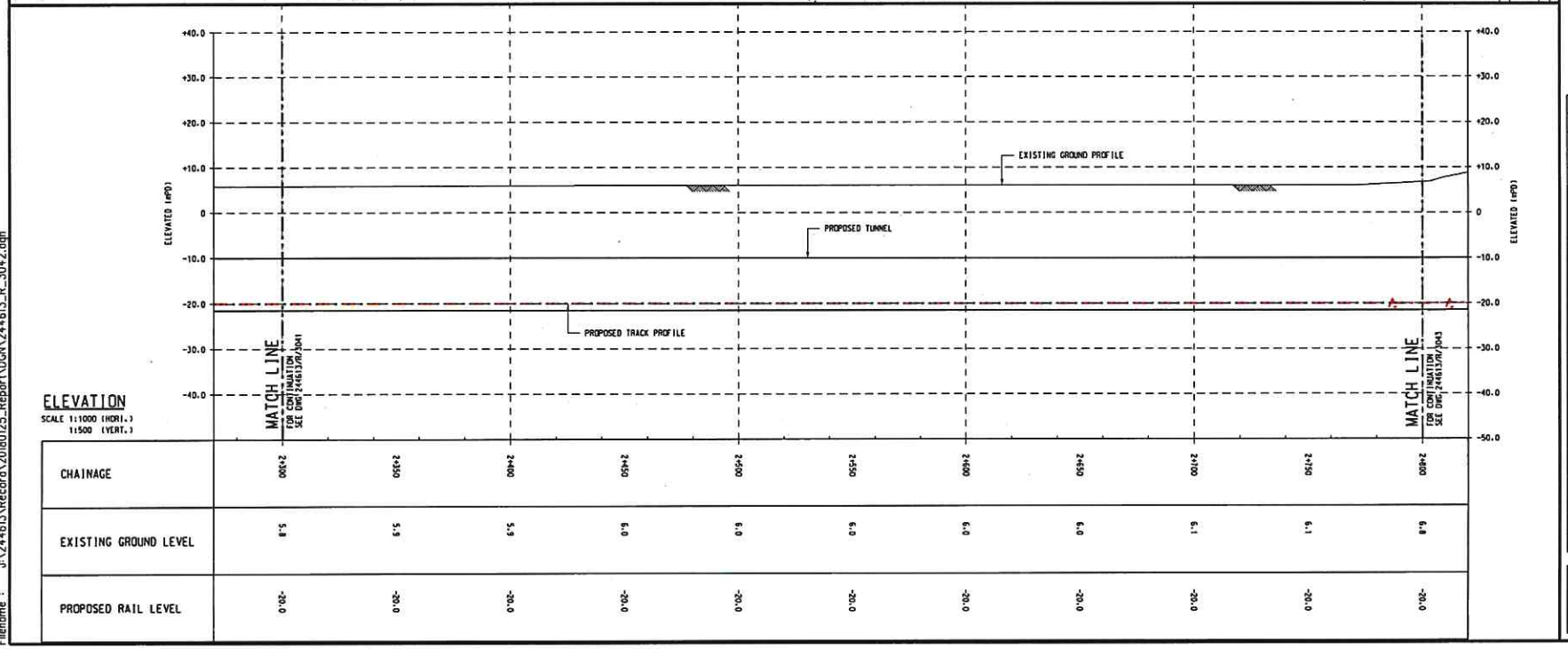

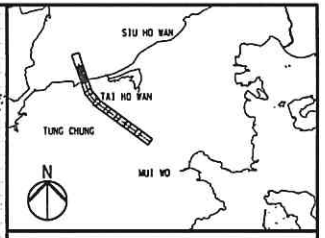

KEY PLAN

NOTE

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/R/3041.

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

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Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 2 OF 9)

Drawing no.	Rev.
Figure 8.10	A

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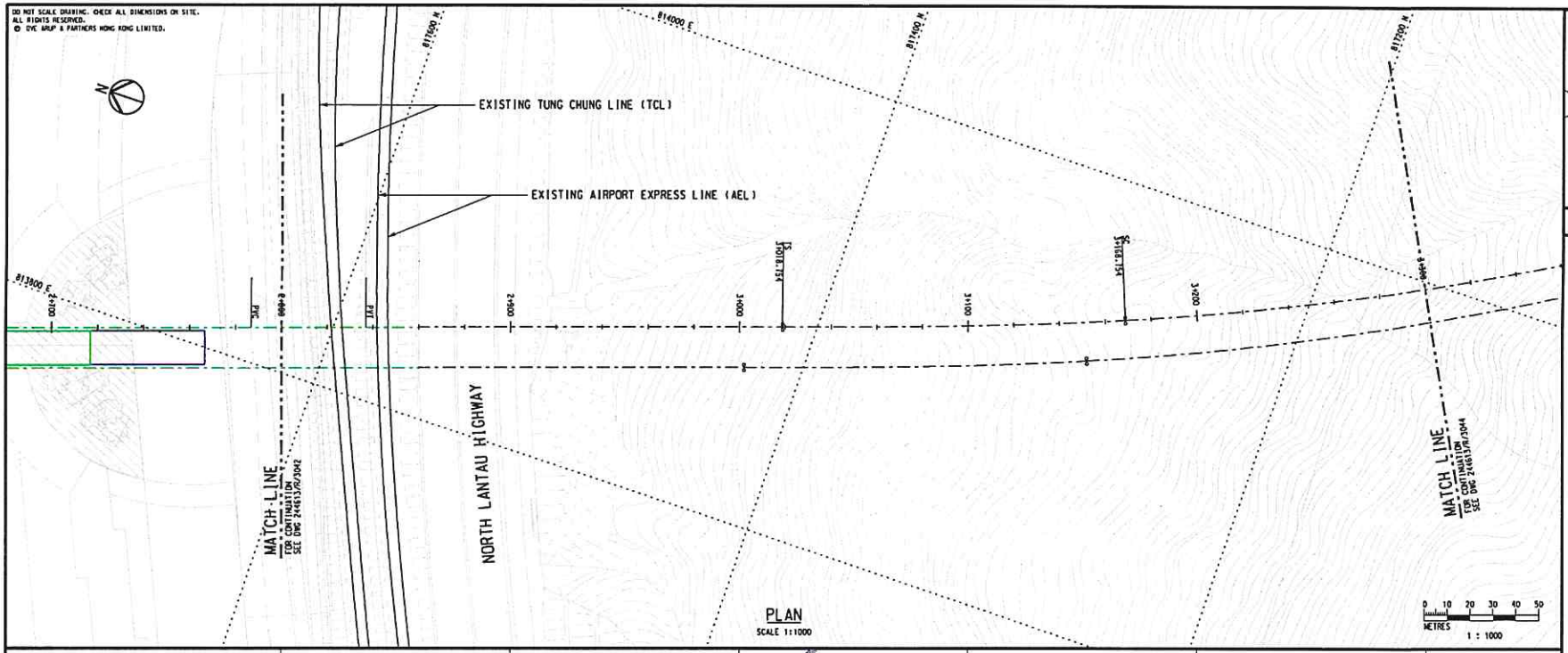

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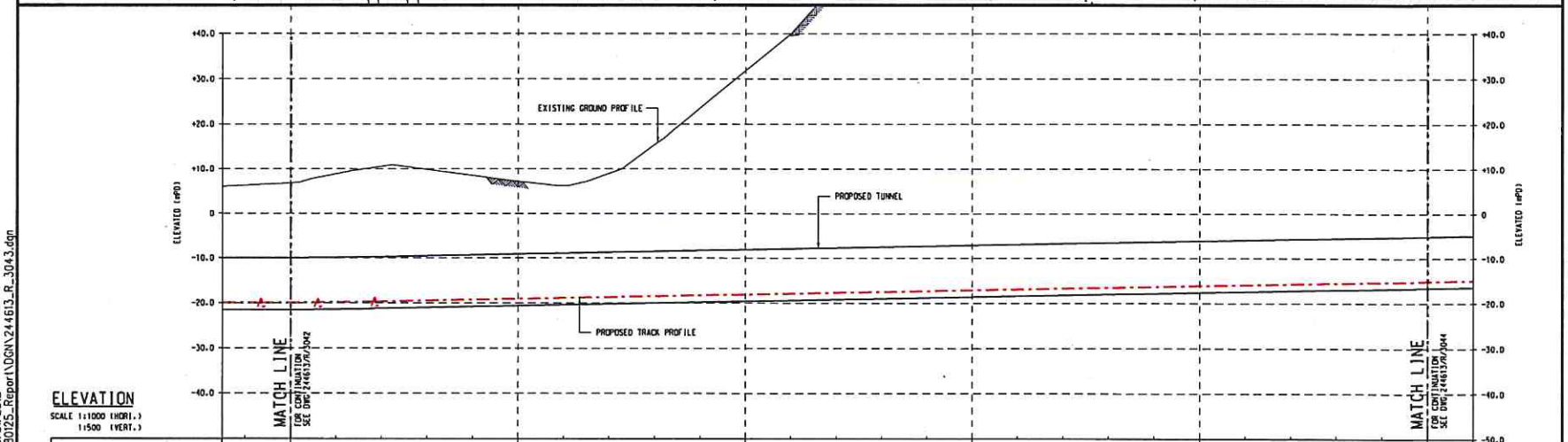
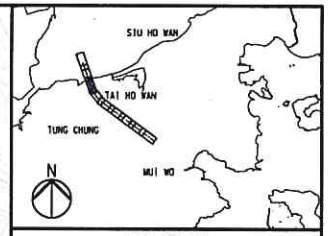


ELEVATION
SCALE 1:1000 (HORI.)
1:500 (VERT.)

CHAINAGE	2+400	2+450	2+500	2+550	3+000	3+050	3+100	3+150	3+200	3+250	3+300
EXISTING GROUND LEVEL	9.8	10.5	7.2	11.6	31.8	58.2	81.8	104.6	116.3	135.8	151.2
PROPOSED RAIL LEVEL	-20.0	-19.6	-19.1	-18.6	-18.1	-17.6	-17.1	-16.6	-16.1	-15.6	-15.1



KEY PLAN

NOTE
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Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 3 OF 9)

Drawing no. Figure 8.11 Rev. A

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Scale 1:1000 @A1
Status PRELIMINARY

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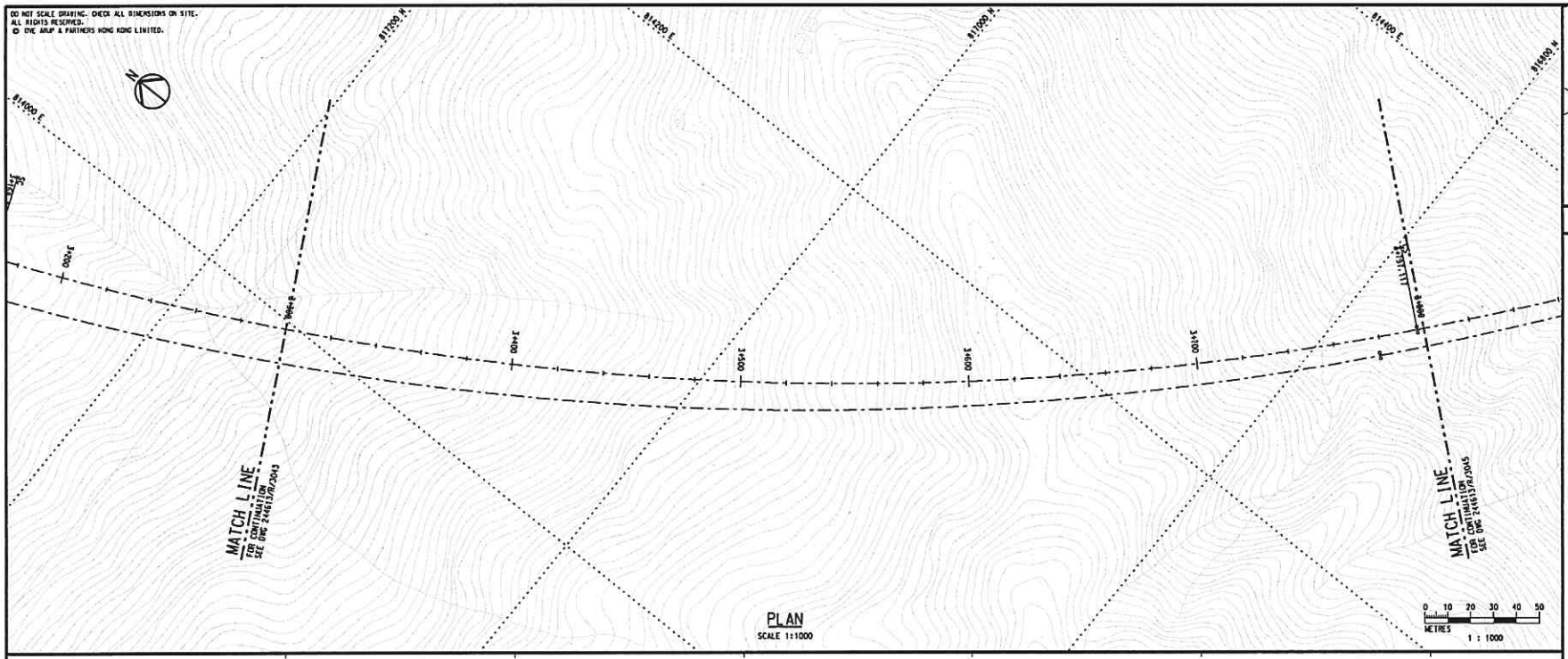

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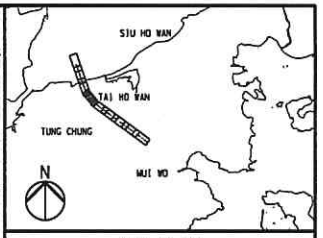

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NOTE

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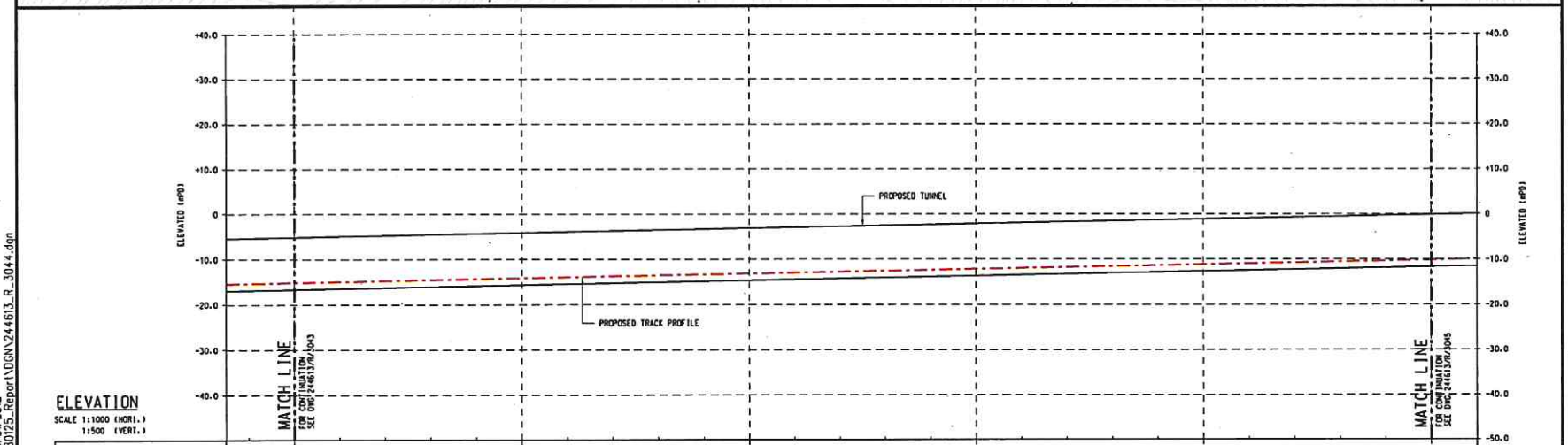

ELEVATION
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1:500 (VERT.)

CHAINAGE	3+300	3+350	3+400	3+450	3+500	3+550	3+600	3+650	3+700	3+750	3+800
EXISTING GROUND LEVEL	151.2	114.2	154.9	217.2	237.5	259.8	286.8	231.8	261.9	234.1	224.2
PROPOSED RAIL LEVEL	-15.1	-14.6	-14.1	-13.6	-13.1	-12.6	-12.1	-11.6	-11.1	-10.6	-10.1

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

Consultant
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Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 1 OF 4)

Drawing no.	Rev.
Figure 8.12	A

Drawn	Date	Checked	Approved
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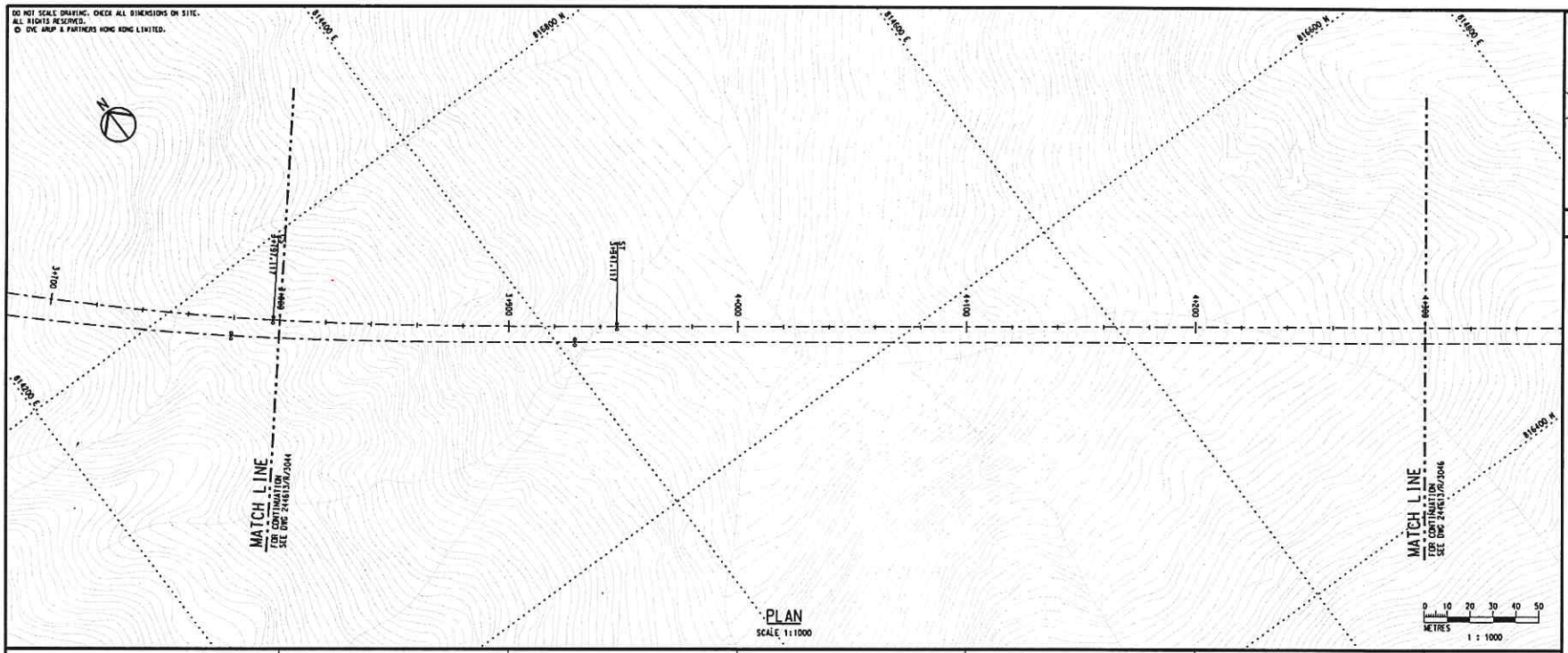

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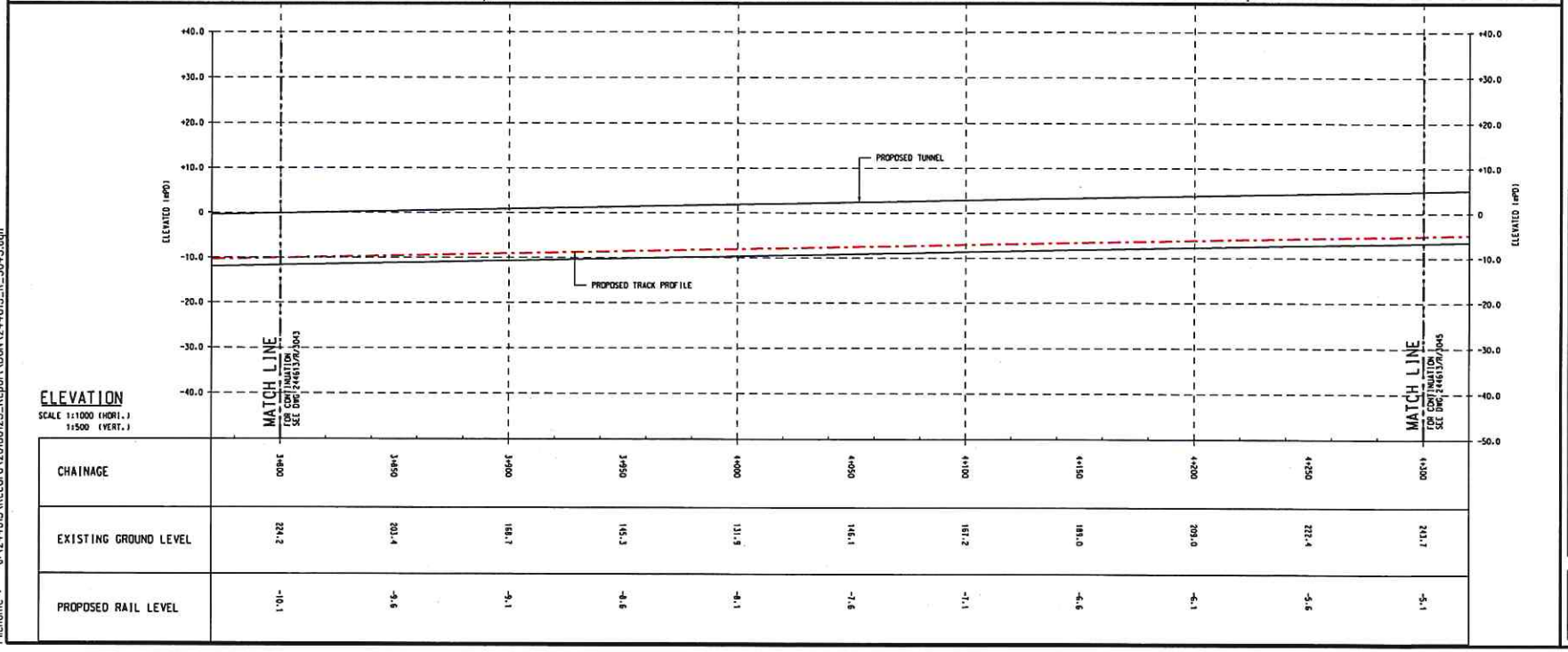

ELEVATION
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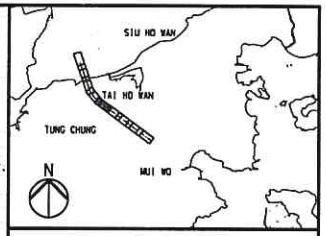
1:500 (VERT.)

CHAINAGE	3+800	3+850	3+900	3+950	4+000	4+050	4+100	4+150	4+200	4+250	4+300
EXISTING GROUND LEVEL	+22.2	+20.4	+18.7	+15.3	+13.5	+14.1	+15.2	+18.0	+20.0	+22.4	+24.1
PROPOSED RAIL LEVEL	-10.1	-9.6	-9.1	-9.6	-8.1	-7.6	-7.1	-9.6	-9.1	-9.6	-9.1



KEY PLAN

NOTE
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Rev	Description	By	Date
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Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 5 OF 9)

Drawing no. Figure 8.13 Rev. A

Drawn	Date	Checked	Approved
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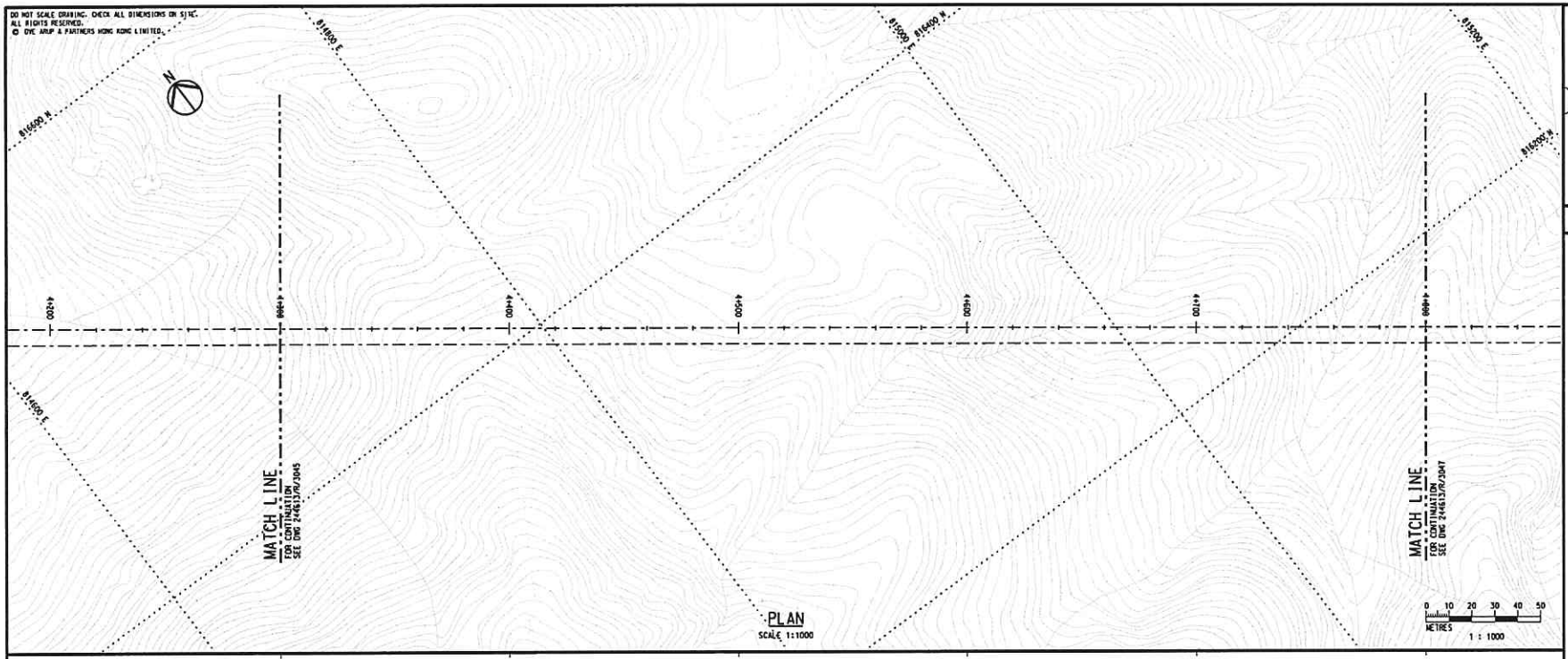

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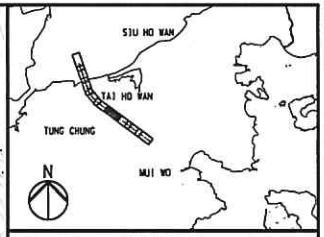

KEY PLAN

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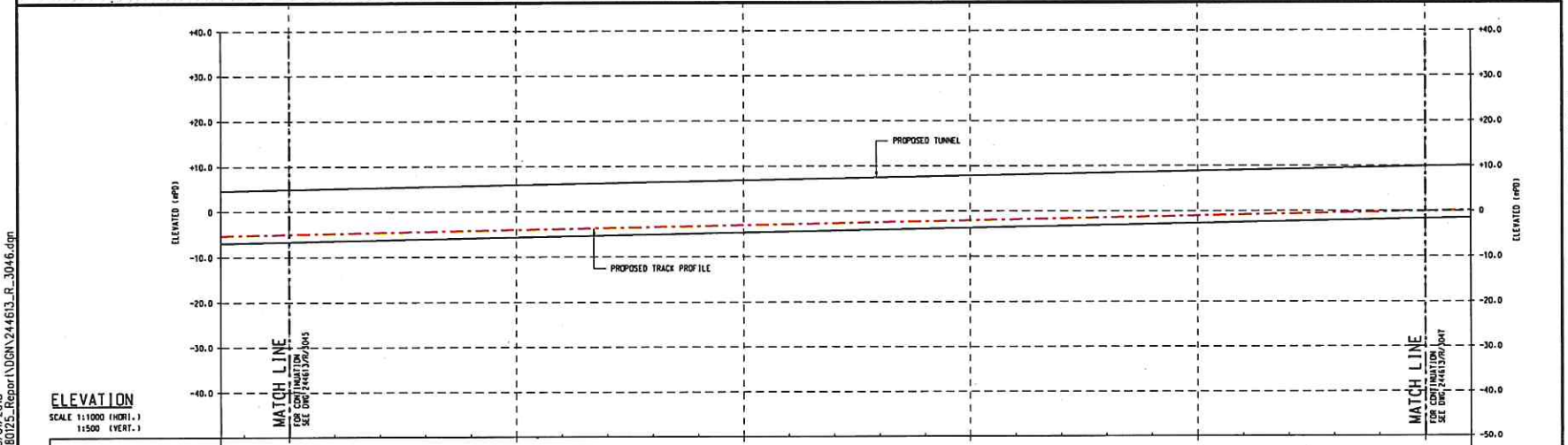

ELEVATION
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1:500 (VERT.)

CHAINAGE	+600	+550	+500	+450	+400	+350	+300	+250	+200	+150	+100
EXISTING GROUND LEVEL	243.7	210.0	211.8	250.5	250.0	232.2	242.3	212.2	214.3	194.0	200.0
PROPOSED RAIL LEVEL	-5.1	-4.6	-4.1	-3.6	-3.1	-2.6	-2.1	-1.6	-1.1	-0.6	-0.1

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

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Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 6 OF 9)

Drawing no.	Figure 8.14	Rev.	A
Drawn	Date	Checked	Approved
MYC	02/16	MS	HS
Scale	1:1000 @A1	Status	PRELIMINARY

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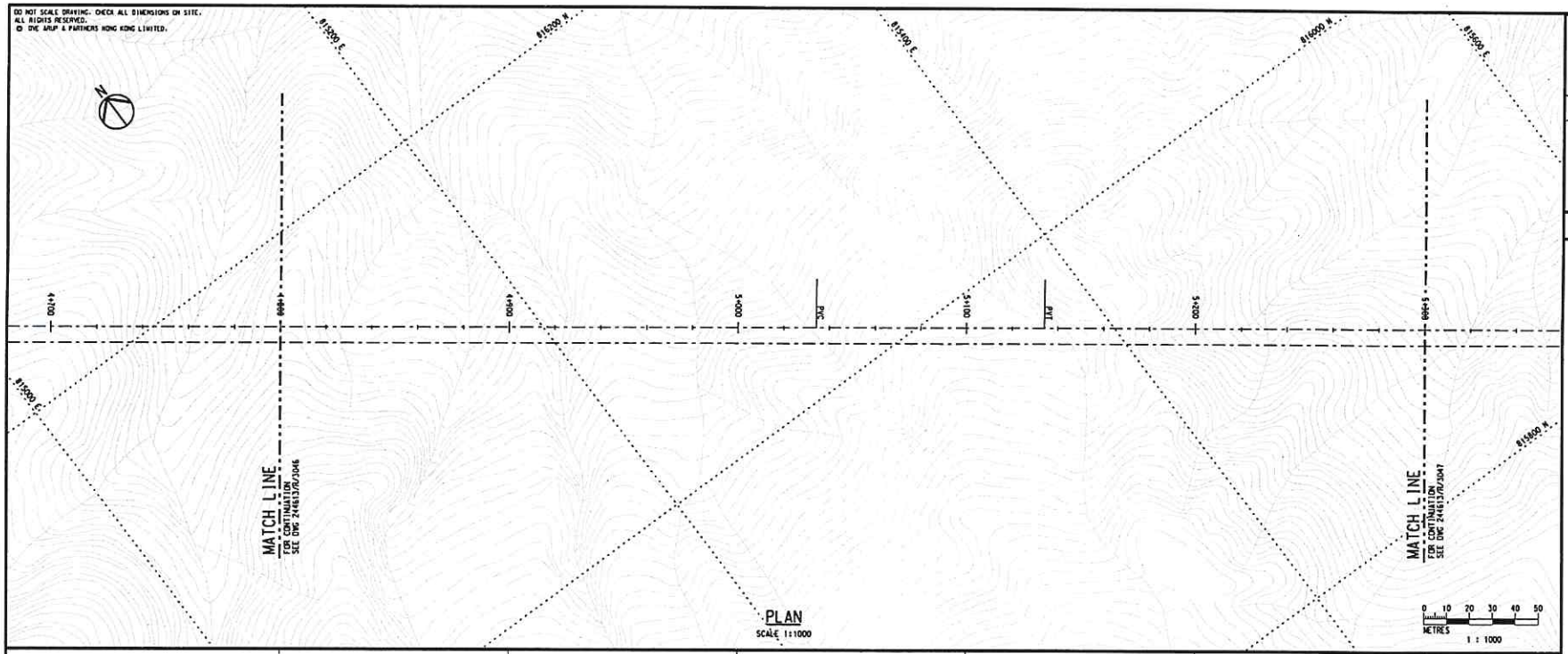

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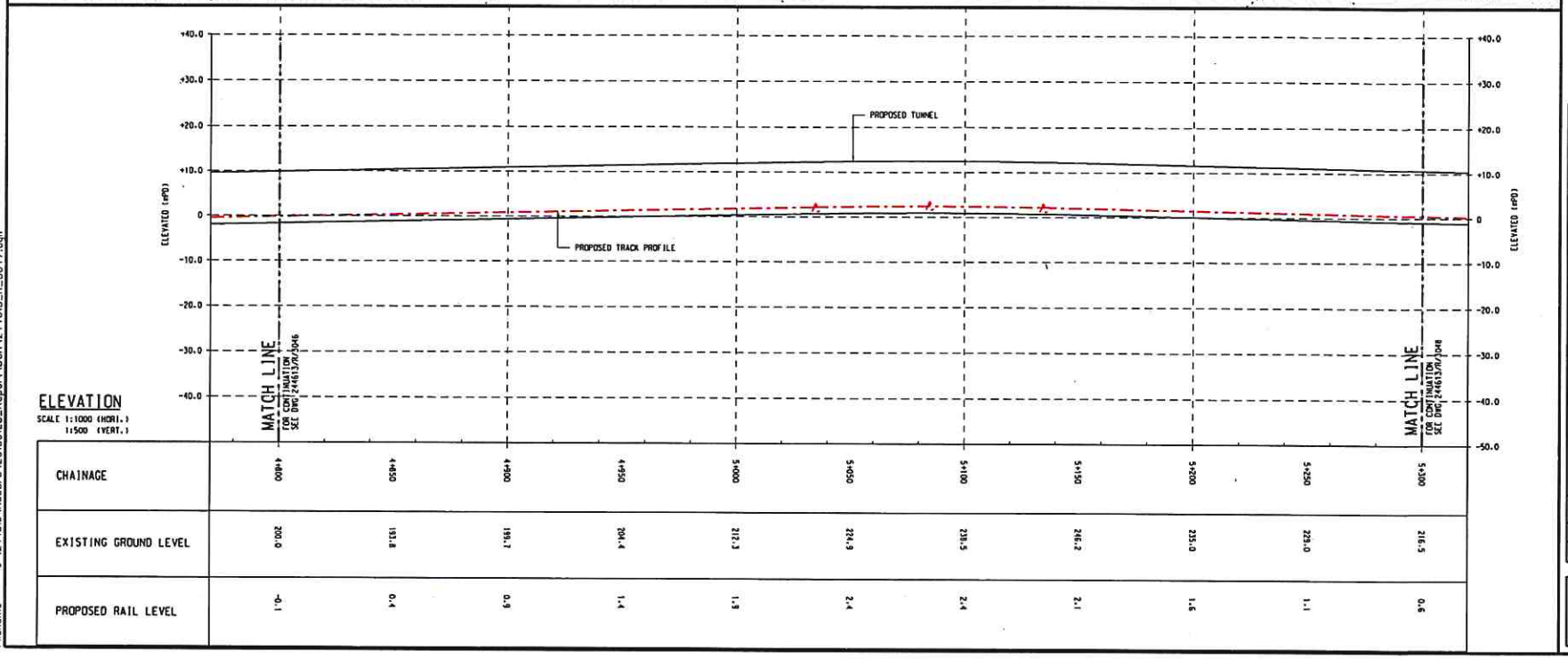

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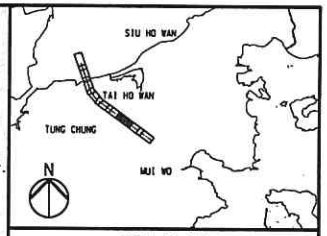
1:500 (VERT.)

CHAINAGE	4+800	4+850	4+900	4+950	5+000	5+050	5+100	5+150	5+200	5+250	5+300
EXISTING GROUND LEVEL	20.0	19.8	19.7	20.4	21.3	22.9	23.5	24.2	23.0	22.8	21.5
PROPOSED RAIL LEVEL	-0.1	0.4	0.9	1.4	1.8	2.4	2.4	2.1	1.6	1.1	0.6



KEY PLAN

NOTE
1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/R/3041.

Rev	Description	By	Date
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Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 7 OF 9)

Drawing no. Figure 8.15 Rev. A

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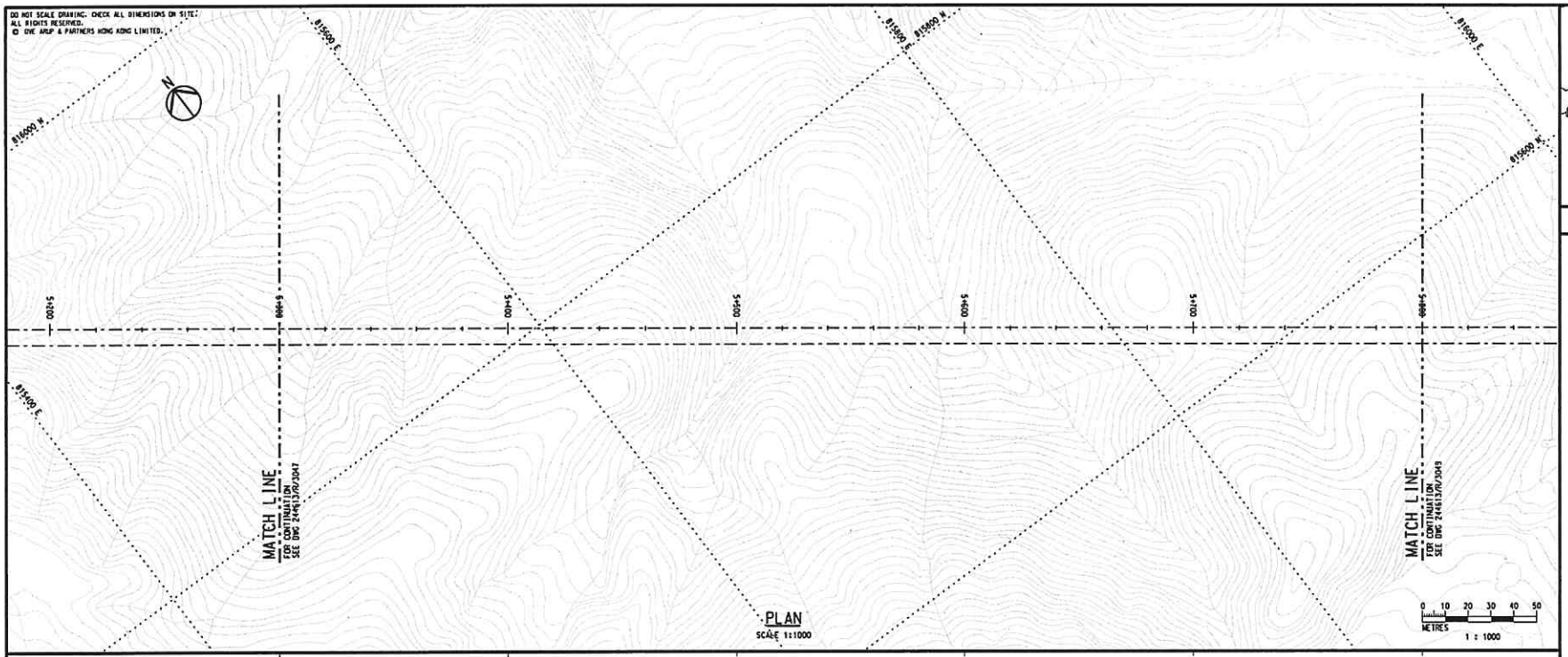

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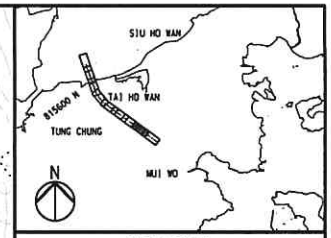

KEY PLAN

NOTE

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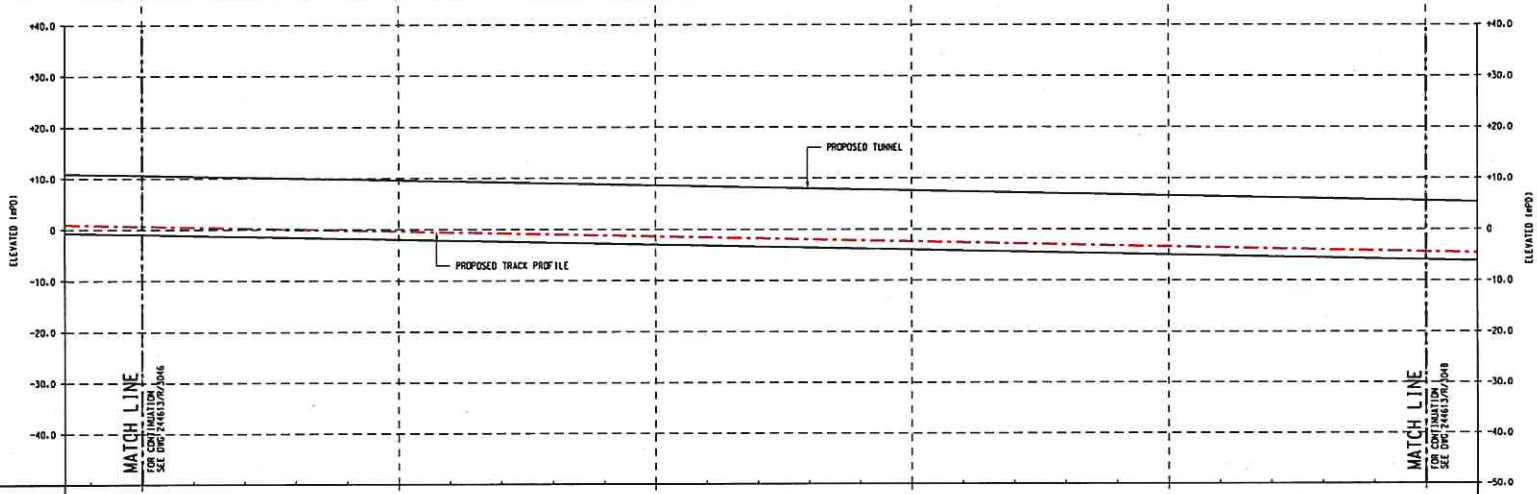

ELEVATION
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1:500 (VERT.)

CHAINAGE	5+200	5+250	5+300	5+350	5+400	5+450	5+500	5+550	5+600	5+650	5+700	5+750	5+800
EXISTING GROUND LEVEL	215.5	215.9	222.8	228.0	200.0	206.5	151.6	220.1	228.8	233.6	238.7		
PROPOSED RAIL LEVEL	0.6	0.1	-0.4	-0.9	-1.4	-1.9	-2.4	-2.9	-3.4	-3.9	-4.4		

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

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Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 8 OF 9)

Drawing no. Figure 8.16 | Rev. A

Drawn	Date	Checked	Approved
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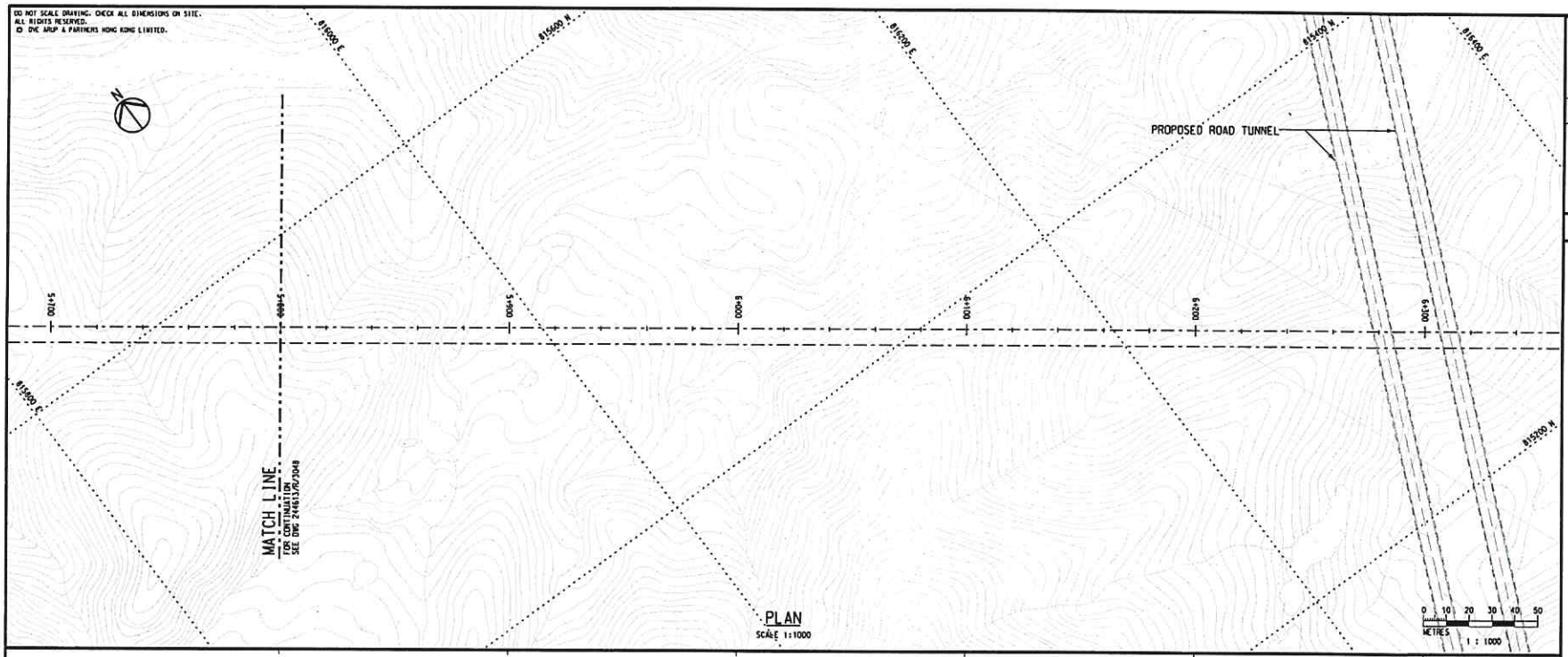

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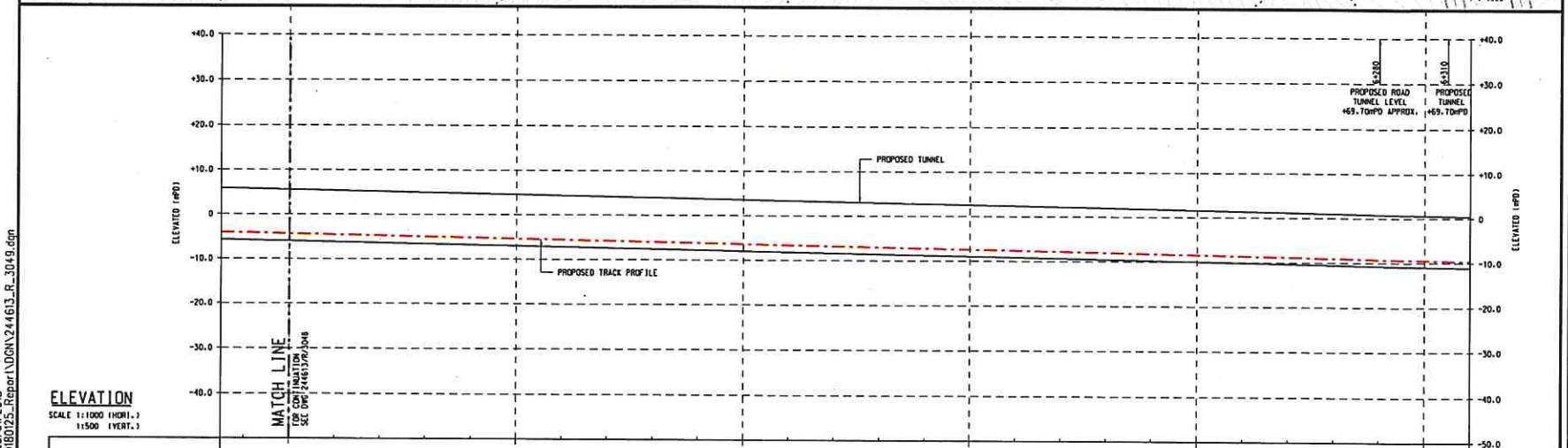

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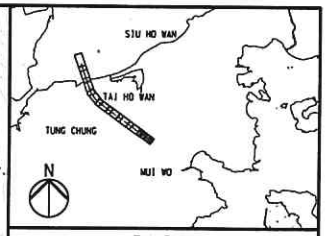
1:500 (VERT.)

CHAINAGE	5+800	5+850	5+900	5+950	6+000	6+050	6+100	6+150	6+200	6+250	6+300
EXISTING GROUND LEVEL	218.7	220.0	218.6	215.2	210.0	215.4	230.0	214.9	195.6	210.0	205.1
PROPOSED RAIL LEVEL	-4.4	-4.9	-5.4	-5.9	-6.4	-6.9	-7.4	-7.9	-8.4	-8.9	-9.4



KEY PLAN

NOTE

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/R/3041.

Rev	Description	By	Date
A	FIRST ISSUE	MS	07/16

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Contract No. and Title
Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title
RAIL OPTION R2-A FROM TUNG CHUNG EAST TO SOUTH EAST LANTAU HORIZONTAL AND VERTICAL ALIGNMENT (SHEET 9 OF 9)

Drawing no. Figure 8.17 Rev. A

Drawn	Date	Checked	Approved
MYC	02/16	MS	MS

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Tables

Table 3.1 Land Use Budget for Initial Land Use Theme 1

Land Use	Area (ha)
Residential PR4 (Site A)	14.8
Residential PR5 (Site B)	5.8
Residential PR4 (Site C)	1.3
GIC (Site A)	1.5
Open Space	8.9 [1]
Commercial PR3 (Site A)	2.1
Commercial PR3 (Site C)	4.5
High-value Logistics PR0.6 (Site B)	19
Total	**57.9**

* Note: Within the reclamation area, the land use areas are estimated including the interstitial space (e.g. major roads, area under SHW interchange, amenity areas, slope areas, etc.)
*

Table 3.2 Development Parameters for Initial Land Use Theme 1

Domestic Sites[2]	**No. of Flats[3&4]**	**Population [5]**
Residential PR4 (Site A)	6,907	18,372
Residential PR5 (Site B)	4,060	11,368
Residential PR4 (Site C)	607	1,614
Total	**11,574**	**31,354**
Non-domestic Sites	**GFA**	**Employment [6]**
Commercial PR3 (Site A)	44,100 sq.m	2,205
Commercial PR3 (Site C)	94,500 sq.m	4,725
High-value Logistics PR0.6 (Site B)	79,800 sq.m	300[7]
Total	**218,400 sq.m.**	**7,230**

[1] With the waterfront promenade, provision of open space results in 8.9 ha.
[2] A large site reduction factor of 0.7 has been applied to all development sites.
[3] Assumptions: At this early stage of the project, it may be premature to determine the public: private housing mix for the residential development. For the purpose of demonstration of land use theme and estimation of population, it is assumed that residential development of PR 4 or below are private housing, while that of PR5 or above are public housing.
[4] Assumptions: average flat size for private residential PR4 is 60 sq.m and; public residential PR5 is 50 sq.m. (based on Tung Chung Study)
[5] Assumptions: person per flat for private housing is 2.66 and public housing is 2.8 (based on Tung Chung Study and comments received from Housing Department)
[6] Assumptions: 20 sq.m. of GFA per worker is assumed based on the lower limit of the working density for (general) business use in Ch. 5 Industry, Guidelines for Worker Densities, HKPSG
[7] The maximum no. of allowed employment within the SHWWTW PHI CZ is subjected to quantitative risk assessment in later stage of project. The maximum allowed employment is assumed as 300 in current stage of study.

Table 3.3 Land Use Budget for Initial Land Use Theme 2

Land Use	Area (ha)
Residential PR2 (Site A)	8.5
Residential PR1.5 (Site C)	1.3
Educational PR3 (Site A)	7.6
Educational PR3 (Site B)	5.8
Educational PR3 (Site C)	4.5
Commercial PR3 (Site A)	1.3
Commercial PR0.2 (Site B)	19
GIC (Site A)	1.0
Open Space	8.9 [8]
Total	**57.9**

* Note: Within the reclamation area, the land use areas are estimated including the interstitial space (e.g. major roads, area under SHW interchange, amenity areas, slope areas, etc.)

[8] With the waterfront promenade, provision of open space results in 8.9 ha.

Table 3.4 Development Parameters for Initial Land Use Theme 2

Domestic Sites[9]	No. of Flats[10&11]	Population [12]	
Residential PR2 (Site A)	1,322	3,517	
Residential PR1.5 (Site C)	152	403	
Total	**1,474**	**3,920**	
Non-domestic Sites	**GFA**	**Employment**	**Student**
Commercial PR3 (Site A)	27,300 sq.m.	1,365 [17]	0
Commercial PR0.2 (Site B)	26,600 sq.m.	300 [13]	0
Educational PR3 (Site A) [14]	159,600 sq.m.	399	7,980
Educational PR3 (Site B) [13]	121,800 sq.m	305	6,090
Educational PR3 (Site C) [13]	94,500 sq.m	236	4,725
Total	**429,800 sq.m.**	**2,605**	**18,795**

[9] A large site reduction factor of 0.7 has been applied to all development sites.
[10] Assumptions: At this early stage of the project, it may be premature to determine the public: private housing mix for the residential development. For the purpose of demonstration of land use theme and estimation of population, it is assumed that residential development of PR 4 or below are private housing, while that of PR5 or above are public housing.
[11] Assumptions: average flat size for private residential PR1.5 and private residential PR2 is 90 sq.m. (based on Tung Chung Study)
[12] Assumptions: person per flat for private housing is 2.66 (Based no Tung Chung Study)
[17] Assumptions: 20sq.m of GFA per worker is assumed based on the lower limit of the worker density for (general) business use in Ch.5 Industry, Guideline for Worker Densities, HKPSG.
[13] The maximum no. of allowed employment within the SHWWTW PHI CZ is subjected to quantitative risk assessment in later stage of project. The maximum allowed employment is assumed as 300 in current stage of study.
[14] Assumptions: Assume 400sq.m of GFA per staff, and a staff : student ratio of 1:20 (i.e. 20sq.m of GFA per student). The staff : student ratio is with reference to City University, HK. The value shall be reviewed at later stage as the type of educational use is not decided yet and could include tertiary institutions, vocational training centres, etc. which would result in different ratios of GFA per worker.

Table 3.5 Land Use Budget for Initial Land Use Theme 3

Land Use	Area (ha)
Commercial PR0.2 (Site B)	19
Commercial PR3 (Site C)	3.9
Hotel/Resort PR3 (Site A)	10.8
Hotel/Resort PR3 (Site C)	1.9
Educational PR3 (Site A)	7.6
Educational PR3 (Site B)	5.8
Open Space	8.9 [15]
Total	**57.9**

* Note: Within the reclamation area, the land use areas are estimated including the interstitial space (e.g. major roads, area under SHW interchange, amenity areas, slope areas, etc.)

Table 3.6 Development Parameters for Initial Land Use Theme 3

Non-domestic Sites[16]	GFA	Employment	Student
Commercial PR3 (Site C)	81,900 sq.m.	4,095[23]	-
Commercial PR0.2 (Site B)	26,600 sq.m.	300 [17]	-
Hotel/Resort PR3 (Site A)	226,800 sq.m.	1906 [18]	-
Hotel/Resort PR3 (Site C)	39,900 sq.m.	335 [18]	-
Educational PR3 (Site A)[19]	159,600 sq.m.	399	7,980
Educational PR3 (Site B) [19]	121,800 sq.m.	305	6,090
Total	**656,600 sq.m.**	**7,340**	**14,070**

[15] With the waterfront promenade, provision of open space results in 8.9 ha.
[16] A large site reduction factor of 0.7 has been applied to all development sites.
[23] Assumptions: 20sq.m of GFA per worker is assumed based on the lower limit of the worker density for (general) business use in Ch. 5 Industry, Guidelines for Worker Densities, HKPSG.
[17] The maximum no. of allowed employment within the SHWWTW PHI CZ is subjected to quantitative risk assessment in later stage of project. The maximum allowed population is assumed as 300 in current stage of study.
[18] Assumptions: 119 sq.m of GFA per worker is assumed based on Government Report "Principal Statistics for all establishments by Major Industry Group, 2006-2008", which had already considered a factor of 1.5 for inflation of GFA).
[19] Assumptions: Assume 400sq.m of GFA per staff, and a staff : student ratio of 1:20 (i.e. 20sq.m of GFA per student). The staff : student ratio is with reference to City University, HK. The value shall be reviewed at later stage as the type of educational use is not decided yet and could include tertiary institutions, vocational training centres, etc. which would result in different ratios of GFA per worker.

Table 3.7 Summary of Evaluation

Evaluation Principle	Evaluation Criteria	Better Performing Theme	Better Performing Theme		
			1	2	3
To explore the potential of the available land for housing development	Optimization of housing supply to meet with the territorial housing needs	1, 2			
To capitalise on the locational advantages to facilitate strategic economic developments	Provision of strategic economic activities to achieve synergy with the existing/future developments in Lantau	2, 3			
	Provision of tourism/recreational facilities (i.e. hotel, resort, etc.) to compliment and enrich the diversity of tourism and leisure facilities in Lantau	2, 3			
To minimise disturbance to ecology and fisheries; and enhance ecological conservation	Avoid encroachment onto Country Park	1, 2, 3			
	Avoid encroachment onto SSSI	1, 2, 3			
	Avoid encroachment onto CWD's habitat	1, 2, 3			
	Avoid adverse impact on on fisheries resources, important spawning and nursery grounds and mariculture activity	1,2,3			
	Avoid encroachment onto the BMP with certain work area allowed between the reclamation site and BMP	1, 2, 3			
	Provision of ecological enhancement initiatives	2, 3			
To provide complementary developments in line with other developments in North Lantau	Development of cross-boundary economic activities	2, 3			
	Development of high value logistics uses	1			
	Provision of tourism/ eco-tourism and/ or recreational uses	3			

Evaluation Principle	Evaluation Criteria	Better Performing Theme	Better Performing Theme		
			1	2	3
	To achieve synergy with the developments in Lantau	2		■	
To provide local business and employment opportunities	Generation of high value added employment opportunities	2		■	
	Provision of regional commercial development	2, 3		■	■
	Provision of local commercial services	1	■		
	Provision of education uses	2,3		■	■
To improve accessibility and strengthen the linkages to the urban areas and adjacent residential/job clusters	Provision of railway transit for residents and workers / Impact on existing Tung Chung Line	2		■	
	Provision of new road connections to other parts of North Lantau / Traffic impact on existing road in North Lantau	2		■	
	Provision of pedestrian linkage to adjacent areas and cycling facilities	1, 2, 3	■	■	■
To create an attractive and continuous waterfront for public enjoyment	Optimization of the waterfront frontage for public enjoyment and creation of vibrancy along the waterfront	1, 2, 3	■	■	■
	Sensible building height profile at the waterfront	2		■	
To ensure cost-effectiveness and smooth implementation	Optimisation of reclamation extent for development	1, 2, 3	■	■	■
	Reference with the AHR on development intensity	1, 2, 3	■	■	■
	Timely implementation programme	2, 3		■	■
To develop in a holistic manner	Programme interface with surrounding infrastructures	2, 3		■	■

Evaluation Principle	Evaluation Criteria	Better Performing Theme	Better Performing Theme		
			1	2	3
To minimize environmental impacts	Careful land use allocation to mitigate noise and air quality impact from highways	2, 3			
	Consideration of the PHI CZ to minimize the hazard to life impact	1, 2, 3			
	Consideration of design to be compatible with Tai Ho Wan	2, 3			

Table 3.8 Land Use Budget for Updated Initial Land Use Theme 2

Land Use	Area (ha)
Residential PR3 (Site A)	8.5
Residential PR3 (Site B)	5.8
Residential PR1.5 (Site C)	1.3
Educational PR3 (Site A)	7.6
Educational PR3 (Site C)	4.5
Commercial PR3 (Site A)	1.3
Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses PR0.2 (Site B)	19
GIC (Site A)	1.0
Open Space (including waterfront promenade)	8.9
Total	**57.9**

* Note: Within the reclamation area, the land use areas are estimated including the interstitial space (e.g. major roads, area under SHW interchange, amenity areas, slope areas, etc.)

Table 3.9 Development Parameters for Updated Initial Land Use Theme 2

Domestic Sites[20]	**No. of Flats**[21&22]	**Population** [23]	
Residential PR3 (Site A)	1,983	5,276	
Residential PR3 (Site B)	1,353	3,600	
Residential PR1.5 (Site C)	152	403	
Total	**3,488**	**9,279**	
Non-domestic Sites	**GFA**	**Employment**	**Student**
Commercial PR3 (Site A)	27,300 sq.m.	1,365 [24]	0
Computer/ Data Process Centre, Clinical Laboratory or Other Similar Uses PR0.2 (Site B)	26,600 sq.m.	300 [25]	0
Educational PR3 (Site A) [26]	159,600 sq.m.	399	7,980
Educational PR3 (Site C) [6]	94,500 sq.m	236	4,725
Total	**308,000 sq.m.**	**2,300**	**12,705**

[20] A large site reduction factor of 0.7 has been applied to all development sites.
[21] Assumptions: At this early stage of the project, it may be premature to determine the public: private housing mix for the residential development. For the purpose of demonstration of land use theme and estimation of population, it is assumed that residential development of PR 4 or below are private housing, while that of PR5 or above are public housing.
[22] Assumptions: average flat size for private residential PR1.5 and private residential PR3 is 90 sq.m. (based on Tung Chung Study)
[23] Assumptions: person per flat for private housing is 2.66 (Based on Tung Chung Study)
[24] Assumptions: 20sq.m of GFA per worker is assumed based on the lower limit of the worker density for (general) business use in Ch.5 Industry, Guideline for Worker Densities, HKPSG.
[25] The maximum no. of allowed employment within the SHWWTW PHI CZ is subjected to quantitative risk assessment in later stage of project. The maximum allowed employment is assumed as 300 in current stage of study.
[26] Assumptions: Assume 400sq.m of GFA per staff, and a staff : student ratio of 1:20 (i.e. 20sq.m of GFA per student). The staff : student ratio is with reference to City University, HK. The value shall be reviewed at later stage as the type of educational use is not decided yet and could include tertiary institutions, vocational training centres, etc. which would result in different ratios of GFA per worker.

Table 5.1: Pros and cons of Preliminary Site Formation Options

	Option 1	Option 2	Option 3
Description	• Cut Platforms	• Elevated Platforms	• Amalgamation of Cut and Elevated Platforms
Key Element	• Involves site formation works with cutting into the existing hillside to create various platforms	• Minimizes the extent of site formation works by constructing elevated platforms	• Adopts a combination of site formation and elevated platforms to create developable land, with an aim to balance the pros and cons between Option 1 and Option 2
Platform Details	• Cut Platforms (+7mPD, +30mPD and +40mPD)	• Elevated Platforms (+30mPD and +50mPD) • Existing Platform (+7mPD)	• Cut Platforms (+30mPD and +40mPD) • Elevated Platform (+30mPD) • Existing Platform (+7mPD)
Developable Area (including access road)	• Approx. 10.0 ha	• Approx. 4.5 ha	• Approx. 9.0 ha
Net Excavation Volume (m^3)	• Approx. 1,532,000	• Approx. 93,000	• Approx. 1,220,000
Affect Natural Stream course	• High • A large scale of natural runoff diversion is envisaged to be carried out within the development extent	• Less • The natural runoff flow paths can be basically untouched in order to minimize the ecological impact, only a few natural runoff may need to be diverted	• High • A large scale of natural runoff diversion is envisaged to be carried out within the development extent
Environmental Issues	• Least landscape and visual impact if proper landscape is implemented	• Landscape and visual impact is significant due to massive structures	• Moderate landscape and visual impact due to one single platform in northeast of the

	• Generate fill for reclamation • Capture-and-translocation programme of Romer's Tree Frog is required • Appropriate treatments to existing trees are required	• Less fill generation • Capture-and-translocation programme of Romer's Tree Frog is required • Appropriate treatments to existing trees are required	landside development • Generate fill for reclamation • Capture-and-translocation programme of Romer's Tree Frog is required • Appropriate treatments to existing trees are required
Utilities Issues	• Less technical and construction difficulties due to low constraint associated with utilities mainly laying at-grade	• Great technical and construction difficulties due to constraint associated with utilities laying at road structures	• Moderate technical and construction difficulties due to constraint associated with utilities laying at road structures on elevated platform in the northeast of the site
Geotechnical Risks	• Natural terrain hazards mitigation measure is anticipated • Large amount of new formed man-made slope is anticipated	• Natural terrain hazards mitigation measure is anticipated • Construction of foundation for elevated platforms on sloping ground is anticipated	• Natural terrain hazards mitigation measure is anticipated • Large amount of new formed man-made slope is anticipated
Statutory Procedures	• Higher flexibility for future implementation • EIA is required	• Less flexibility for future implementation • EIA is required	• Higher flexibility for future implementation • EIA is required

Table 6.1 Summary of EAR monitoring and dolphin detections at Siu Ho Wan sites (C4 - C6), 23 Feb 2016 - 23 Apr 2017

Site	Lat/Lon Depth (m)	Depl. No.	Recording Dates	No. of Rec. Days	No. of Files	Days with Dolphins (%)	Files with Dolphins (%)
C4	N22 18.562	1	23 Feb 2016 - 29 Mar 2016	36	10235	18 (50%)	111 (1.1%)
	E113 58.644	2	14 Apr 2016 - 13 May 2016	30	8510	16 (53%)	43 (0.51%)
	6.0m	3	20 May 2016 - 15 July 2016	57	16236	11 (19%)	27 (0.17%)
		4	07 Aug 2016 - 12 Sep 2016	37	10452	11 (30%)	13 (0.12%)
		5	06 Oct 2016 - 07 Nov 2016	33	9374	33 (100%)	310 (3.3%)
		6	17 Nov 2016 - 22 Dec 2016	36	10206	36 (100%)	357 (3.5%)
		7	24 Jan 2017 - 23 Feb 2017	31	9374	23 (74%)	66 (0.70%)
		8	18 Mar 2017 - 24 Apr 2017	38	10809	25 (66%)	48 (0.44%)
				Total: 298	**Total: 85196**	**Total: 173 (58%)**	**Total: 975 (1.1%)**
C5	N22 18.814	1	Not Recovered	NR			
	E113 59.144	2	Not Recovered	NR			
	6.6m	3	Not Recovered	NR			
		4	08 Jul 2016 - 11 Sep 2016	66	18720	14 (21%)	72 (0.38%)
		5	06 Oct 2016 - 07 Nov 2016	33	9216	8 (24%)	16 (0.17%)
		6	17 Nov 2016 - 11 Jan 2017	56	16848	9 (16%)	16 (0.09%)
		7	24 Jan 2017 - 23 Feb 2017	31	8640	12 (39%)	26 (0.30%)
		8	18 Mar 2017 - 24 Apr 2017	38	10944	7 (18%)	25 (0.23%)
				Total: 224	**Total: 64368**	**Total: 50 (22%)**	**Total: 155 (0.24%)**
C6	N22 19.007	1	23 Feb 2016 - 29 Mar 2016	36	10096	19 (53%)	211 (2.1%)
	E113 59.613	2	14 Apr 2016 - 13 May 2016	30	8514	19 (63%)	36 (0.42%)
	6.2m	3	20 May 2016 - 18 June 2016	30	8217	9 (30%)	30 (0.37%)
		4	07 Aug 2016 - 09 Sep 2016	34	9517	2 (5.9%)	8 (0.08%)
		5	06 Oct 2016 - 07 Nov 2016	33	9380	10 (30%)	11 (0.12%)
		6	Not Recovered	NR	NR	NR	NR
		7	24 Jan 2017- 23 Feb 2017	31	8810	6 (19%)	11 (0.12%)
		8	18 Mar 2017- 24 Apr 2017	38	10815	11 (29%)	26 (0.24%)
				Total: 232	**Total: 65349**	**Total: 76 (33%)**	**Total: 333 (0.51%)**

Table 6.2. Number of CWD detections during daytime and nighttime hours at SHW, 23 Feb 2016 - 23 Apr 2017.

EAR site	# detections during daytime (hour 0700-1800) (% of total)	# detections during nighttime (hour 1900-0600) (% of total)
C4	398 (41%)	577 (59%)
C5	26 (17%)	129 (83%)
C6	68 (20%)	265 (80%)

Table 7.1 Summary of Option Evaluation for Routing Option

Routing Option Group	Planning and Land Use	Environmental	Traffic	Impact on Locals	Implementation	Engineering	Cost
1	×××	-	×	-	✓	✓	✓✓
2	✓	××	×	××	✓	✓	✓
3	✓	×	✓	××	✓	✓	-
4	✓	-	✓	-	✓	✓	××
5	✓	×××	××	-	×	✓	-

✓✓✓ denotes very good; ✓✓ denotes good; ✓ denotes slightly good; - denotes fair; × denotes slightly poor; ×× denotes poor, ××× denotes very poor and non-starter

Table 7.2 Summary of Option Evaluation for Interchange at North Lantau

Interchange Option	Planning and Land Use	Environmental	Traffic	Impact on Locals	Implementation	Engineering	Cost
N1	✓	×××	××	-	×	×	×
N2	✓	-	×××	-	✓	✓	-
N3	×	-	✓✓	-	✓	✓	×

✓✓✓ denotes very good; ✓✓ denotes good; ✓ denotes slightly good; - denotes fair; × denotes slightly poor; ×× denotes poor, ××× denotes very poor and non-preferable

Table 7.3 Summary of Evaluation for Interchange Option at North Lantau

Interchange Option	Planning and Land Use	Environmental	Traffic	Impact on Locals	Implementation	Engineering	Cost
N1	Moderate land requirement	Encroach Tai Ho priority site for enhanced conservation	Overburden Tai Ho Interchange	No major adverse impact	Potential judicial review on encroachment to Tai Ho	Low constructability for connecting to TMCLKL	Higher cost
N2	Moderate land requirement	No encroachment to major environmental constraints	Less than absolute weaving length. Very poor traffic performance and high traffic safety hazard.	No major adverse impact	Typical implementation	Technically feasible	Moderate cost
N3	Larger land requirement in Siu Ho Wan Reclamation	No encroachment to major environmental constraints	Satisfactory traffic performance	No major adverse impact	Typical implementation	Technically feasible	Higher cost

Table 7.4 Summary of Geotechnical Evaluation for Routing Option

Route options	Geological	Groundwater	Geotechnical
1	• The proposed interchange and associated slip roads of all routes are located within the boundary of Designated Area of Northshore Lantau and complex geological conditions are expected. • All route options involve similar geological strata and also structures: NE trending inferred and identified faults	• Highly not preferred. • Very closed to Reservoir of Discovery Bay.	• Preferred. • Hard rock tunnelling in most of the sections; • Minimal risks from man-made and natural slopes at tunnel portals.
2		• Not preferred. • Closed to Reservoir of Discovery Bay.	• Preferred. • Hard rock tunnelling in most of the sections; • Minimal risks from man-made and natural slopes at tunnel portals.
3		• Fair. • Average groundwater inflow is expected.	• Not preferred. • Extensive natural terrain hazards may affect the day-lighted sections near Mui Wo town centre
4		• Fair. • Average groundwater inflow is expected.	• Fair. • Hard rock tunnelling in most of the sections; • Minimal to medium risks from man-made and natural slopes at portals and day-lighted sections near Mui Wo town centre
5		• Not preferred. • Expected high groundwater inflow as the Tai Ho Wan tunnel section located at the foothill of hilly terrains.	• Highly not preferred. • Section of mixed ground tunnelling expected near Tai Ho Wan section; • Extensive natural terrain hazards may affect the day-lighted sections near Tai Ho Wan and Mui Wo town centre

Table 8.1 Qualitative Comparison for Routing Options

Routing Option	Route Length	Planning and Lands	Environmental	Traffic / Served Population	Interfacing Issue with MTRCL	Suitability for Future ELM/BCF Connection	Engineering	Fire and Building Services	Cost
R1-A	-	××	×	✓	××	-	×	-	××
R1-B	✓	××	×	✓	××	-	×	-	××
R1-C	×	××	-	✓	××	×	××	-	××
R1-D	✓✓	×	×	✓	-	-	×	-	××
R2-A	✓✓	✓	×	✓✓	✓✓	✓✓	✓	-	✓
R2-B	-	✓✓	-	✓✓	✓✓	-	××	-	-

✓✓✓ denotes very good; ✓✓ denotes good; ✓ denotes slightly good; - denotes fair; × denotes slightly poor; ×× denotes poor

Table 8.2 Summary of Evaluation for Routing Option

Routing Option	Route Length	Planning and Land Use	Environmental	Traffic / Served Population	Interfacing Issue with MTRCL	Suitability for Future ELM/BCF Connection	Engineering	Fire and Building Services	Cost
R1-A	Approx. 5.5 km between stations	Interfacing issues with MTRC SHW Topside Development may not be able to be incorporated considering the different implementation programmes	Encroachment to freshwater marshland at Mui Wo	Serving population in Siu Ho Wan	Complicated interface issue with SIW (Tung Chung Line) Station and MTRC Siu Ho Wan Topside Development	• Possible connection to Hei Ling Chau via an uninhabited part of Lantau Island • No direct connection to HKBCF	• Complicated construction in SIW Station	Technically feasible	Very high cost, due to complicated construction in SIW Station
R1-B	Approx. 5.3 km between stations	ditto	Encroachment to freshwater marshland at Mui Wo	ditto	ditto	• Possible connection to Hei Ling Chau via an uninhabited part of Lantau Island • No direct connection to HKBCF	• Complicated construction in SIW Station	Technically feasible	Very high cost, due to complicated construction in SIW Station

Routing Option	Route Length	Planning and Land Use	Environmental	Traffic / Served Population	Interfacing Issue with MTRCL	Suitability for Future ELM/BCF Connection	Engineering	Fire and Building Services	Cost
R1-C	Approx. 6.3 km between stations	ditto	No encroachment to major environmental constraints	ditto	ditto	• No direct connection to HKBCF	• Complicated construction in SIW Station • Complicated construction for possible connection to Hei Ling Chau.	Technically feasible	Very high cost, due to longest tunnel
R1-D	Approx. 5.2 km between stations	Impose constraints on land use planning in SHW reclamation area	Encroachment to freshwater marshland at Mui Wo	ditto	• Least interface with SIW (Tung Chung Line) Station • Railway tunnel passes through MTRC SHW Depot Topside Development. Underground reservation zone is required for future tunnel construction	• No direct connection to HKBCF	• Relatively simple construction in SIW Station in reclamation area	Technically feasible	Very high cost, due to need of adopting TBM for main tunnel

Routing Option	Route Length	Planning and Land Use	Environmental	Traffic / Served Population	Interfacing Issue with MTRCL	Suitability for Future ELM/BCF Connection	Engineering	Fire and Building Services	Cost
R2-A	Approx. 5.1 km between stations	TCE station located along the central green area to minimize impact on TCE OZP	Encroachment to freshwater marshland at Mui Wo	Serving larger population in TCE	Interface with TCE (Tung Chung Line) station	• Possible connection to HKBCF via the HKBCF-TCE rail link.	• Relatively less complicated construction in TCE Station (as compared to SIW Station Option 1)	Technically feasible	Lower cost, due to shorter overall route length and relatively less complicated construction in TCE Station
R2-B	Approx. 5.5 km between stations	ditto	No encroachment to major environmental constraints	ditto	ditto	• Possible connection to HKBCF via the HKBCF-TCE rail link.	• Relatively less complicated construction in TCE Station (as compared to SIW Station Option 1)	Technically feasible	Moderate cost, due to due to relatively less complicated construction in TCE

Table 8.3 Building services and railway-related E&M installations required

Major types of Building Services / E&M Installations	**Purposes of installations**
Building Services Installations	
Tunnel Ventilation System (not applicable for building solely for EEP/EAP purpose)	• Keep the tunnel environment according to NWDSM • Offer a smoke-controlled environment to the satisfaction of HKFSD during fire incidents
Electrical Systems	• Provide power supply to tunnel ventilation system, and other building services
Air-conditioning & Mechanical Ventilation	• Remove heat dissipated from equipment, via air-conditioning or mechanical ventilation, to ensure proper functioning of equipment/system served • Achieve human comfort for occupied areas
Central Control and Monitoring System	• Provide dedicated, reliable and redundant controllers for tunnel ventilation system and tunnel lighting system • Provide separate controllers for other building services systems
Fire Services	• Provide fire protection installations such as AFA systems, tunnel fire hydrant and hose reel system, building fire hydrant and hose reel system, etc. in compliance with regulations • Offer gas flooding protection system for water-sensitive plant rooms
Plumbing and Drainage	• Provide fresh water, flushing & cleansing water supplies and various drainage to support the operation of road tunnel and ventilation buildings
Railway-related E&M Installations	
Signalling, Communication, Main Control System, Overhead Line System, Traction Supply System, Automatic Fare Collection System, etc.	• Support the daily operations of railway line and stations

Appendix A
Technical Assessment on Proposed Road Link

1.1 Geometric Design

Siu Ho Wan Interchange

1.1.1 The preliminary layout of the Siu Ho Wan Interchange is shown in Drawing No. 244613/H/1103 to 1104. A free-flow semi-directional T junction is proposed.

1.1.2 The preliminary traffic forecast suggests that the ramps to the Tung Chung direction should be in 2-lane and the ramps to the Sunny Bay direction should be in 1-lane.

1.1.3 It is preliminarily assessed that the weaving traffic volume between TM - CLKL and the proposed Siu Ho Wan Interchange will justify an additional weaving lane between the interchanges. Widening of North Lantau Highway is proposed in that section.

1.1.4 In addition, more space is needed to house the additional ramps of Siu Ho Wan Interchange. Since the northern side is constrained by the running rail lines, realignment of the North Lantau Highway to the south is necessary. A design speed of 110km/hr will be adopted for the realigned North Lantau Highway.

1.1.5 Cheung Tung Road and the associated utilities have to be diverted southward to provide the space for North Lantau Highway realignment. Edges of the government land allocation along Cheung Tung Road needs to be resumed but key structures are avoided. Slope modification work is anticipated. A localised diversion of the at-grade section of existing Sham Shui Kok Drive is required. The diverted Cheung Tung Road has also avoided the planned columbarium site at the eastern ends of Sham Shui Kok Drive.

1.1.6 There exist a bottleneck at the Organic Waste Treatment Facility. With consideration to cost effectiveness, it is intended to avoid the demolition and relocation of the building structure of the organic waste treatment facility. There is enough space between the ramps and the building facility to accommodate the realigned carriageway of Cheung Tung Road, but a typical 5m verge cannot physically be provided at that location. However there is more than 3.5m headroom

beneath the ramp to house the congested utility if necessary. It is considered that with careful utility design, the utility can cross the bottleneck.

1.1.7 The location of the span across the rail lines are selected to avoid the 2-level rail portion. This reduces the height of the bridge.

1.1.8 The Siu Ho Wan is constrained by the Marine Park at the north and the essential infrastructure facility of sewage treatment plant and the water treatment work at the south. The physical space between the constraints does not allow the placement of an arc with radius 320m, unless either constraints are encroached.

1.1.9 The off-slip from North Lantau Highway eastbound is the critical curve. As large as possible, the maximum achievable inner radius of curvature for that ramp is 175m. From the first principle on centripetal acceleration and skid resistance assumption in the British system (basis of TPDM), it is considered very unsafe to adopt a posted speed 80km/hr for this situation. It is proposed to adopt a design speed of 70km/hr, radius=175m, superelevation=7% for this section for design purpose.

1.1.10 The tunnel schematic road cross sections are shown in Drawing No. 244613/H/2001. A typical dual 2-lane tunnel cross section is shown. In addition the wider tunnel cross section at curves with 3m sightline widening is also prepared.

1.1.11 The schematic layout plan for the Route 4 are shown in Drawing Nos. 244613/H/2200 to 2205.

1.1.12 The horizontal and vertical alignments for the Routes 4 are shown in Drawing Nos. 244613/H/2300 to 2302.

Portal Locations

1.1.13 The north tunnel portal location is selected south of the temporary government land allocations (TGLAs). The area is currently site office and hence has less land implications.

1.1.14 It is preferable to cross the Discovery Bay at the west side to minimise the bridge height. However there is a natural stream at a valley. The stream is collecting run-

off from a relatively large drainage catchment. The north tunnel portal is proposed to be east of the valley to minimise the drainage impact.

Tunnel Facilities

Toll Facilities

1.1.15 The most important criteria on the location of the toll facility is the tolling strategy on the traffic planning to ELM. As the ELM is still at a schematic stage, it is premature to determine the location of the toll facility at the current stage.

1.1.16 The advance in technology has made electronic road pricing system like radio frequency identification (RFID) and automatic license-plate recognition (ALPR) more practicable and cost effective. The civil provision of these systems involve sign gantries. It is noticed that the Transport Department is recently carrying out consultation on the above electronic road pricing system. Subject to the implementation programme of the road link and the adoption of electronic road pricing system, it is likely that toll plaza will not be necessary, in order to save valuable land.

Administration Building

1.1.17 For a long road tunnel, an administration building is preferable for the recovery, rescue and maintenance purposes. The location of the administration building is preferably close to the tunnel portals for fast response. It can be at Siu Ho Wan south of Cheung Tung Road.

1.1.18 It is learnt that there might be potential expansion for the Siu Ho Wan Sewage Treatment Plant. As both projects are in early stage, continuous liaison is recommended to co-locate the road link and the sewerage treatment plant expansion.

Ventilation Building

1.1.19 In addition to the ventilation buildings at both ends of the tunnel, a middle ventilation building and the associated ventilation shaft is anticipated to be required due to the long main tunnel, subject to the future technological development in ventilation fan system.

1.1.20 It is assumed that the middle ventilation building shall be outside the gazetted country park boundary.

Fire Engineering

1.1.21 The fire safety designs of the road tunnels shall refer to the following codes and standards:

- Code of Practice for Fire Safety in Buildings, 2011, BD, HKSAR Government (FS code 2011)
- Code of Practice for Minimum Fire Service Installation and Equipment, FSD, HKSAR Government (FSI code)
- NFPA 502 Standard for Road Tunnels, Bridges and Other Limited Access Highways, 2011 edition, National Fire Protection Association (NFPA 502)

1.1.22 In addition, reference is made to the precedent road tunnel projects (Tuen Mun - Chek Lap Kok Link and Liantang-Heung Yuen Wai BCP Connecting Road) in Hong Kong which are currently undergone the approval process with Highways Department. For any new and special design features to cope with the site constraints, performance-based fire engineering approach may be adopted in the design stage.

Road Tunnel Fire Safety

Fire Service Installations (FSI)

1.1.23 The provisions of FSI and smoke control for the road tunnel shall be based on the FSI code with the followings:

- Closed circuit television system
- Dynamic smoke extraction system
- Emergency power supply
- Emergency lighting
- Emergency power points
- Exit sign
- Fire detection and alarm system
- Fire control centre
- Tunnel Fire hydrant/hose reel system
- Fireman's communication system
- Gas detection system including CO detector and alarm
- Automatic foam type fire extinguishing system
- Portable hand-operated approved appliance

Smoke Control Strategy

1.1.24 Overhead smoke extraction system shall be designed to control smoke generated from a fire within the tunnel. The sectional area of the tunnel, gradient, tunnel alignment, fire size, walkway level and length of smoke zone etc are the major factors to derive the required smoke extraction rate and system design.

1.1.25 Making reference to precedent projects, the smoke extraction system shall enable to maintain a tenable environment within 2.5m above the highest occupied level (i.e. walkway) from a 50MW fire (heavy goods vehicle) to provide a safe evacuation environment for the evacuees and fire-brigade in case of fire. A smoke extraction rate in the order of $400m^3/s$ will be required for the said purpose.

1.1.26 The tunnel tube shall be divided into certain number of smoke zones. Provision of smoke barriers for diving smoke zones is generally not proposed along the carriageway of road tunnel. This is due to the need to maintain a clear height for large vehicles and thus only limited spaces at high level can provide for smoke barriers. If shallow smoke barriers are designed, it may not be effective in limiting the spread of smoke. However, the forming of smoke zones in tunnels by smoke barriers shall be reviewed and considered in future detailed design stage. If technically feasible, it should be adopted in tunnel smoke extraction system design.

1.1.27 The designed smoke extraction rate and the length of each smoke zone shall be based on the detailed calculation and CFD simulation study in future detailed design stage.

1.1.28 Smoke extraction system shall be able to operate for at least an hour/ the entire period for MoE and MoA. Mechanical makeup air shall be provided and it shall ensure the airstream temperature within the smoke extraction system is less than 250°C. Makeup air velocity shall not exceed 3m/s so as to prevent disturbance to the smoke layer.

TVS Operation in Fire Situation

1.1.29 Under fire emergency operation, the Tunnel Ventilation System (TVS) shall be switched to the smoke control system operation mode. Relevant tunnel ventilation fans shall be operated in exhaust mode. And all motorized fire and smoke dampers

(MFSDs) at the vents within the incident zone shall be opened to extract smoke. Make-up air shall come from the two ends of the incident zone.

1.1.30 The smoke control system operation mode can be actuated automatically by the activation of the linear heat detection cable within the tunnel or by manual actuation from fire control centre. Since the operation sequence during smoke control system operation mode are yet to be confirmed in this early stage of project, the exact operation sequence and corresponding settings for different scenarios of fire locations (e.g. smoke zone boundary fire scenario) shall be further reviewed and coordinated in future detailed design stage with the authorities and MTRCL.

Means of Escape (MoE) and Means of Access (MoA)

1.1.31 As shown in Plate 1.1, cross passage and walkway shall be used for MoE and MoA:

- Cross passage shall be provided at 100 m intervals along the entire tunnels. The minimum dimensions shall be with 2000mm clear width and 2100mm clear height.
- Walkway provided on the tunnel side with cross passage shall be used for evacuation/ access. A clear width00mm and clear height of 2000mm shall be maintained in accordance with the recent precedent case.

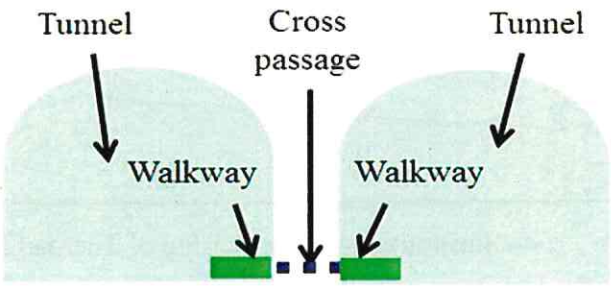


Plate 1.1 Illustration of Cross Passage and Walkway

1.1.32 In case of emergency, evacuation and access from/to the location of the incident tunnel could be achieved by the following means:

- Evacuate from the incident tunnel through the cross passages to the walkway of the non-incident tunnel and walk continuously to the tunnel portals/ to be rescued;
- Fire-brigade shall access from the tunnel portals of the non-incident tunnel and walk through the cross passages to the incident tunnel for firefighting and rescue;

Fire Separation and Compartmentation

1.1.33 The tunnel construction and the cross passage shall have the fire resistance rating (FRR) of not less than 4 hours according to the FS code 2011 requirement. 4-hour fire separation partition wall shall also be maintained between the tunnel tubes.

1.1.34 Non-combustible thermal barrier shall be designed and provided to protect the tunnel structure. As shown in Plate 1.2, the coverage of the thermal barrier inside the tunnels shall include but not limited to the soffit and wall of each ventilation duct and the soffit and wall of each tunnel tube. The thermal barrier shall be capable of withstanding the Rijkswaterstaat (RWS) time-temperature fire curve for 2 hours and shall fulfil the protection requirements of structural elements as stipulated in NFPA 502.

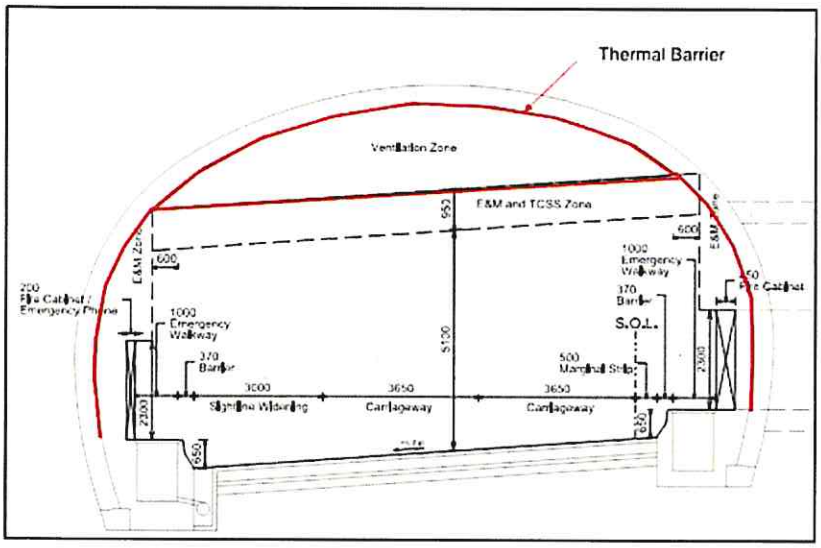


Plate 1.2 Illustration on the Provision of Thermal Barrier

1.2 Building Services Engineering

Tunnel Ventilation System

1.2.1 A feasible tunnel ventilation scheme is the major concern. It will consider different ventilation rates during normal operations and smoke extraction rate during fire incidences, as tabulated below.

Table 1.2 Operation scenarios of tunnel ventilation system

Scenario	Descriptions	Dominance
Uni-directional Traffic, Normal Operation	Normal operation of tunnels – one tube for northbound, and the other one for southbound	Considerably dominant at assumed speed limit 80km/h, and extraction ratio of 40% at portals
Bi-directional Traffic, Normal Operation	Only one tube of tunnels is in operation when the other is closed for maintenance.	Less dominant
Fire Incident	Fire occurs within any part of road tunnels	Most dominant at assumed fire load size of 50MW

1.2.2 The design of tunnel ventilation system shall refer to and base on the following codes, regulations and standards:

- Road Tunnels: Vehicle Emission and Air Demand for Ventilation (2012), issued by PIARC;
- Practice Notes on the Control of Air Pollution in Vehicle Tunnels (1995), issued by the Environmental Protection Department;
- Code of Practice for Minimum Fire Services Installation and Equipment and Inspection and Testing and Equipment (2012), and latest Circular letters, HKFSD;
- Technical Memoranda TM19:1995, CIBSE.

1.2.3 Semi-transverse ventilation system will be adopted for the road tunnels. The whole tunnels will be divided into 2 major segments by 3 ventilation buildings – two

ventilation buildings located at each end of the road tunnels and one located near the middle of the road tunnels.

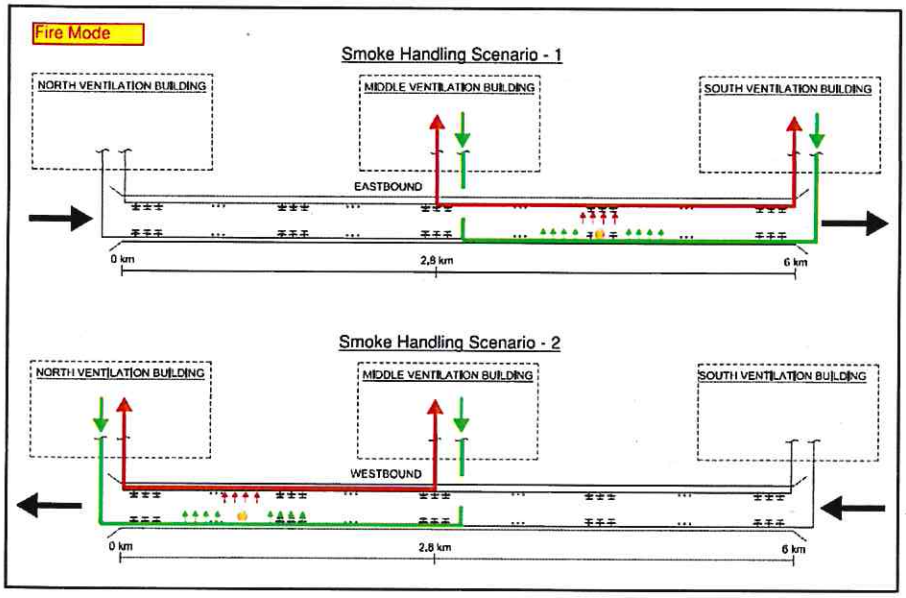


Plate 1.3 Assumed tunnel ventilation scheme

1.2.4 The availability of suitable tunnel ventilation fans and power transformers will govern the number of ventilation building and locations of ventilation buildings. Under the proposed arrangement of 3 ventilation buildings for an approximate 6km long tunnel, overhead ventilation ducts of cross-section of at least $20m^2$ will be required for semi-transverse ventilation system. In addition, another ventilation ducts of at least $15m^2$ will be reserved for any mechanical make-up at low level within smoke zone. The more detailed ventilation system and arrangement will be further elaborated and agreed with the authority in detailed design stage of the Project. The tunnel ventilation fans, working in groups, will be sized to cater for air flow requirement under critical scenario and so the pressure drop along tunnels. The fans will work on 660V power supply from group(s) of 2kV/660V transformers, of which the ratings will range from 2 to 2.5 MVA.

1.2.5 Alternative arrangement of using 2 ventilation buildings is not cost-effective in terms of equipment availability and requires enormously big ventilation zone/duct

within tunnels. The ventilation zone will have to be enlarged in order to cater for the pressure loss of air flow experienced along the tunnels.

Other building services requirements

1.2.6 All ventilation buildings will be above-ground structures. They should be in multi-storey arrangement and house the following key building services installations:

Table 1.3 Building Services Installations Required

Major types of Building Services / E&M Installations	Purposes of installations
Tunnel Ventilation System	• Keep the air quality of road tunnels within acceptable levels during day-to-day operations through air dilution • Offer a smoke-controlled environment to the satisfaction of HKFSD during fire incidents • **NO air purification system is assumed.**
Electrical Systems	• Provide power supply to **tunnel ventilation system, tunnel lighting system** and other building services/tunnel E&M installations • The power supply to tunnel ventilation system will be a dedicated one and dual-feed, aligning with recent tunnel projects
Air-conditioning & Mechanical Ventilation	• Remove heat dissipated from equipment, via air-conditioning or mechanical ventilation, to ensure proper functioning of equipment/system served • Achieve human comfort for occupied areas
Central Control and Monitoring System	• Provide dedicated, reliable and redundant controllers for tunnel ventilation system and tunnel lighting system • Provide separate controllers for other building services systems
Fire Services	• Provide fire protection installations such as AFA systems, tunnel fire hydrant and hose reel system, building fire hydrant and hose reel system, etc. in compliance with regulations • Offer gas flooding protection system for water-sensitive plant rooms • Provide fixed foam system to petrol interceptor(s), if required in detailed tunnel profile
Plumbing and Drainage	• Provide fresh water, flushing & cleansing water supplies and various drainage to support the operation of road tunnel and ventilation buildings

Major types of Building Services / E&M Installations	Purposes of installations
Extra Low Voltage systems and other control systems	• Support the operation of road tunnels with the help of Tunnel Control and Signal System, Security CCTV system, security system, IT system and intercom system, etc.

1.2.7 Along the tunnels, there shall be tunnel lighting system, air quality monitoring system, tunnel fire hydrant & hose reel system and linear heat detection cable system.

1.2.8 E&M equipment will be located within cross passages as standalone plant rooms or cabinets. Mechanical ventilation may be provided to the passages to achieve directional airflow or specific ventilation rate.

1.2.9 All of these aforementioned building services and E&M installations will be required under any routing options.

1.3 Bridge Engineering

1.3.1 The Siu Ho Wan Interchange consists of bridge structures.

1.3.2 Due to the constraints of rail line, submarine outfall and North Lantau Highway at Siu Ho Wan, a typical span of 60m is considered more cost effective. In the longest skewed span crossing rail line, span up to 80m is anticipated. The profile is designed to allow the bridge structural depth.

1.3.3 Prestressed concrete box girder bridge structure is considered suitable for this range of span. The construction technologies of which is also well established by the local industries.

1.3.4 Depending on the final solution adopted for the interface between the existing submarine outfall and the reclamation, a large span bridge might be needed for the option of no reclamation above the existing submarine outfall. The bridge is thus anticipated to provide sufficient setback from the seawall structure and the submarine outfall. The bridge span could be smaller for the other options of reclaiming above the existing submarine outfall with permanent diversion of

outfall, but the actual spans depend on the temporary or permanent diversion arrangement.

1.3.5 At the crossing across rail line, the bridge design should consider sufficient clearance from the running rail line. Typically the permanent structure should be at least 7m above the rail line or at least 2m above the overhead line mast, whichever the higher. The pier typically has to be 6m clear from the rail track. The exact dimensions shall be confirmed with MTRCL during the detailed design stage.

1.3.6 In order to avoid conflict with the structure of the Organic Waste Treatment Facility, one of the ramp is designed at a relatively small skewed angle to the North Lantau Highway. An intermediate support at the central reserve of the realigned North Lantau Highway is anticipated necessary to reduce the bridge span. The road geometry of the realigned Cheung Tung Road is designed to allow sufficient space and clearance for the piers at the central reserve.

1.4 Tunnel and Geotechnical Engineering

Tunnel

Geological section along the road tunnel alignment

1.4.1 For the purpose of preliminary geological study of road connection from North Lantau to South Lantau, the section under Route 4 of the preferred Western tunnel option from Siu Ho Wan is adopted. Detailed locations and nature of the structural geologic features are shown in Drawing Nos. 244613/G/3101-3104.

1.4.2 Based on the geological section along the proposed road tunnel alignment, the road tunnel alignment may run cross two major faults, Yam O Fault and Tai Ho Fault. These two geological faults would pose some difficulties for the tunnel excavation, such as instability of excavated face and groundwater ingress. In addition, the maximum rock cover to the road tunnel is 370m approximately which will lead to a very high water pressure at the tunnel level and therefore a challenging task to control the water ingress during tunnel excavation. As soil is noted near the tunnel portal, soft ground tunnel construction method such as pipe roofing would be used for the excavation of tunnel section near the portal.

Possible construction method for road tunnel

1.4.3 According to the interpreted geological profile of the road tunnel alignment connecting Siu Ho Wan and South Lantau, the tunnel alignment runs mainly in

rock. Two construction method, i.e., drill-and-blast and Tunnel Boring Machine (TBM), are commonly used for tunnelling in rock in Hong Kong.

1.4.4 The comparison between Drill and Blast method and TBM Method is summarised in Table 1.4 below.

Table 1.4 Comparison of Tunnelling Method

Key Considerations	Drill-and-Blast	TBM
Geological condition	Better ability to adapt variable rock condition	Relatively uniform ground condition required
Envisaged Construction Risk	– Soft ground near the portal – control of groundwater ingress	– Change of ground condition – high rock hardness
Construction efficiency	Can produce a more flexible tunnel cross section and therefore the efficiency of the utilization of tunnel space is higher.	Circular section produced and therefore the efficiency of the utilization of tunnel space is lower.
Construction rate	Approx. 4 to 9 m/ day	Approx. 10 m/ day. Delivery time for a new TBM of approximately one year
Construction cost	Lower	Higher
Effect on surroundings	Ground vibration to nearby facilities to be assessed.	Effect on surrounding is in generally less.
Environment	Noise, dust and visual impact on sensitive receives located near the tunnel portals; C & D materials from overbreak are expected	Noise, dust and visual impact on sensitive receives near the launching and retrieval shafts; Less C & D materials from overbreak

1.4.5 Based on the comparison of the two construction methods, drill-and-blast is preferred as it can adapt more variable rock condition, the ability to produce a more flexible tunnel cross section and a lower construction cost.

Geotechnical

(a) General Geology

1.4.6 The area of the potential alignments traverse through is dominated by Mesozoic intrusive dykes cutting granite and volcanic rocks. The hill slopes mainly comprise outcrops of Mesozoic tuff, lava and sedimentary rocks of the Upper Jurassic-Lower Cretaceous Repulse Bay Volcanic Group in the western and northern part of the area covering the proposed alignments. Superficial deposits of Quaternary age are also present on hill slopes, in valleys and more extensively in lowland areas. An overview of the geology of the area is shown in Drawing no. 2444613/G/3002.

(b) Geological Structures

1.4.7 The major geological structures observed / inferred within and close to the proposed alignments are shown in Drawing no. 2444613/G/3002. The southwest-northeast trending Shek Pik Fault is the most prominent fault within the area and cuts across the northwestern portion of the area. It is located approximately 70 to 80 m northwest from Tai Ho Wan and Siu Ho Wan. The southwest-northeast trending Yam O Fault is another major fault which is close to the proposed alignments. The Pak Mong Fault and Tai Ho Fault, trending northnortheast - southsouthwest and north-south respectively, are also recorded near to Tai Ho Wan.

(c) Solid Geology

1.4.8 The published 1:20,000 geological map indicates that the bedrock geology of area covering the proposed alignments comprises mainly of Rhyolite dykes within the onshore area. The Rhyolite dykes intruded into the rhyodacitic crystal tuff, which belongs to the Tsuen Wan Volcanic Group, and is observed at the eastern portion of the Area. Rhyolitic vitric tuff and lava belonging to the Lantau Volcanic Group and Granite belonging to the Lamma Suite are observed southwestern to the proposed alignments.

1.4.9 Further details also presented in the published 1:5,000 geological maps. These indicate that the majority of the hillside areas of the Area comprise Feldsparphyric Rhyolite and medium-grained Granite. The Feldsparphyric Rhyolite is dominant at the north flank of the hillside areas close to Siu Ho Wan while the medium-grained Granite is dominant at the south flank in south Lantau. Eutaxite of the Lantau Formation is dominantly a fine ash vitric tuff and flow-banded rhyolite lava with minor eutaxitic coarse ash crystal tuff. Several minor intrusions, including quartzphyric rhyolite, aplite, basalt and quartz veins can be found along the alignments.

(d) Hydrology

1.4.10 The proposed road tunnel alignments traverse through predominantly natural terrain areas with different river catchments. Comprises at least four main tributaries, Mui Wo River flows down the southeastern slopes of Lautau and drains into Silvermine Bay. The Discover Bay Reservoir and a few ponds are located to the east of the proposed road tunnel alignment.

(e) Instability Records

1.4.11 Historical data relating to any previously recorded landslides were collected through a review of GEO Enhanced Natural Terrain Landslide Inventory (ENTLI), Large Landslide Study (LLS) and GEO Incident records.

(f) Groundwater

1.4.12 Existing installed groundwater instrumentation including piezometer and standpipe, within 50 m of the proposed road tunnels have been reviewed and given in the following table. Available groundwater monitoring points are sparsely located along the proposed road tunnel and thus no interpreted groundwater levels could be made in most of the area.

1.4.13 Groundwater conditions at and in vicinity to the proposed tunnel portals and site formation works are to be reviewed during detail design stage. In view of the hilly terrain of the potential portal locations and the presence of existing natural drainages, groundwater level and flow may be significant during wet seasons and may result in potential risks of flooding and slope instability. Provision of raking drains and soil nails and proper drainage system shall be provided to mitigate the constraints arisen from groundwater.

Ventilation shaft

1.4.14 Ventilation shafts will be required for the proposed tunnel. Based on the diameter and length of the ventilation shaft, Pilot shaft method can be used for the construction of the ventilation shaft. The pilot shaft can be advanced by raise boring. After the pilot shaft is established, the final shaft is excavated from above by the drill and blast method, and the spoil is mucked down the pilot hole. Scaling

and rock support should be carried out successively from above. The permanent structure of the shaft can be constructed using cast in-situ concrete.

Slope Work

1.4.15 The at-grade and viaduct portion of the strategic link and the realignment of part of Cheung Tung Road involves site formation works. The most extensive slope work is at the south of realigned Cheung Tung Road to provide space for the accommodation of the ramps of Siu Ho Wan Interchange.

1.4.16 The site formation works for this section of road link will involve cutting of the existing natural hillsides and man-made slopes, for the platforms of at grade road mainly. A newly formed man-made soil slope will be constructed as a result, which is designed at 45 degree, 7.5m height maximum per batter 1m width berm. The newly formed slope will have maximum height about 40m. Newly formed minor cut slopes are to be constructed above proposed tunnel portals and the final extent shall be determined upon the final design of tunnel portal locations and level. The newly formed man-made slopes (proposed cut at 45 degree) above the proposed portals are anticipated to be less than 10m in all locations. Man-made slopes affected or be affected by the proposed works are to be dealt according to ETWB TC(W) No. 29/2002.

1.4.17 For the existing slopes may affect or be affected by the proposed road and tunnel works, a number of existing man made features are identified and given in Drawing No. 244613/G/3301 to 3303 for option route 4. Drawing No. 244613/G/3341 showed existing slopes that may be affected by the possible ventilation buildings. A summary of the potential impact to them is presented below and details are given in **Annex 1** Man-made slopes affected or be affected by the proposed works are to be dealt according to ETWB TC(W) No. 29/2002.

Table 1.5 Potential Impact to Existing Man-made Features

Feature No.	C-T-L Category	Past Instability	Related Earthworks	Potential Impact
10NW-C/C2	2	At the Footslope of Large Landslide Dataset 10NWCL006	Siu Ho Wan Interchange and Realignment of Cheung Tung Road	To be modified
10NW-C/C11	3	At the Footslope of Large Landslide Dataset 10NWCL007	Realignment of Cheung Tung Road	To be modified
10NW-C/C22	2	Nil	Realignment of Cheung Tung Road	To be modified

Feature No.	C-T-L Category	Past Instability	Related Earthworks	Potential Impact
10NW-C/C26	2	At the Footslope of Historical Landslide Catchment 10NW-C/DF2 and partially within Large Landslide Dataset 10NWCL004	Realignment of Cheung Tung Road	To be modified
10NW-C/C27	2	At the Footslope of Historical Landslide Catchment 10NW-C/DF2	Realignment of Cheung Tung Road	To be modified
10NW-C/C28	2	Nil	Realignment of Cheung Tung Road	To be modified
10NW-C/C30	3	Nil	Possible Piling of Viaduct at Siu Ho Wan Interchange	To be modified
10NW-C/C34	3	Nil	Possible Piling of Viaduct at Siu Ho Wan Interchange	To be modified
10NW-C/C35	3	Nil	Realignment of Cheung Tung Road	To be modified/ removed
10NW-C/C37	3	Nil	Realignment of Cheung Tung Road	To be modified
10NW-C/C40	3	Nil	Realignment of Cheung Tung Road	To be modified
10NW-C/C54	2	Partially within Historical Landslide Catchment 10NW-C/DF4 and 10NW-C/DF5	Possible Piling of Viaduct at Siu Ho Wan Interchange	To be modified
10NW-C/F2	3	Nil	Interchange and Realignment of Cheung Tung Road	To be modified
10NW-C/F23	2	Nil	Interchange	To be modified
10NW-C/F24	3	Nil	Realignment of Cheung Tung Road	To be modified
10NW-C/F27	2	Nil	Possible Piling of Interchange	To be modified
10NW-C/F41	2	At the Footslope of Large Landslide Dataset 10NWCL006	Realignment of Cheung Tung Road	To be modified
10NW-C/F42	1	Nil	Realignment of Cheung Tung Road	To be modified

Feature No.	C-T-L Category	Past Instability	Related Earthworks	Potential Impact
10NW-C/F47	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/F51	2	Nil	Realignment of North Lantau Highway and Cheung Tung Road	To be modified
10NW-C/FR26	1	Nil	Realignment of North Lantau Highway	To be modified
10NW-C/FR28	2	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/FR34	3	At the Footslope of Large Landslide Dataset 10NWCL006	Realignment of Cheung Tung Road	To be modified
10NW-C/FR35	3	Nil	Realignment of Cheung Tung Road	To be modified
10NW-C/R9	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R10	3	Partially at the Footslope of Large Landslide Dataset 10NWCL002	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R11	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R12	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R15	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R16	3	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R18	2	Nil	Possible Piling of Interchange Viaduct	To be modified
10NW-C/R19	2	Nil	Possible Piling of Interchange Viaduct	To be modified

1.4.18 A number of recent and relict landslides, boulder fields have been recorded in the ENTLI at and in vicinity to the proposed tunnel portals (Drawing No. 244613/G/3032). In addition, recorded historical landslide catchments (HLC) are identified in closed vicinity to the proposed infrastructure works (Drawing No. 244613/G/3032). NTHS will be required to assess whether the natural landslide

hazards will affect the proposed road links, particularly the tunnel portals, ventilation shafts, piers of proposed viaducts, and etc. Natural terrain hazard mitigation measures are to be recommended, if found necessary, in accordance with GEO Report No. 138, GEO TGN 36 and the relevant published technical standards.

1.4.19 A number of existing unregistered man-made features affected or be affected by the proposed road links are given in Drawing No. 244613/G/3301 to 3303. All the unregistered slopes concerned shall be dealt with under the requirements of ETWB TC(W) No. 29/2002.

1.4.20 The strategic road link will unavoidably have to encroach in the Deposited Area for Discovery Bay Tunnel Link and Tunnel Area, and other Lots other than government lands. The land (including slope features) will be acquired under the CAP 370 Roads (Works, Use and Compensation) Ordinance through the normal gazettal process.

Tunnel Protection Zone

1.4.21 To protect the structural integrity of the road tunnel from future disturbance, it is proposed that 30m measured on plan from each side of the tunnel perimeter to be zoned as road tunnel protection zone. Parties carrying out future construction within the tunnel protection zone will have to consult the tunnel maintenance party and to demonstrate that the construction has no adverse impact to the road tunnel.

1.5 Environmental Consideration

1.5.1 Since the tunnel section will run underneath the country park, it will not affect the habitat or any tree species within the country park. Special attention should be paid during the determination of ventilation buildings along the preferred routing and effort should be made to minimise the disturbance on Country Park due to the erection of above ground structures. From the preliminary design as shown in Drawing No. 244613/H/1002, all the potential tunnel portal, the associated slope formations, access and aboveground structures would be located on the hillside outside the country park area. In addition, possible encroachment on Tai Ho Wan and Tai Ho Steam SSSI should be avoided and any potential disturbance impacts should be minimized. The nearest distance between the recommended route and Tai Ho Stream SSSI is more than 600m and underneath the existing ground. The proposed level of tunnel portal at Siu Ho Wan is around +31.5mPD where the level of the nearest Country Park Boundary is around +98mPD, impacts due to terrain modification and site formation to the Country Park are therefore not expected to be significant. Nevertheless, further study shall be carried out to evaluate the

potential impact on Country Park, Tai Ho Wan and Tai Ho Stream SSSI during construction phase and operational phase in the future investigation stage.

1.5.2 Freshwater marshes Luk Tei Tong Marsh, which comprise of active wet agriculture, inactive wet agriculture, pond, and river/ stream, have been identified in Mui Wo. Since the extent of marshland is yet to be confirmed under this Study, the alignment of road link shall minimise the disturbance to marshland to avoid significant ecological impact on this marshland.

1.5.3 The Road P1 Siu Ho Wan section and the road access to the reclamation development would be constructed on newly reclaimed land, therefore marine works is not expected to be involved. In addition, any direct encroachment on fisheries resources such as fishponds on land would be avoided.

1.5.4 One key issue is that the viaduct sections of preferred road link alignment with its associated portals would fall within the 1km Consultation Zones (CZ) of SHWWTW in Siu Ho Wan. Quantitative Risk Assessment (QRA) is required in the future investigation stage to demonstrate that the risks due to new development road link, which results in increase of transient population within the CZ, are acceptable in accordance with the Risk Guidelines. In addition, in the event of any possible chlorine gas leakage, chlorine could also be drawn into the tunnel via the portals and proper mitigation measures such as activation of outdoor air supply from ventilation building could be considered subject to the outcome of QRA. The CZ of SHWWTW PHI could possibly be reduced from l km to 400m. A detailed assessment on the QRA shall be carried out in future studies taking into account the transient population of the proposed strategic road link and the latest status of the possible conversion work in SHW WTW.

1.5.5 Quantitative noise assessment will be carried out in the EIA stage to determine the need for noise barrier along the viaduct section for protection of existing noise sensitive receivers located approximately 150m-200m away from the alignment. In case noise mitigations are required to achieve full noise compliance at noise sensitive receivers, exact extent of the noise mitigation will be further determined during EIA stage. Nevertheless, the installation of the noise barrier on viaduct structure is typical.

1.5.6 On EIA waste aspect, the mucking out from the main tunnel will mostly be good-quality rock. According to the geological profile, the excavated material will be mainly rhyolite in the north and granite in the south portion of the proposed tunnel. The good-quality excavated granite is likely suitable for use in concrete production whereas the other type of rocks can be classified and reused as rock fill for bedding

or seawall. It is recommended that the good-quality granite can also be exported to quarry site for further beneficial reuse.

1.6 Land Requirement

Siu Ho Wan

1.6.1 Portion of the Permanent Government Land Allocation (GLAs) along Cheung Tung road has to be resumed to provide space for the interchange. However, major structure of the facility is avoided. The extent of the land acquisition is shown in Drawing No. 244613/H/1103 to 1104. Further liaison with the relevant government departments is to be followed up in the future.

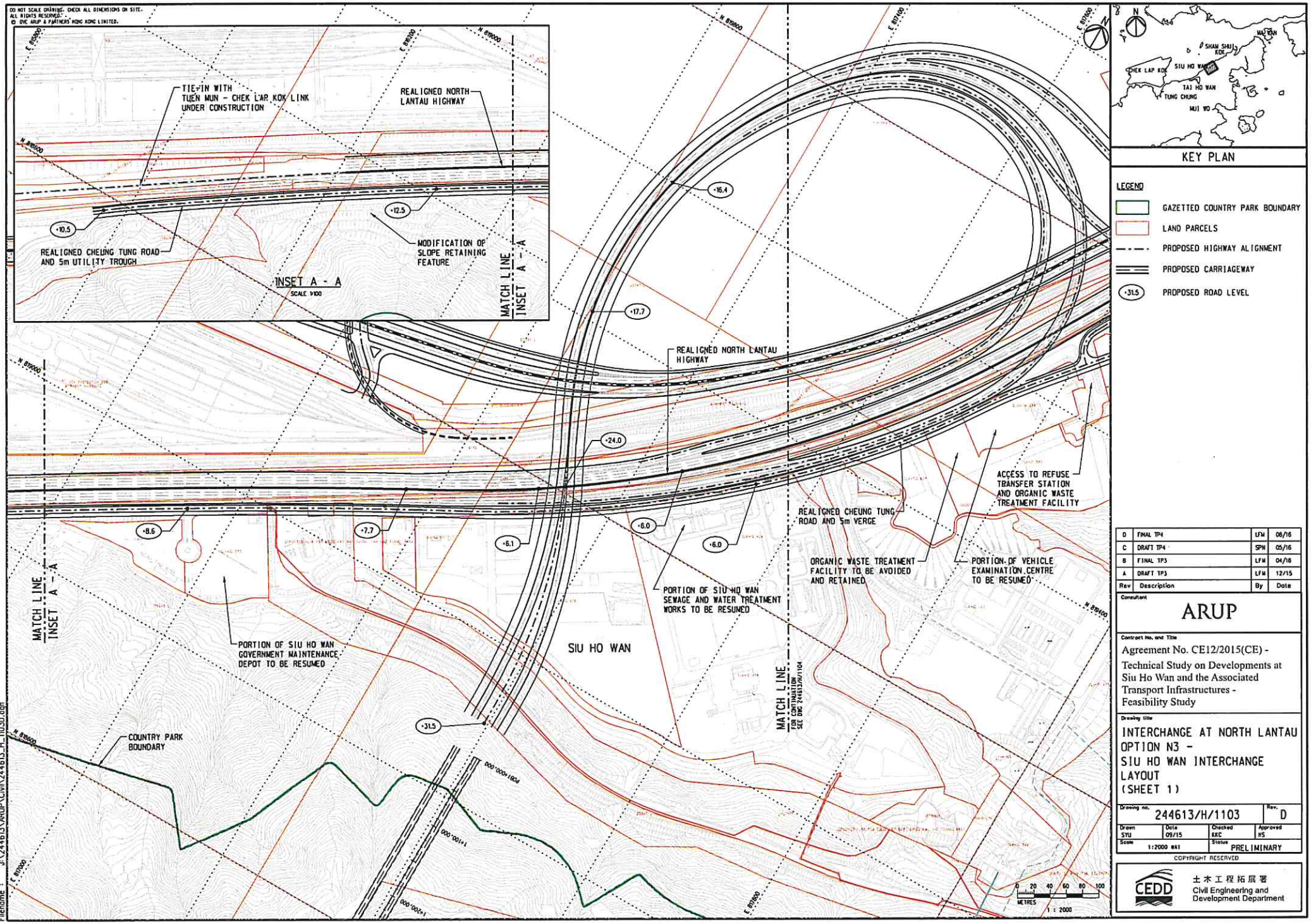
- Siu Ho Wan Government Maintenance Depot (GLA-IS 373)
- Siu Ho Wan Sewage Treatment Works (GLA-IS 424)
- Siu Ho Wan Water Treatment Works (GLA-IS 425)
- Organic Waste Treatment Facility (GLA-IS 582)
- Siu Ho Wan Vehicle Pound Vehicle Examination Centre and Weigh Station (GLA-TW 374)

1.6.2 Portion of the Short Term Tenancy (STTs) along Cheung Tung road has to be resumed to provide space for the interchange.

- New Lantao Bus Repairing Centre (STT CX 1367)
- KMB Siu Ho Wan Bus Depot (STT 1200)
- (STT CX 1883)

1.6.3 In addition, there are several Temporary Government Land Allocation (TGLAs) to be resumed along realigned Cheung Tung Road. The TGLAs are currently mostly site office or works area and are likely to expire by the time of implementation of the strategic road link.

1.6.4 The Siu Ho Wan Interchange is crossing the MTRCL Lot No. 2 RP at five locations. Easement will need to be created at these locations and liaison with MTRCL will be required.



Rev	Description	By	Date
D	FINAL TP4	LFM	08/16
C	DRAFT TP4	SPN	05/16
B	FINAL TP3	LFM	04/16
A	DRAFT TP3	LFM	12/15

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

INTERCHANGE AT NORTH LANTAU
OPTION N3 -
SIU HO WAN INTERCHANGE LAYOUT
(SHEET 1)

Drawing no.	Rev.
244613/H/1103	D

Drawn	Date	Checked	Approved
SYU	09/15	KKC	HS

Scale 1:2000 @A1 — Status PRELIMINARY

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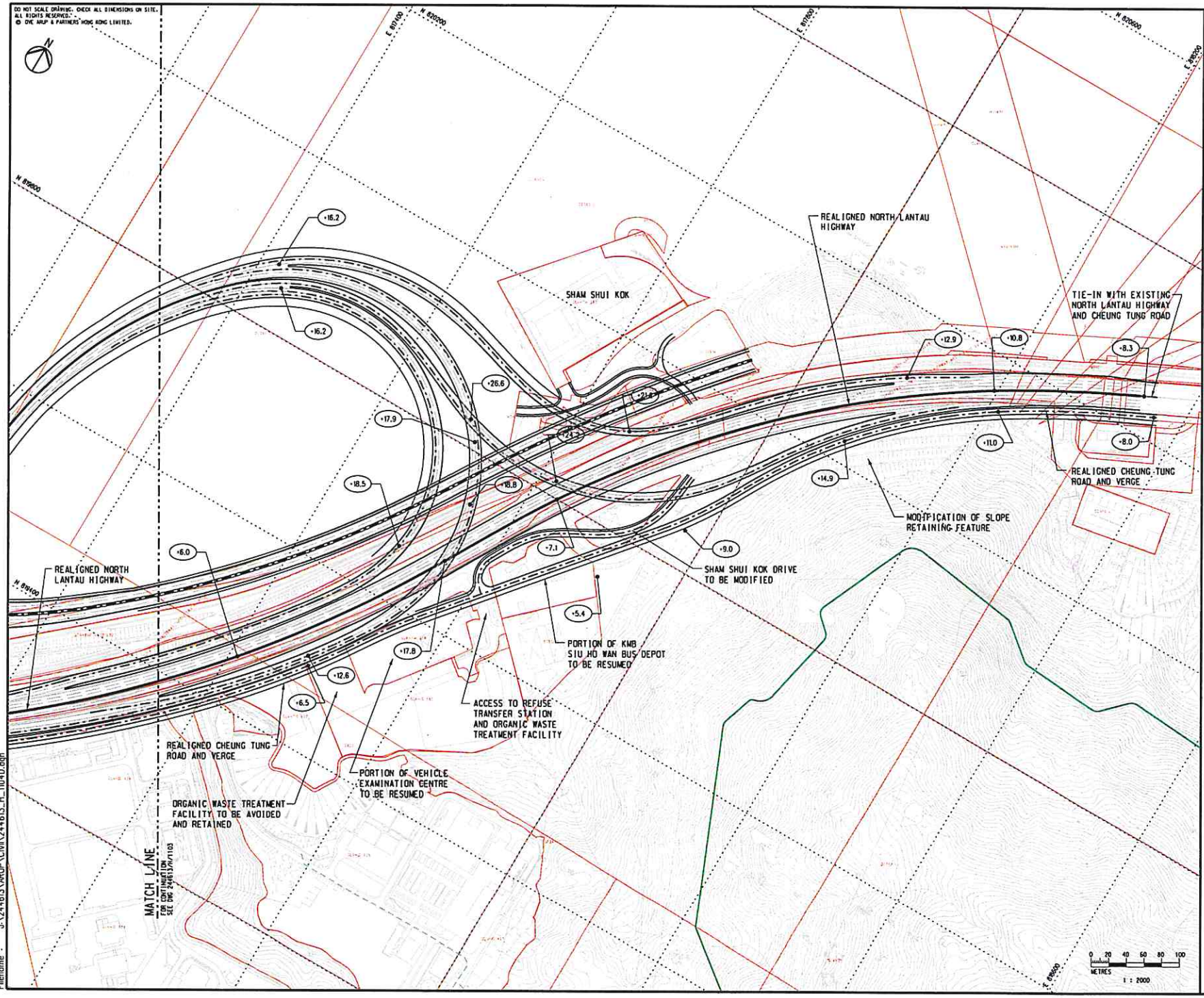

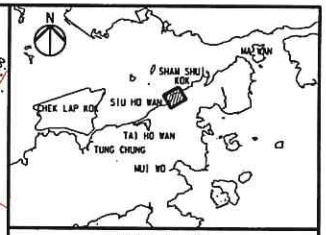

KEY PLAN

LEGEND

- GAZETTED COUNTRY PARK BOUNDARY
- LAND PARCELS
- PROPOSED HIGHWAY ALIGNMENT
- PROPOSED CARRIAGEWAY
- +31.5 PROPOSED ROAD LEVEL

Rev	Description	By	Date
D	FINAL TP4	LFM	08/16
C	DRAFT TP4	SPN	05/16
B	FINAL TP3	LFM	04/16
A	DRAFT TP3	LFM	12/15

Consultant

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

INTERCHANGE AT NORTH LANTAU
OPTION N3 -
SIU HO WAN INTERCHANGE
LAYOUT
(SHEET 2)

Drawing no.	Rev.
244613/H/1104	D

Drawn	Date	Checked	Approved
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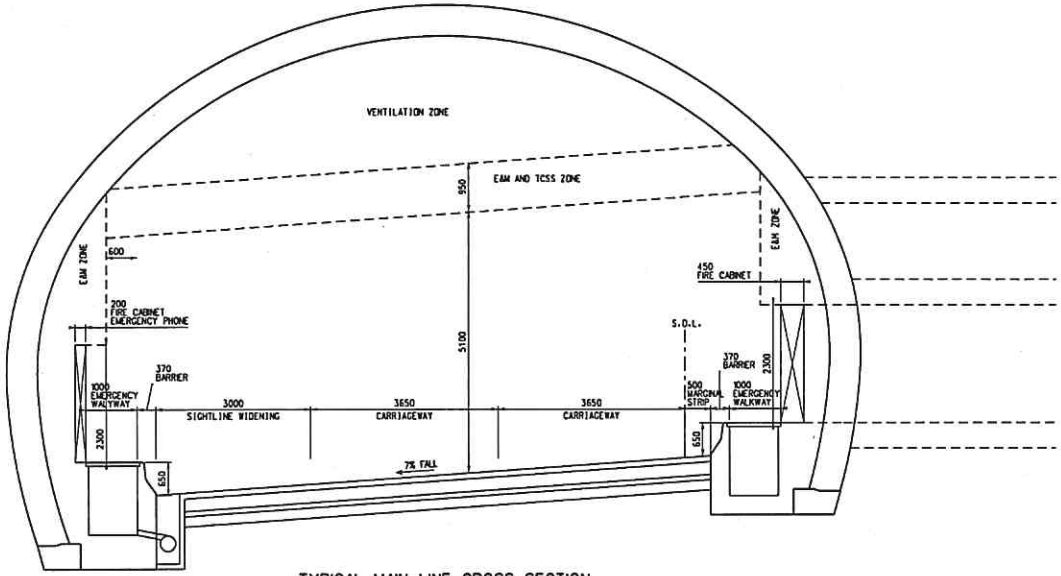
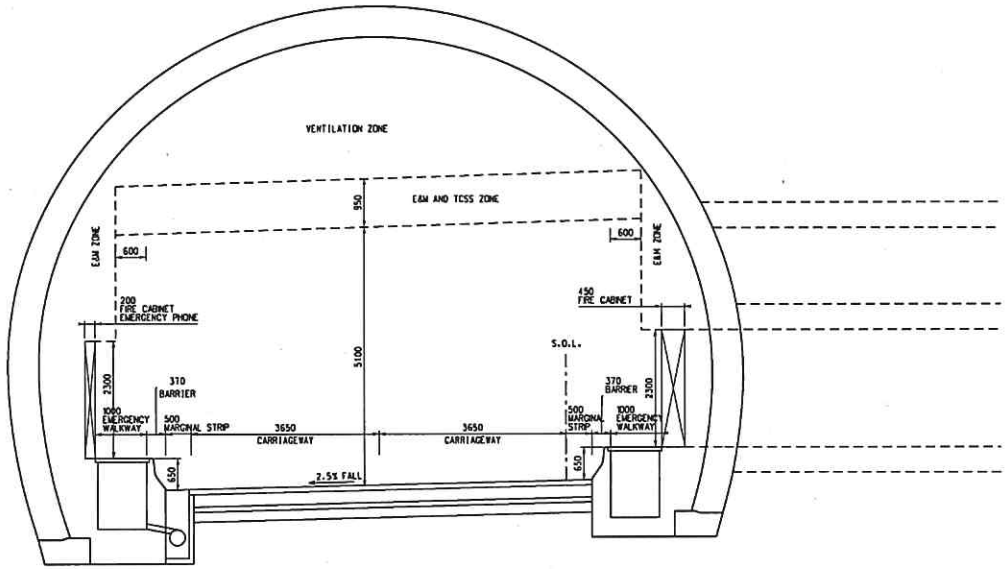


TYPICAL MAIN LINE CROSS SECTION
(TUNNEL AT CURVE)



TYPICAL MAIN LINE CROSS SECTION
(TUNNEL AT STRAIGHT)

Rev	Description	By	Date
B	FINAL TP4	LFM	08/16
A	DRAFT TP3	LFM	12/15

Consultant

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

ROAD CROSS SECTION
FOR STRATEGIC LINK
(SHEET 1)

Drawing no.	Rev.
244613/H/2001	B

Drawn	Date	Checked	Approved
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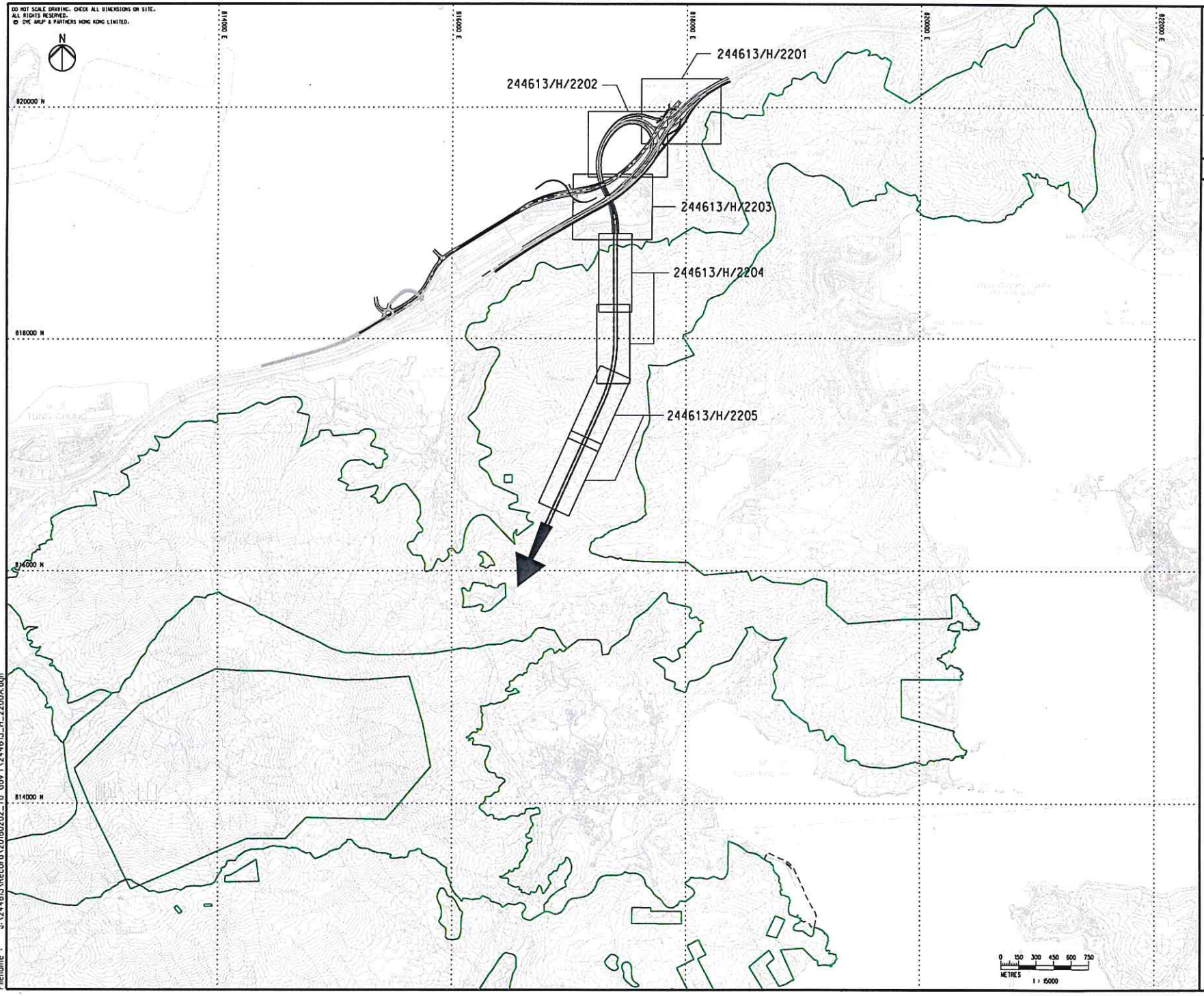

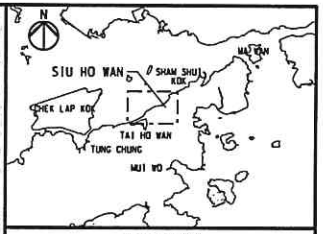

KEY PLAN

Rev	Description	By	Date
A	DRAFT TP4	SPN	12/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

STRATEGIC LINK SCENARIO H2
(SIU HO WAN TO SOUTHEAST LANTAU)
OPTION ROUTE 4

Drawing no.		Rev.
244613/H/2200		A
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		Approved: HS
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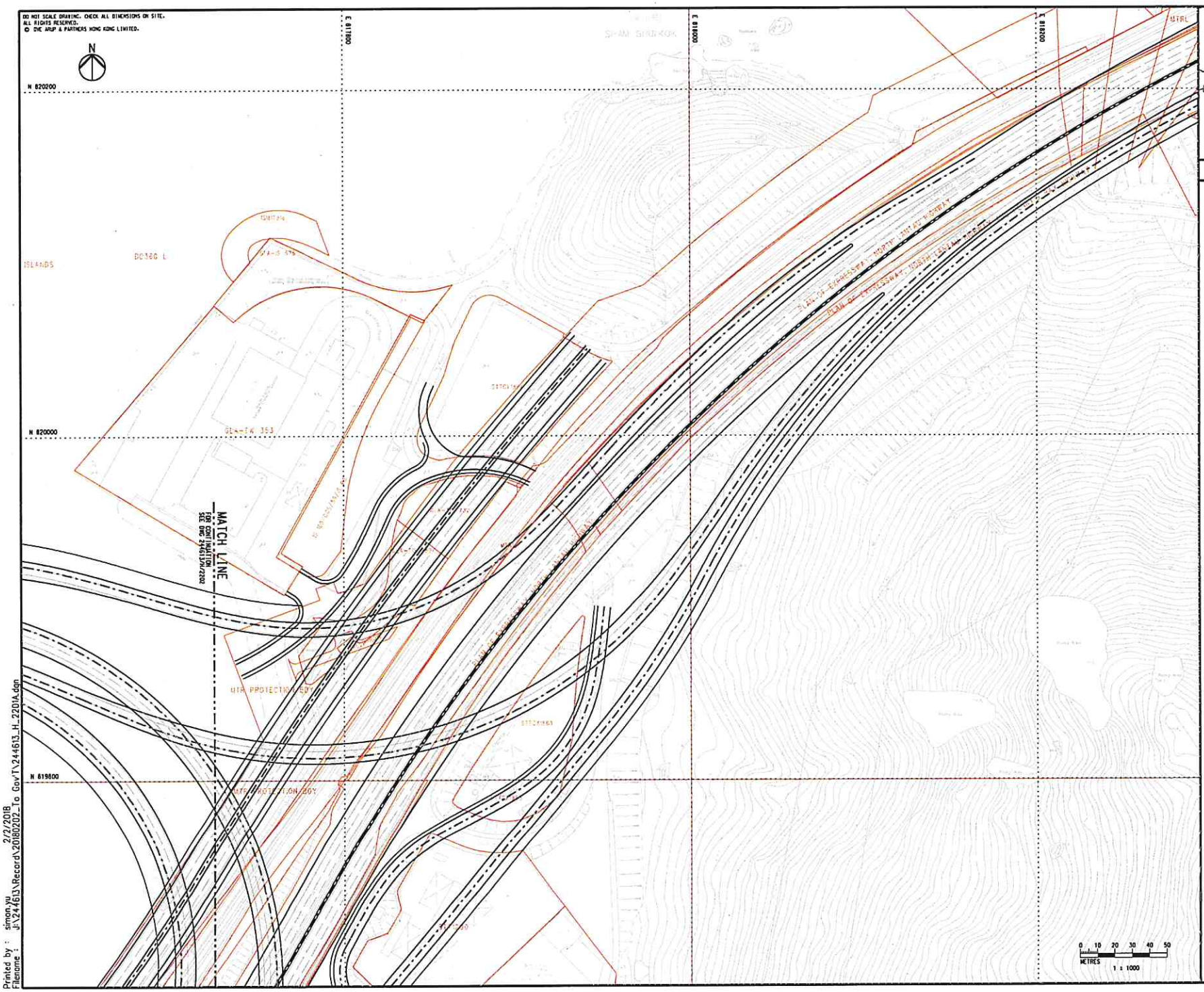

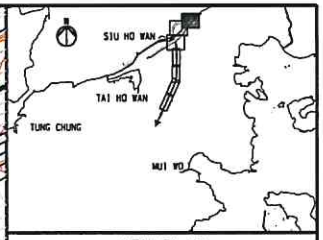

KEY PLAN

Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

Consultant

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing Title

STRATEGIC LINK SCENARIO H2
(SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO)
OPTION ROUTE 4
(SHEET 1)

Drawing no.	Rev.
244613/H/2201	A

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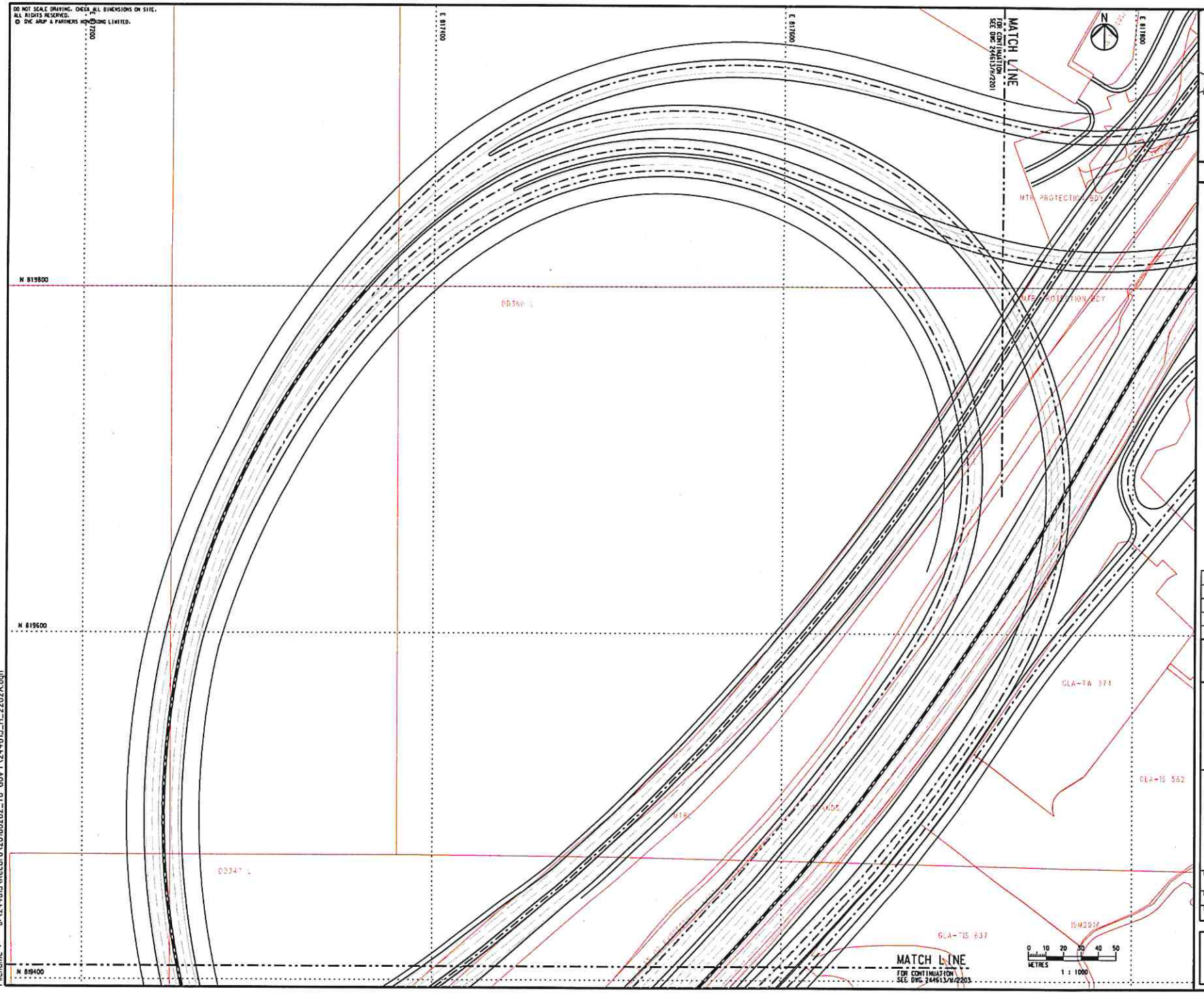

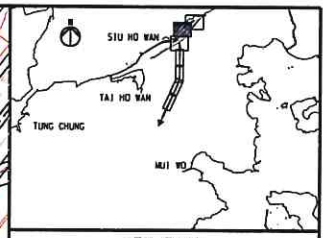

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Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

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Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing Title

STRATEGIC LINK SCENARIO H2
(SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO)
OPTION ROUTE 4
(SHEET 2)

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244613/H/2202	A

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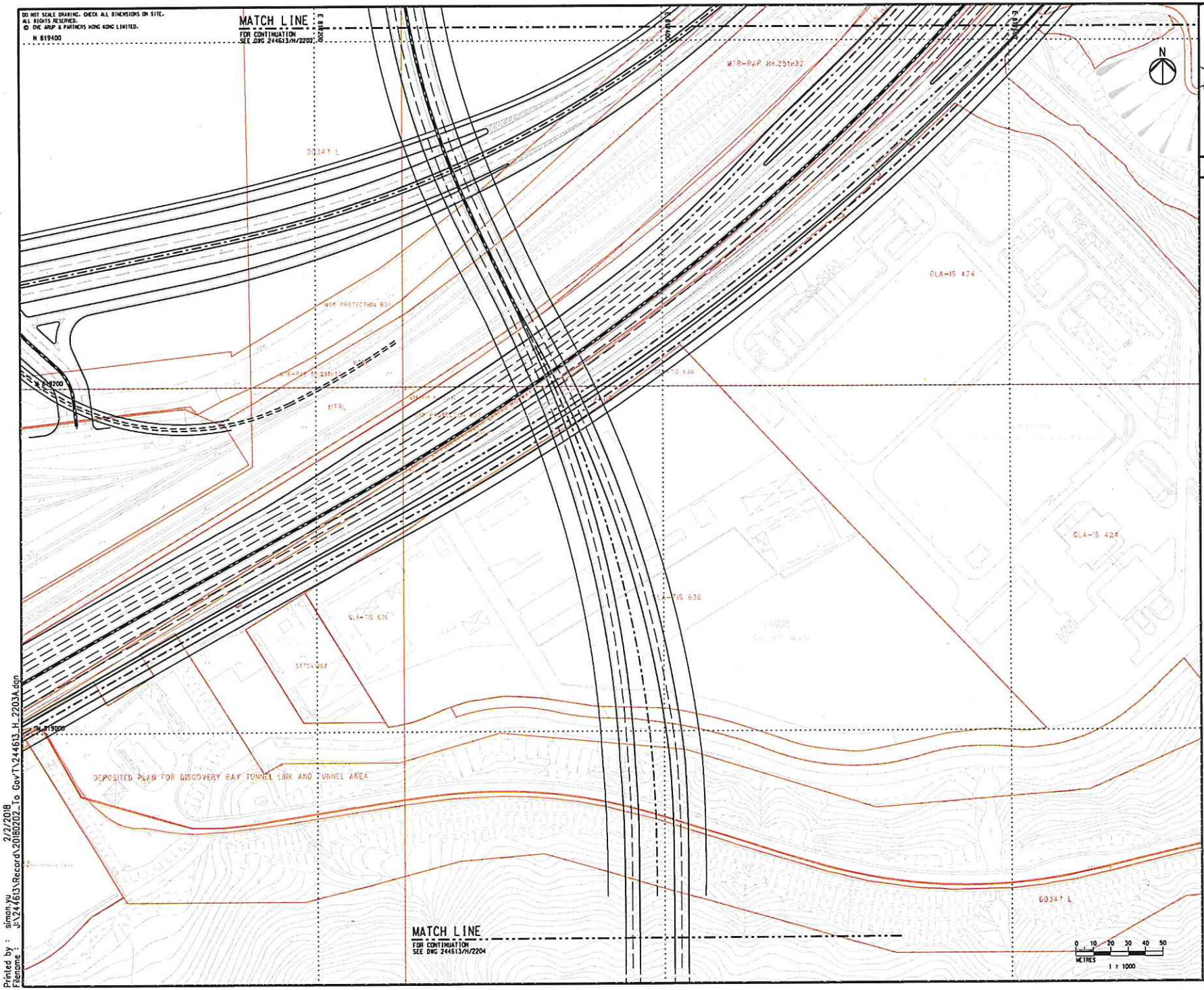

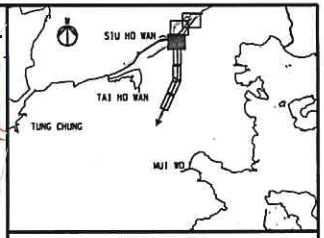

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A	DRAFT TP4	SPN	05/16

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Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

STRATEGIC LINK SCENARIO H2
(SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO)
OPTION ROUTE 4
(SHEET 3)

Drawing no.	Rev.
244613/H/2203	A

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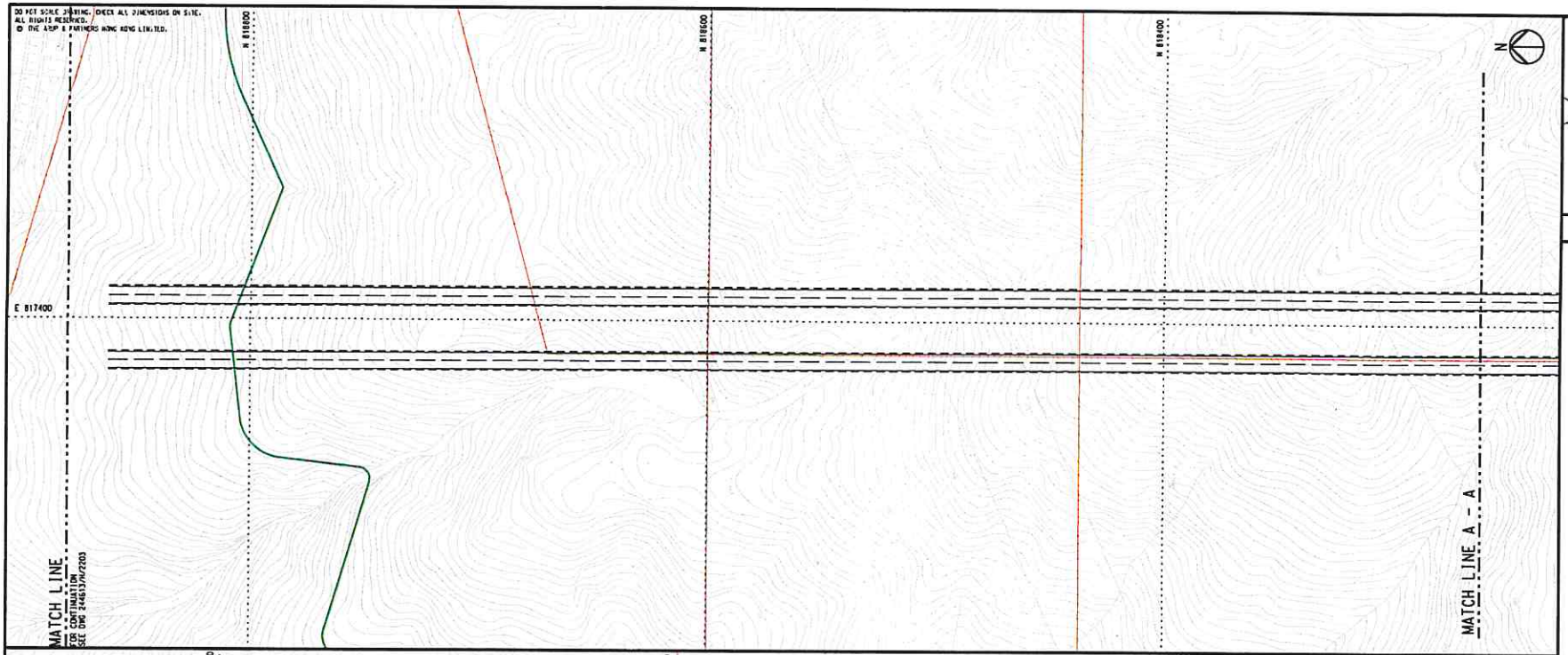

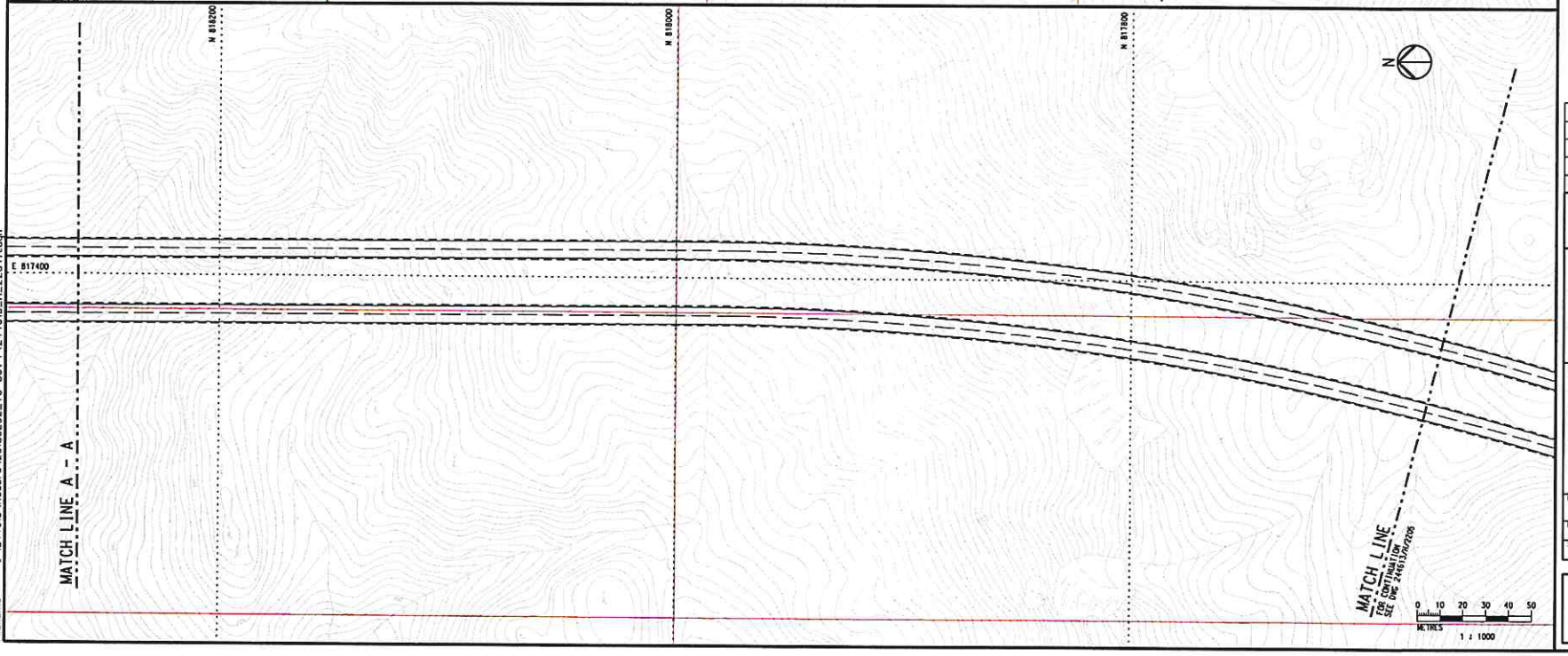

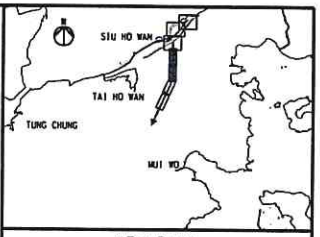

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Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

STRATEGIC LINK SCENARIO H2 (SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO) OPTION ROUTE 4 (SHEET 4)

Drawing no.		Rev.
244613/H/2204		A
Drawn: STU	Date: 12/15	Checked: KKC
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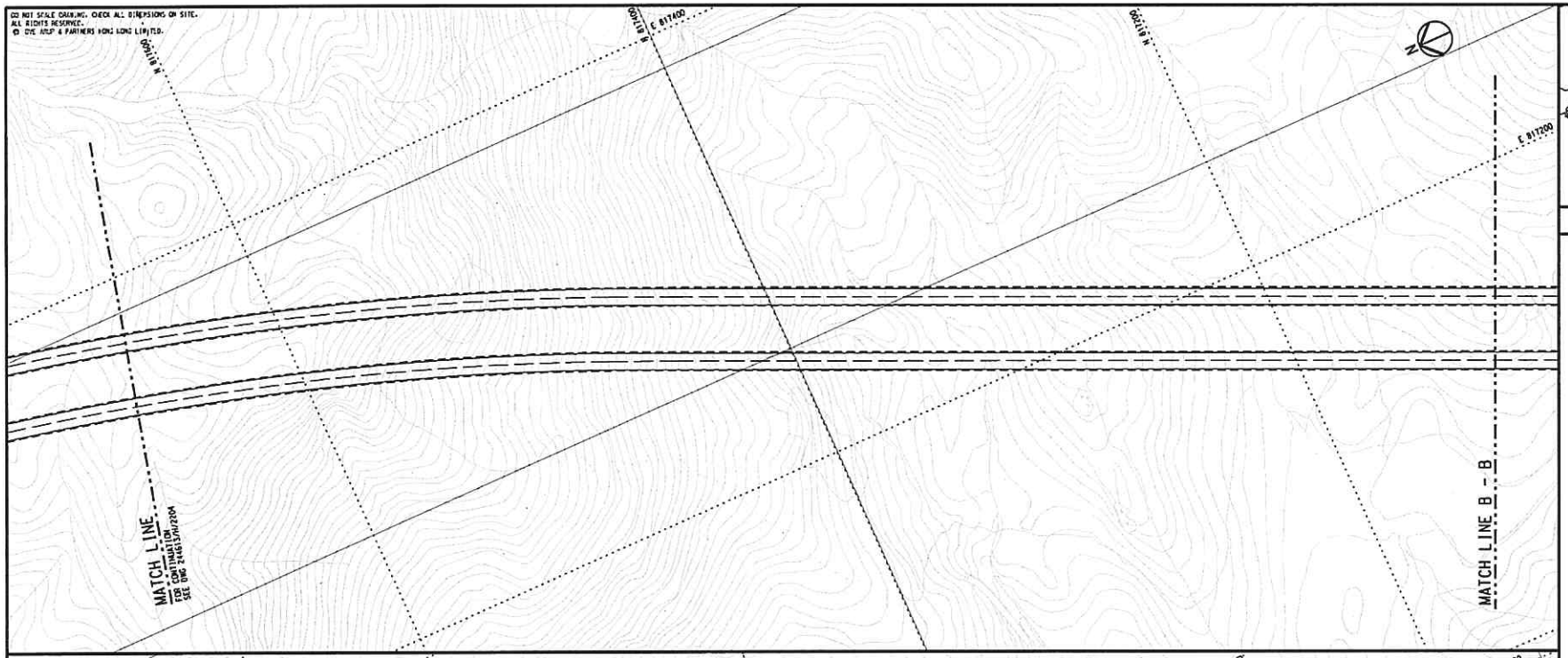

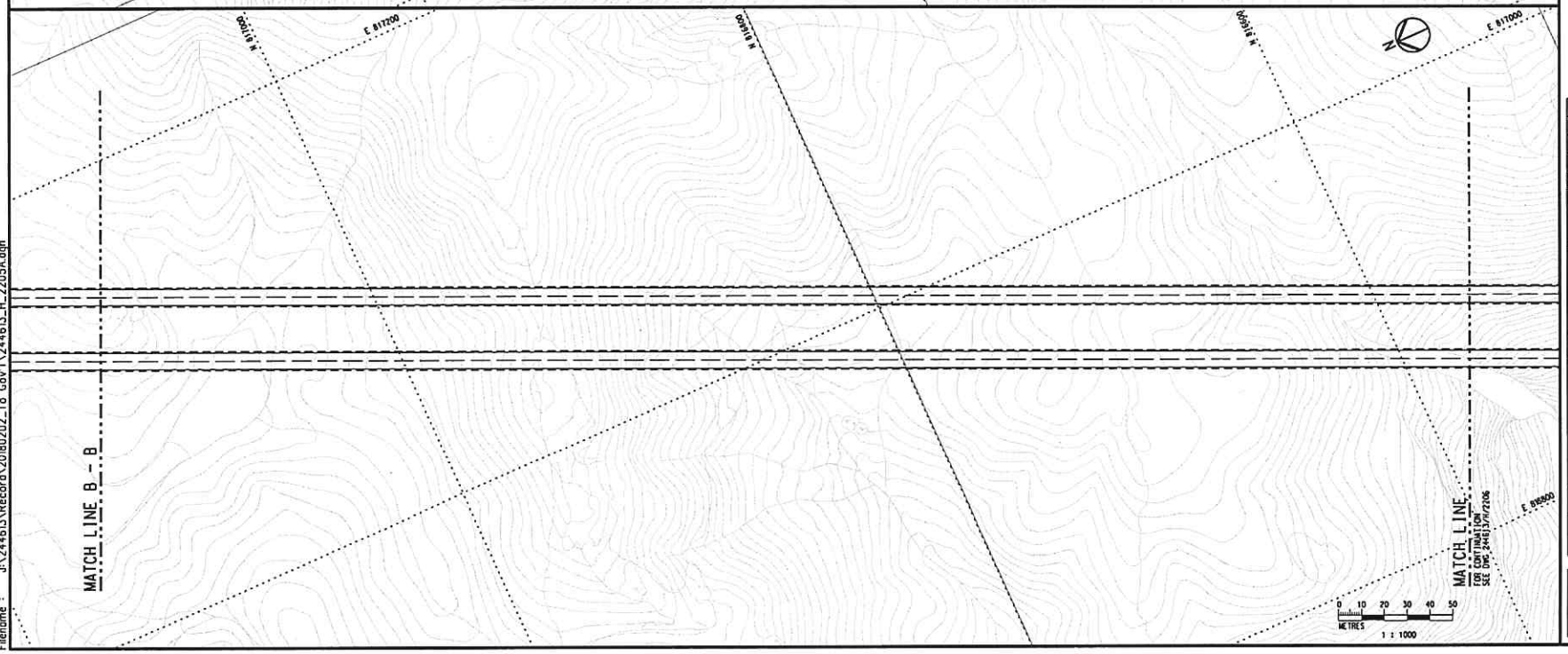

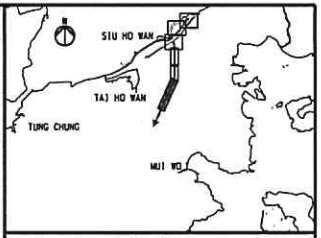

KEY PLAN

Rev	Description	By	Date
A	DRAFT TP4	SPN	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

STRATEGIC LINK SCENARIO H2
(SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO)
OPTION ROUTE 4
(SHEET 5)

Drawing no.	Rev.
244613/H/2205	A

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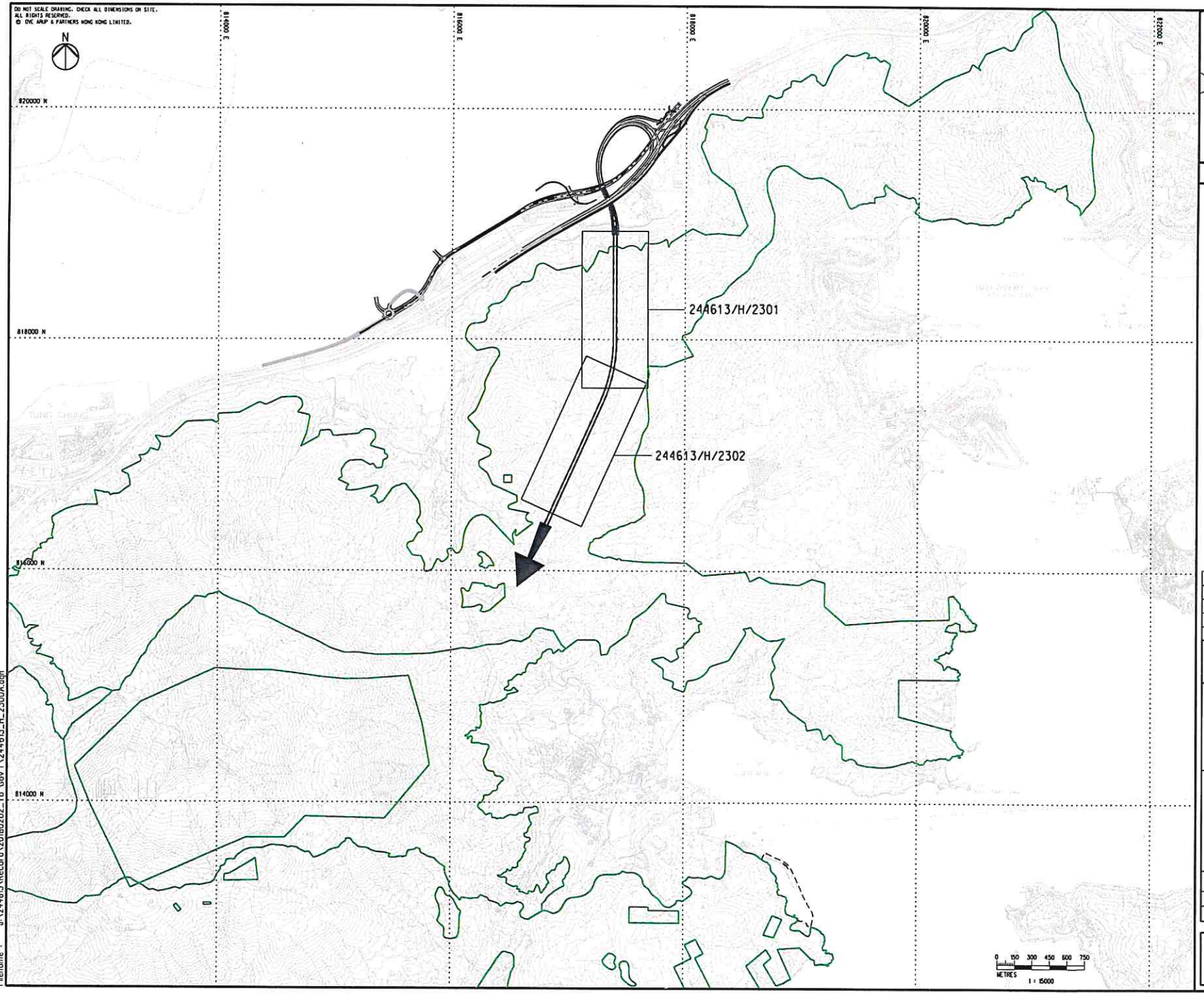

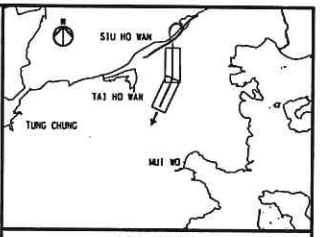

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Rev	Description	By	Date
A	DRAFT TP4	SPH	05/16

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Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SIU HO WAN TO SOUTHEAST LANTAU TUNNEL HORIZONTAL AND VERTICAL ALIGNMENTS KEY PLAN (ROUTE 4)

Drawing no.	Rev.
244613/H/2300	A

Drawn	Date	Checked	Approved
TING	12/15	KKC	HS

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Status: PRELIMINARY

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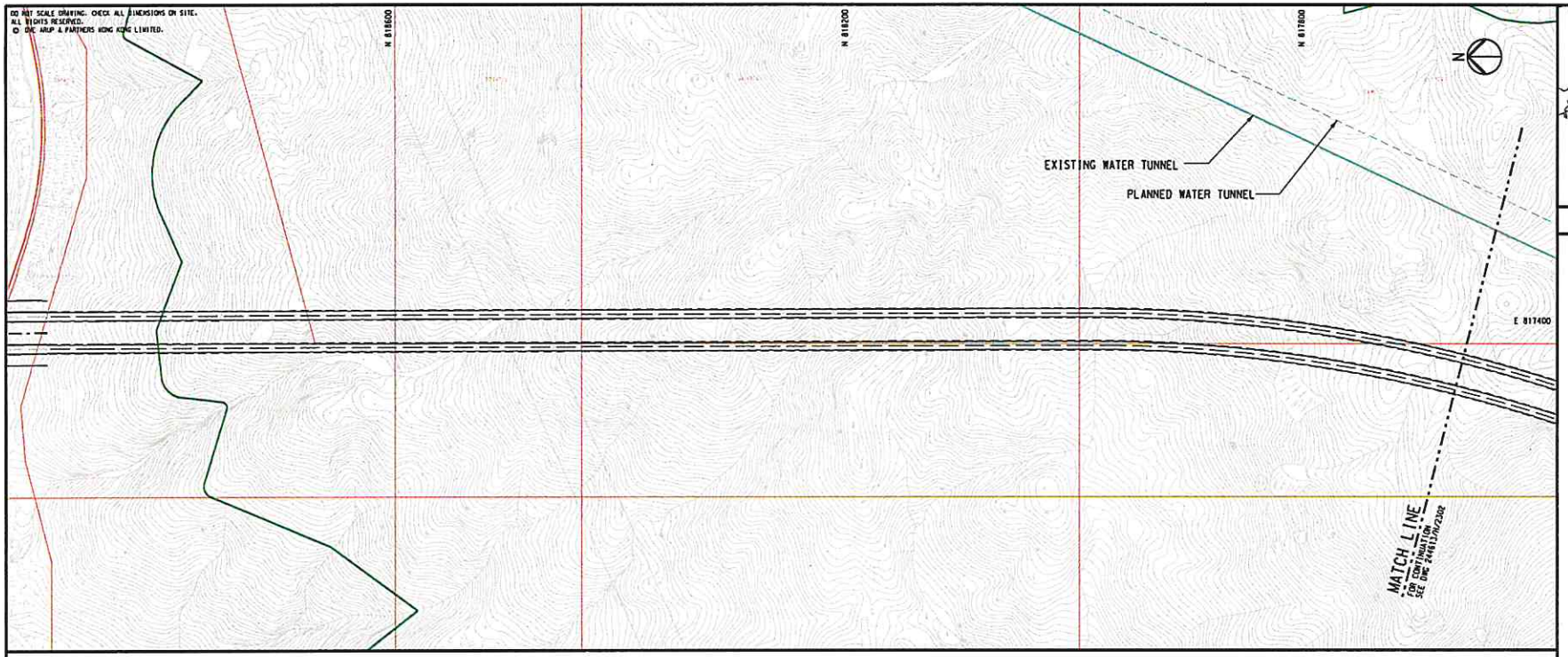

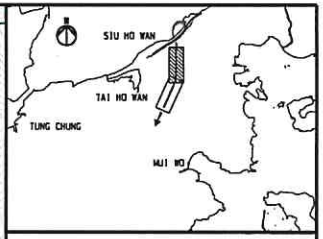

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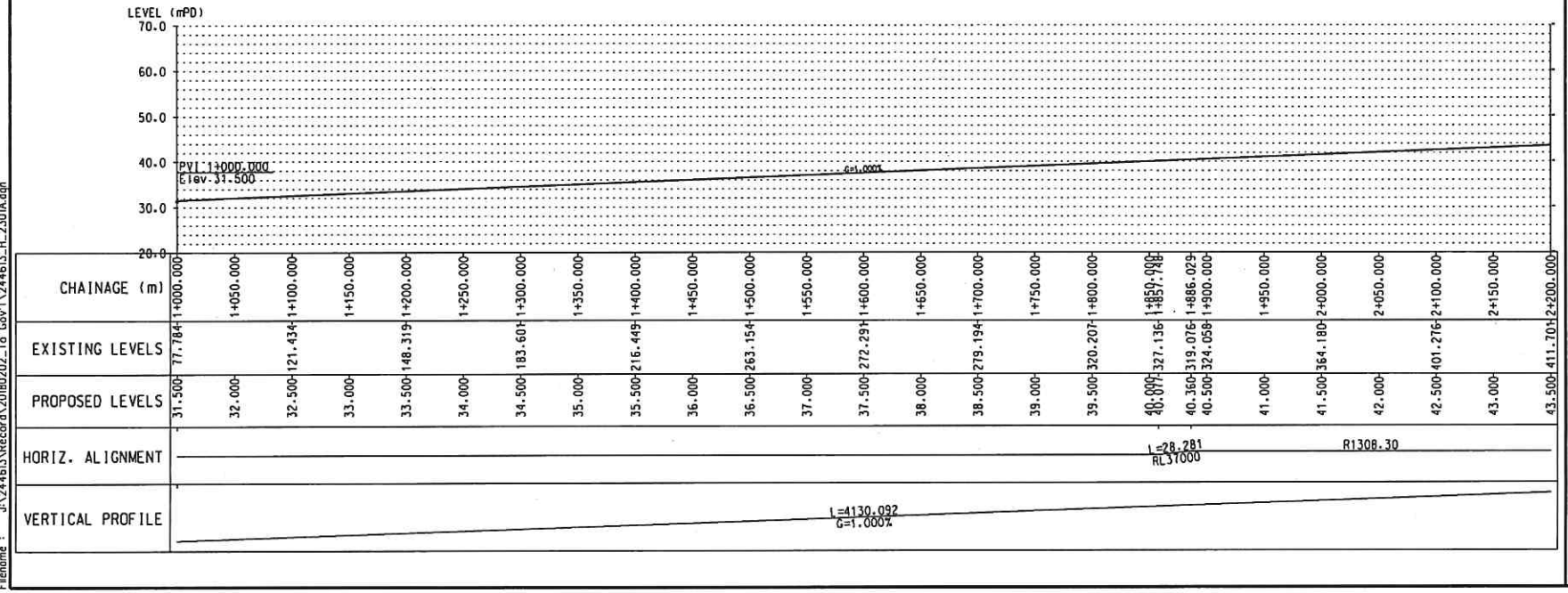

Rev	Description	By	Date
A	DRAFT TP4	SPH	05/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing Title

SIU HO WAN TO SOUTHEAST LANTAU TUNNEL HORIZONTAL AND VERTICAL ALIGNMENTS KEY PLAN (ROUTE 4) (SHEET 1)

Drawing no.		Rev.
244613/H/2301		A
Drawn: SYU	Date: 12/15	Checked: KKC	Approved: HS
Scale: HOR 1:2000 @A1, VER 1:500	Status: PRELIMINARY	

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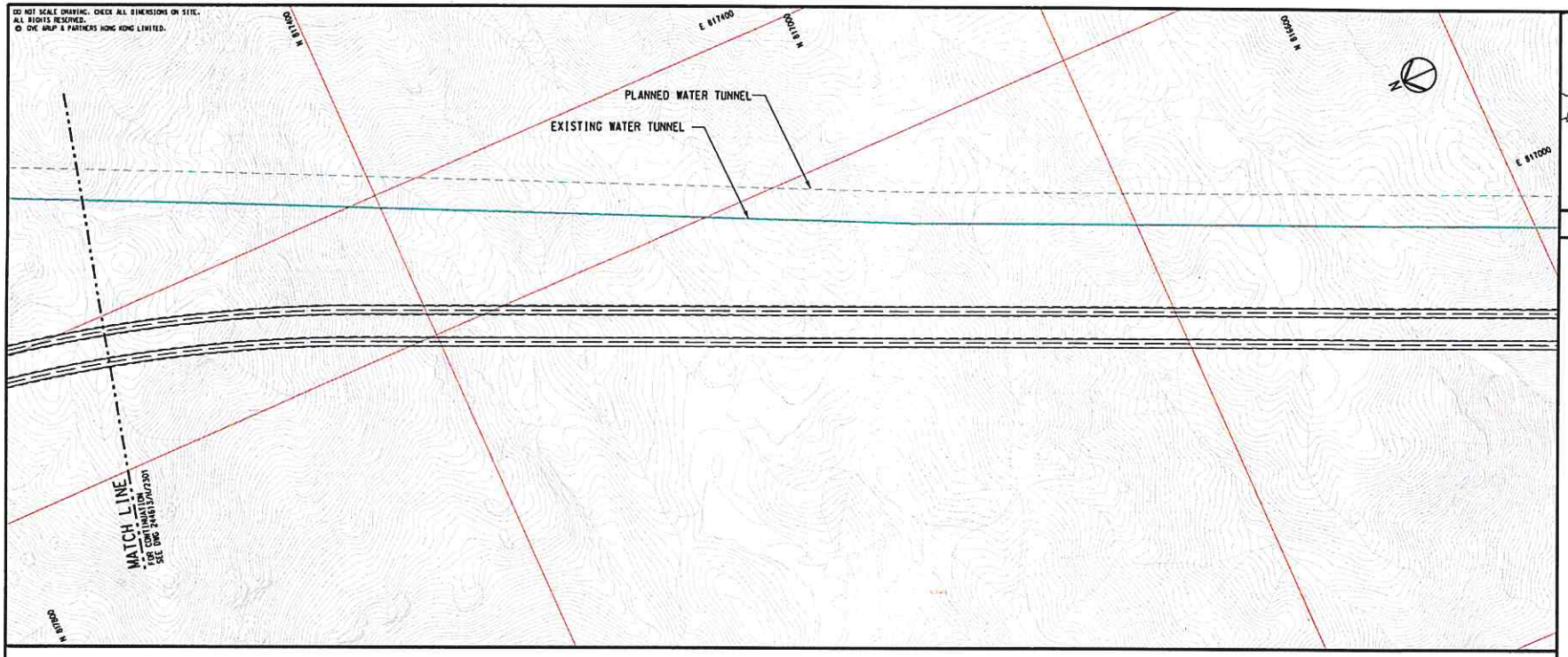

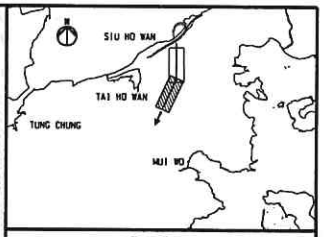

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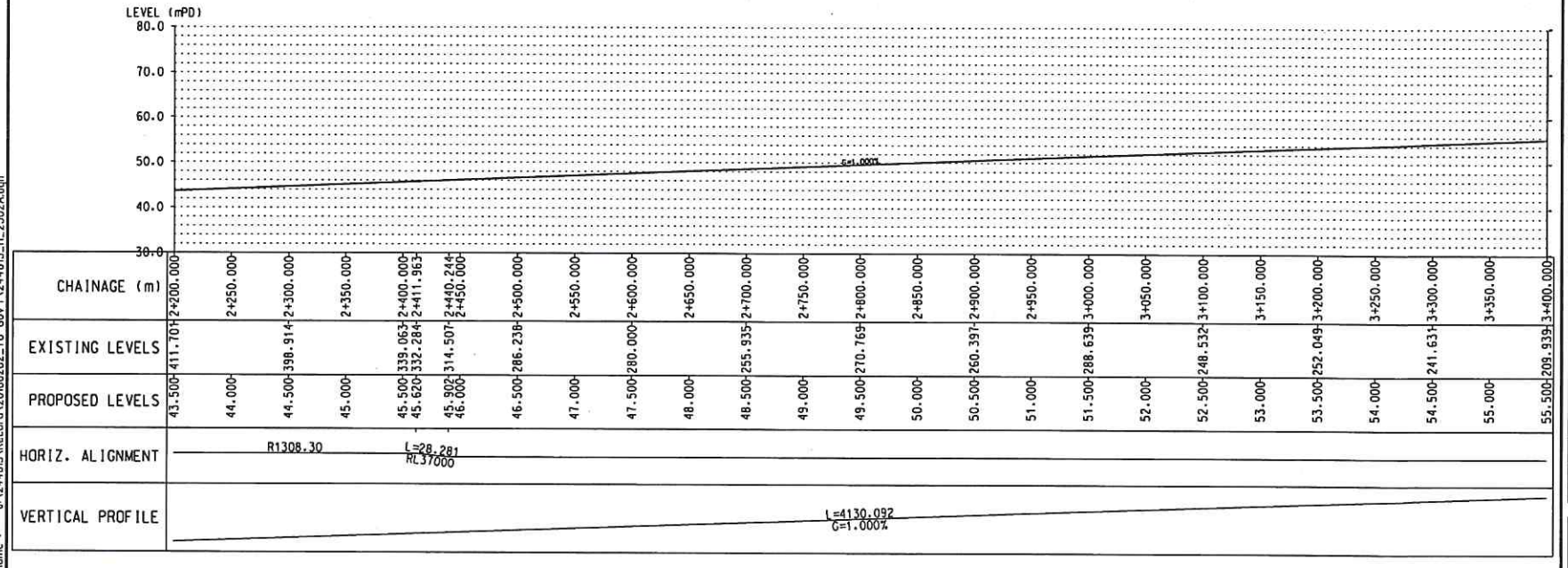

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A	DRAFT TP4	SPN	05/16

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Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SIU HO WAN TO SOUTHEAST LANTAU TUNNEL HORIZONTAL AND VERTICAL ALIGNMENTS KEY PLAN
(ROUTE 4)
(SHEET 2)

Drawing no.	Rev.
244613/H/2302	A

Drawn	Date	Checked	Approved
STU	12/15	RKC	HS

Scale: HOR 1:2000 @A1, VER 1:500
Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : simon.yu 2/2/2018
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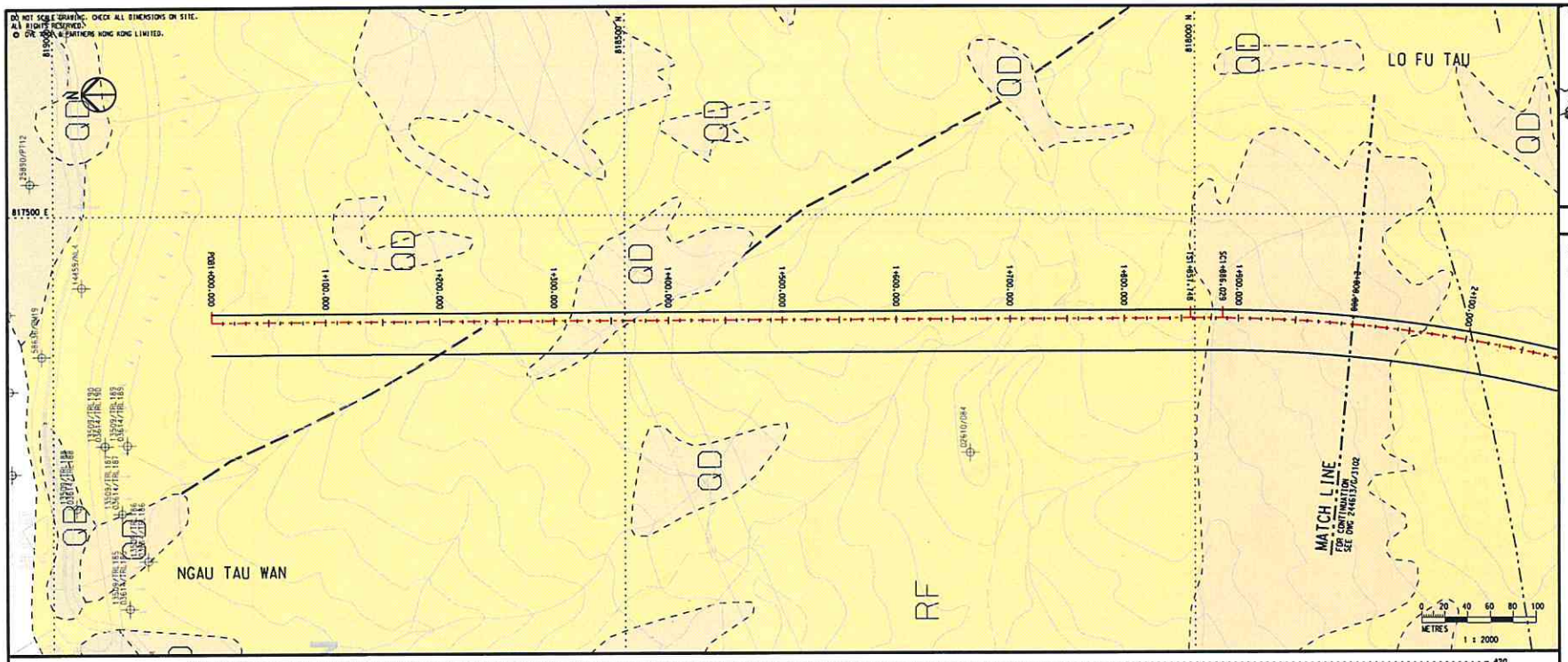
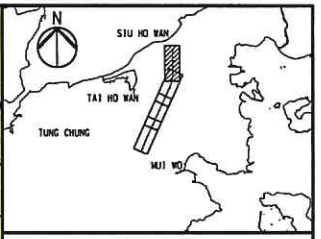
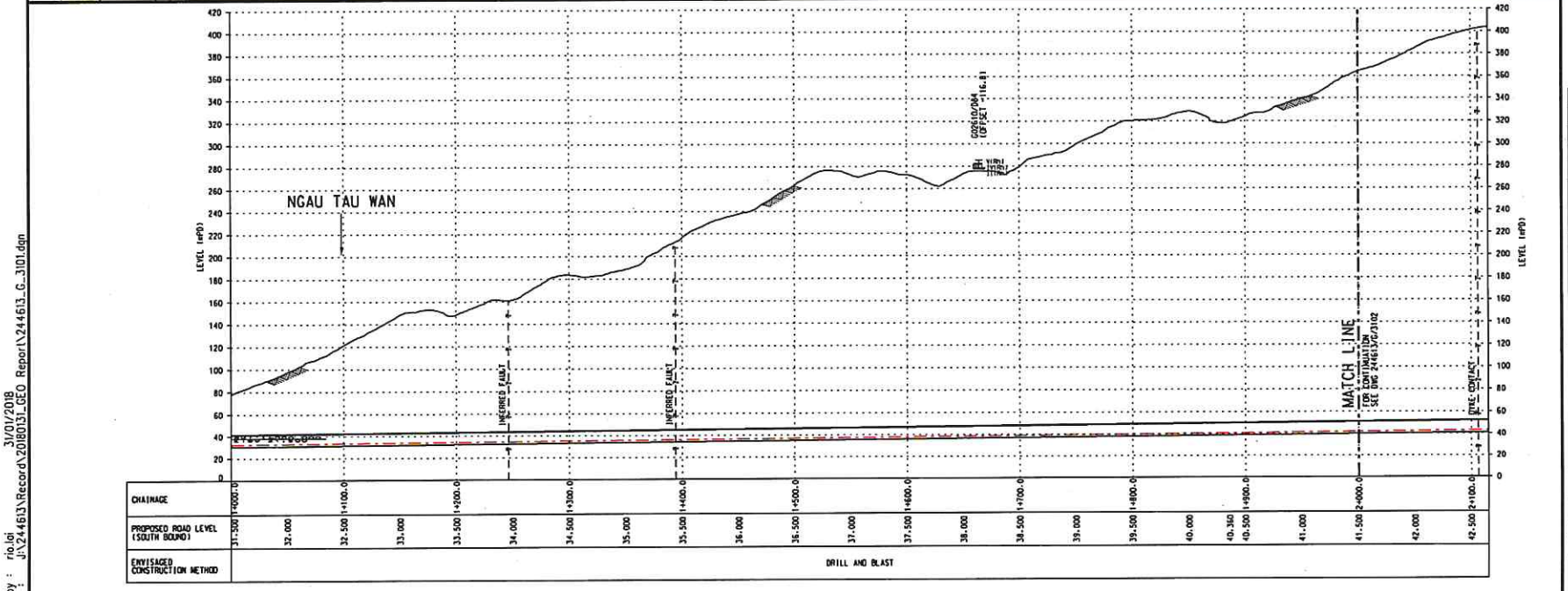




KEY PLAN

NOTES

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/G/3100.



Rev	Description	By	Date
C	SECOND ISSUE	KYL	08/16
B	FIRST ISSUE	ML	02/16
A	FOR CEDD COMMENT	ML	01/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: GEOLOGICAL PLAN AND LONGITUDINAL SECTION ROAD TUNNEL (ROUTE 4) (SHEET 1)

Drawing no.	Rev.
244613/G/3101	C

Drawn	Date	Checked	Approved
MYC	12/15	HC	HS

Scale: 1:2000 @A1 — Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.loi 31/01/2018
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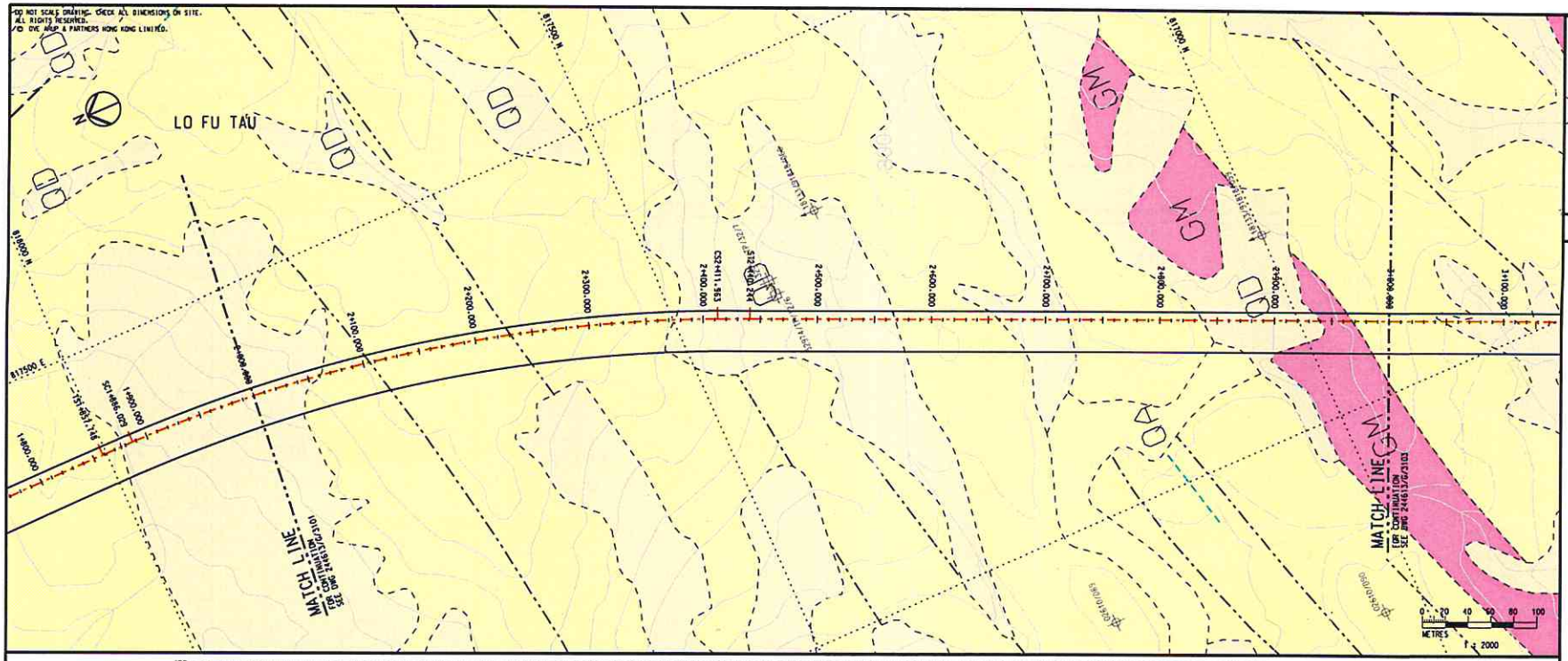

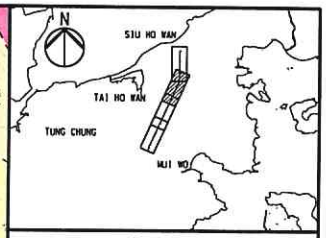

KEY PLAN

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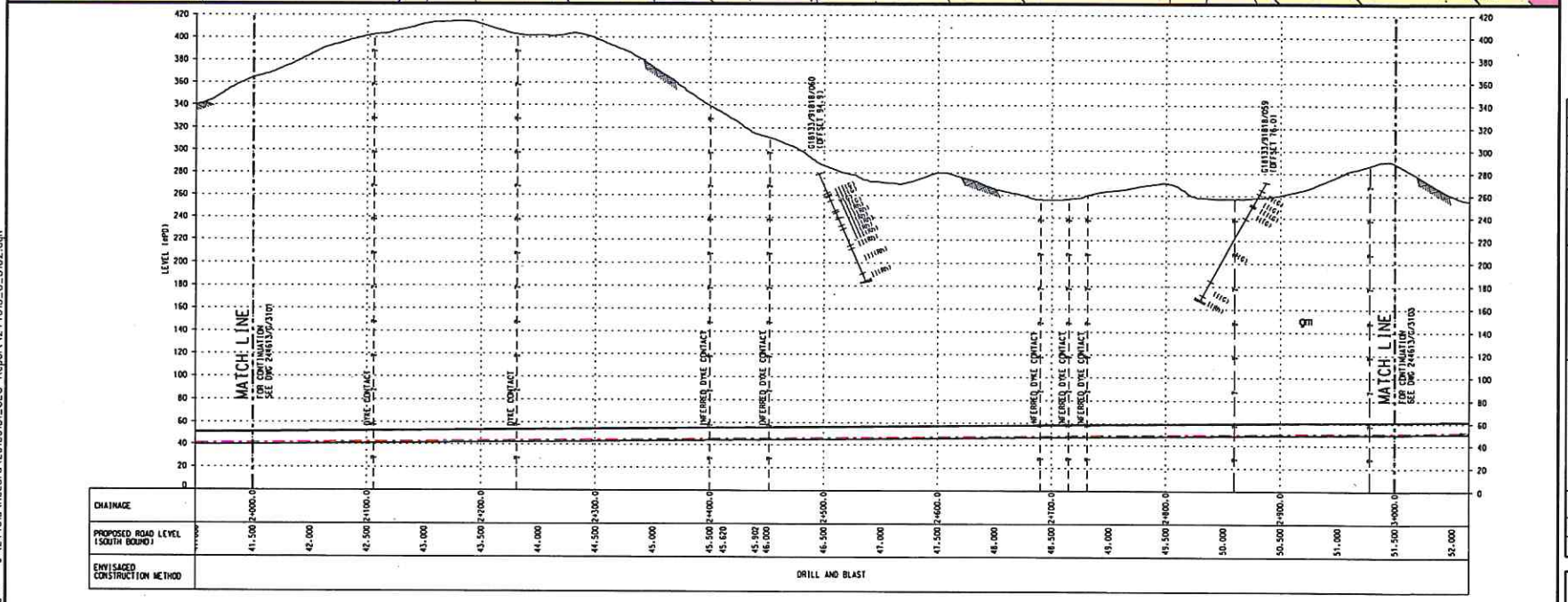

Rev	Description	By	Date
C	SECOND ISSUE	KYL	08/16
B	FIRST ISSUE	ML	02/16
A	FOR CEDD COMMENT	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION ROAD TUNNEL (ROUTE 4) (SHEET 2)

Drawing no.	Rev.
244613/G/3102	C

Drawn	Date	Checked	Approved
MYC	12/15	HC	HS

Scale: 1:2000 @A1

Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.lai 31/01/2018
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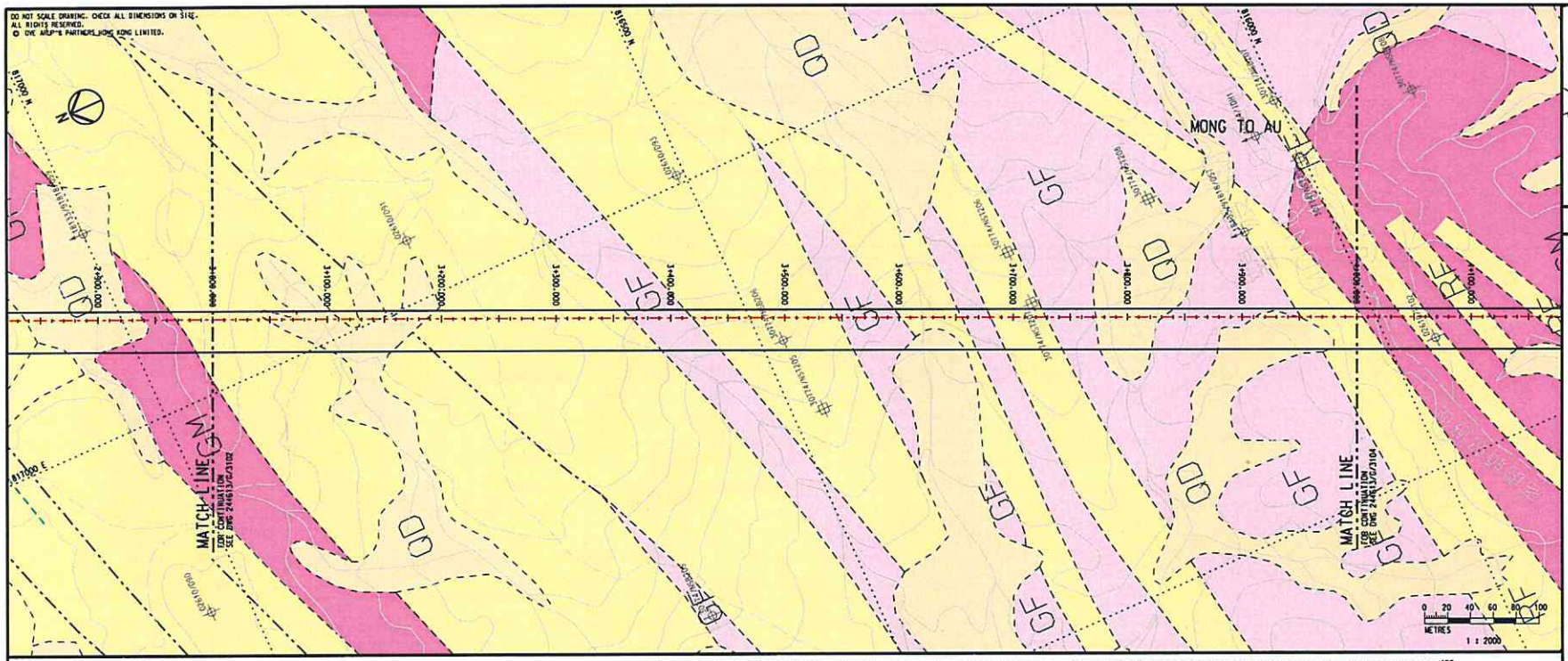
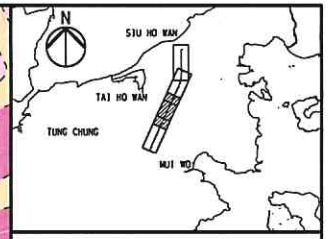
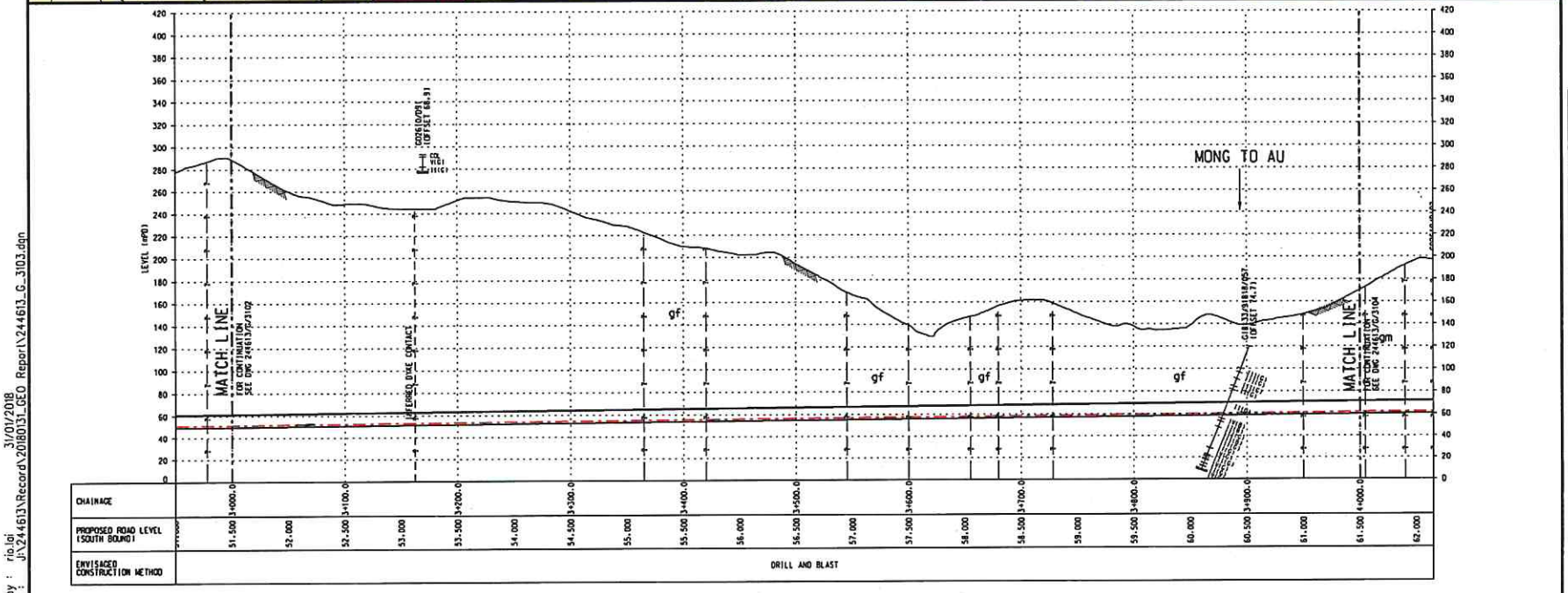




KEY PLAN

NOTES

1. FOR NOTES AND LEGEND, REFER TO DRAWING NO. 244613/G/3100.



Rev	Description	By	Date
C	SECOND ISSUE	KYL	08/16
B	FIRST ISSUE	ML	02/16
A	FOR CEDD COMMENT	ML	01/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

GEOLOGICAL PLAN AND LONGITUDINAL SECTION ROAD TUNNEL (ROUTE 4) (SHEET 3)

Drawing no.			Rev.
244613/G/3103			C
Drawn	Date	Checked	Approved
MYC	12/15	HC	HS
Scale	1:2000 @A1	Status	PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.lai
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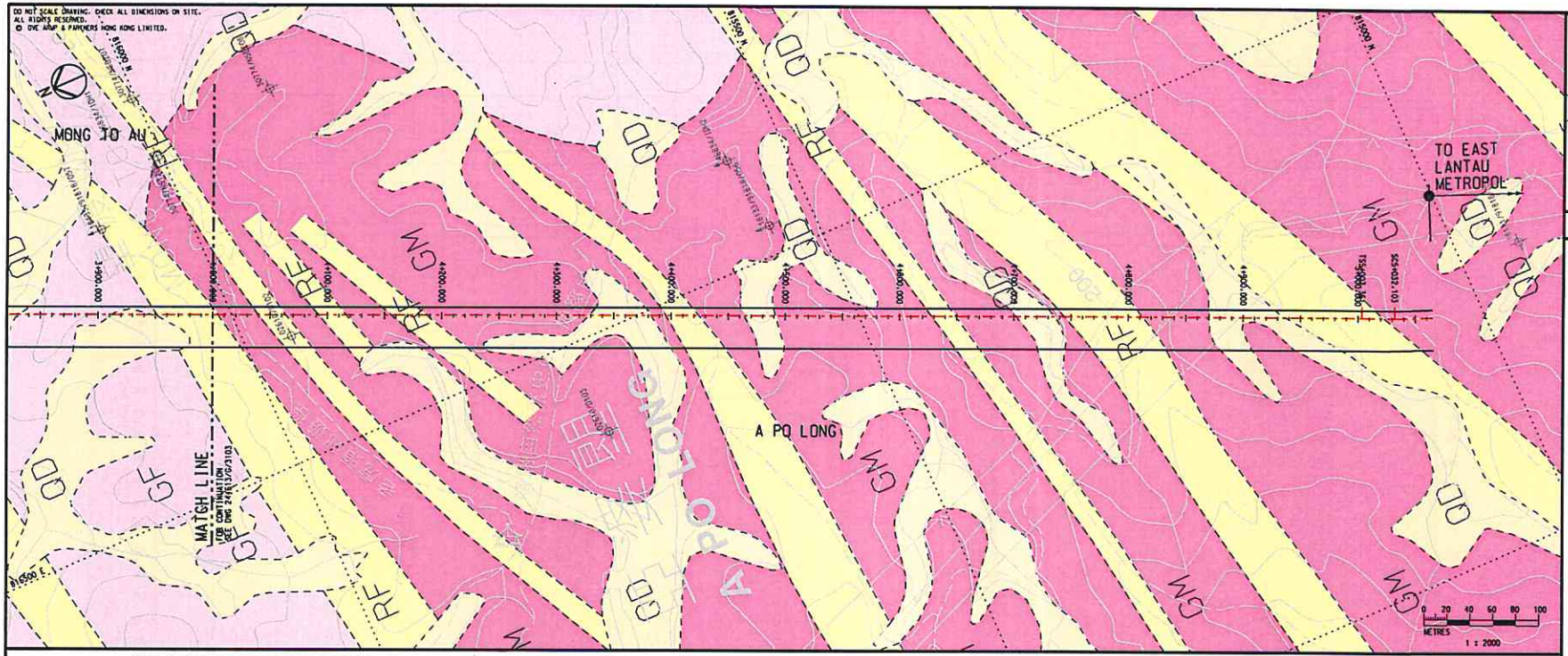
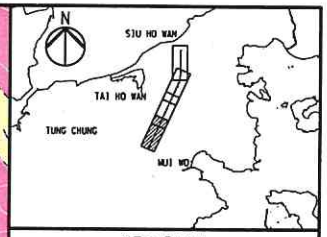
31/01/2018





KEY PLAN

NOTES

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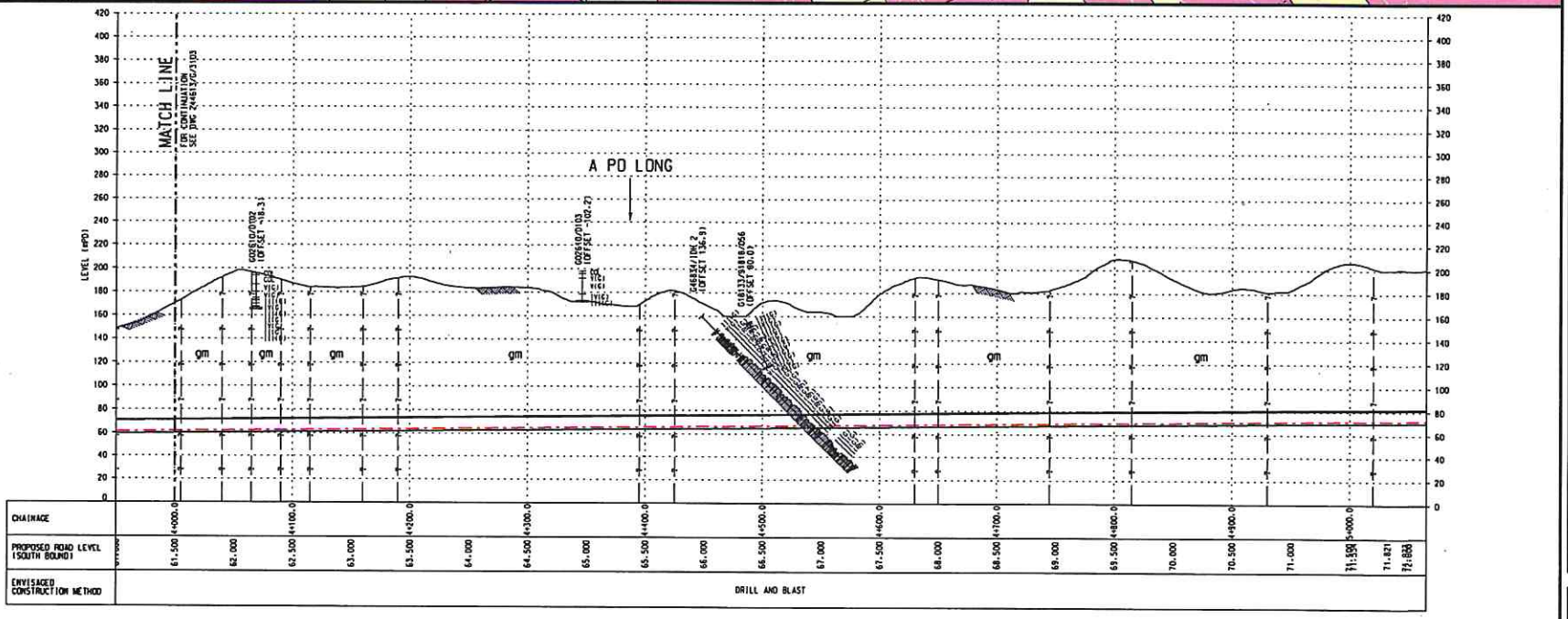

Rev	Description	By	Date
C	SECOND ISSUE	KYL	08/16
B	FIRST ISSUE	ML	02/16
A	FOR CEDD COMMENT	ML	01/16

Consultant: ARUP

Contract No. and Title: Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title: GEOLOGICAL PLAN AND LONGITUDINAL SECTION ROAD TUNNEL (ROUTE 4) (SHEET 4)

Drawing no. 244613/G/3104 Rev. C

Drawn	Date	Checked	Approved
MTC	12/15	HC	HS

Scale: 1:2000 @A1 Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.lai
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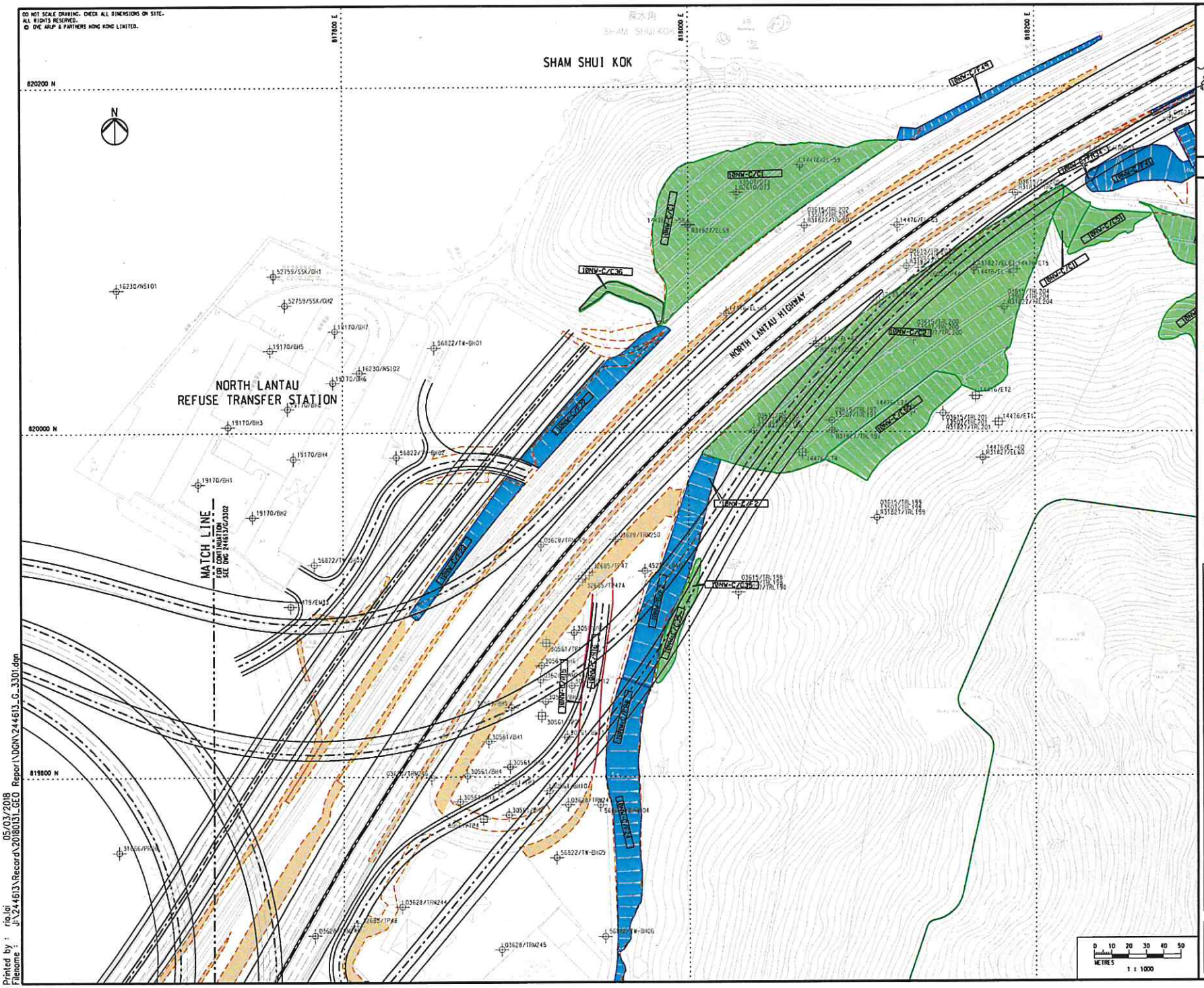
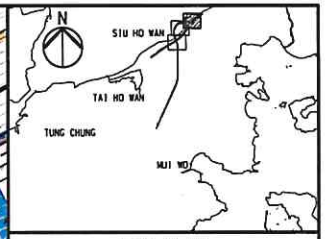
31/01/2018





KEY PLAN

NOTE

1. REFER TO DRAWING NO. 244613/M/2201-2211 FOR THE DETAILS OF SIU HO WAN TO MUI WO OPTION ROUTE 3A.

LEGEND

- EXISTING SLOPE FEATURE
- AFFECTED UNREGISTERED SLOPE
- EXISTING CUT SLOPE (REGISTERED FEATURES)
- EXISTING FILL SLOPE (REGISTERED FEATURES)
- EXISTING DISTURBED TERRAIN (REGISTERED FEATURES)
- EXISTING RETAINING WALL (REGISTERED FEATURES)
- GAZETTED COUNTRY PARK BOUNDARY
- EXISTING BOREHOLES
- EXISTING INCLINED BOREHOLES
- EXISTING TRAIL PIT
- EXISTING VIBROCORE
- EXISTING CONE PENETRATION TEST
- PROPOSED CARRIAGEWAY
- PROPOSED CARRIAGEWAY TUNNEL

Rev	Description	By	Date
B	SECOND ISSUE	KYL	10/16
A	FIRST ISSUE	HC	08/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SLOPE LAYOUT PLAN OF STRATEGIC LINK SCENARIO H2 (SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO) OPTION ROUTE 4 (SHEET 1)

Drawing no.	Rev.
244613/G/3301	B

Drawn	Date	Checked	Approved
MTC	08/16	HC	HS

Scale: 1:1000 @A1

Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : rio.lai 05/03/2018
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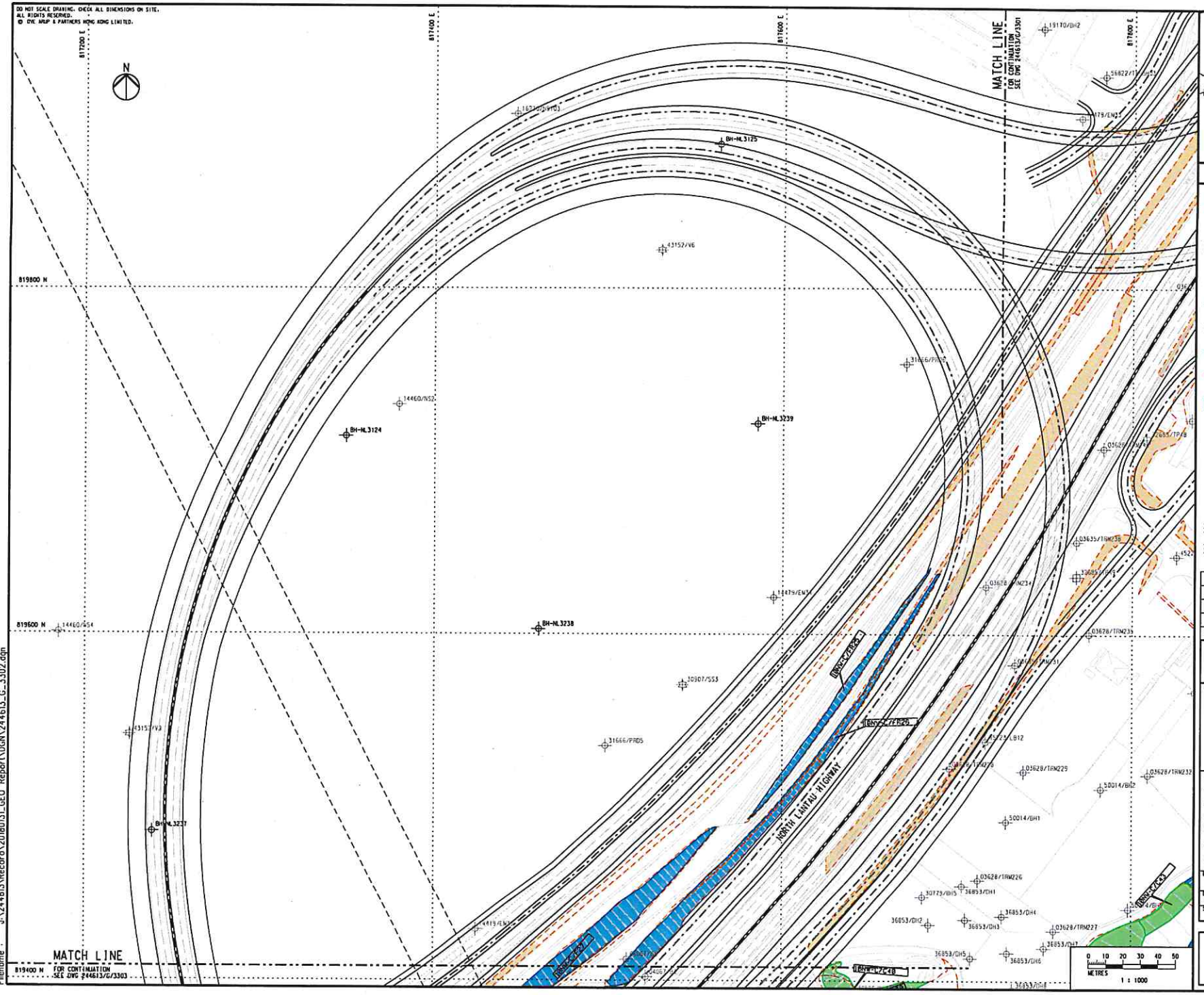

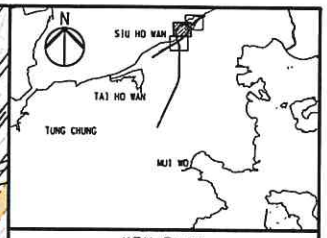

KEY PLAN

NOTE

1. REFER TO DRAWING NO. 244613/M/2201-2211 FOR THE DETAILS OF SIU HO WAN TO MUI WO OPTION ROUTE 3A.

LEGEND

- EXISTING SLOPE FEATURE
- AFFECTED UNREGISTERED SLOPE
- EXISTING CUT SLOPE (REGISTERED FEATURES)
- EXISTING FILL SLOPE (REGISTERED FEATURES)
- EXISTING DISTURBED TERRAIN (REGISTERED FEATURES)
- EXISTING RETAINING WALL (REGISTERED FEATURES)
- GAZETTED COUNTRY PARK BOUNDARY
- EXISTING BOREHOLES
- EXISTING INCLINED BOREHOLES
- EXISTING TRAIL PIT
- EXISTING VIBROCORE
- EXISTING CONE PENETRATION TEST
- PROPOSED CARRIAGEWAY
- PROPOSED CARRIAGEWAY TUNNEL

Rev	Description	By	Date
B	SECOND ISSUE	KYL	10/16
A	FIRST ISSUE	HC	08/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SLOPE LAYOUT PLAN OF STRATEGIC LINK SCENARIO H2 (SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO) OPTION ROUTE 4 (SHEET 2)

Drawing no.	Rev.
244613/G/3302	B

Drawn	Date	Checked	Approved
MTC	08/16	HC	HS

Scale: 1:1000 @A1 — Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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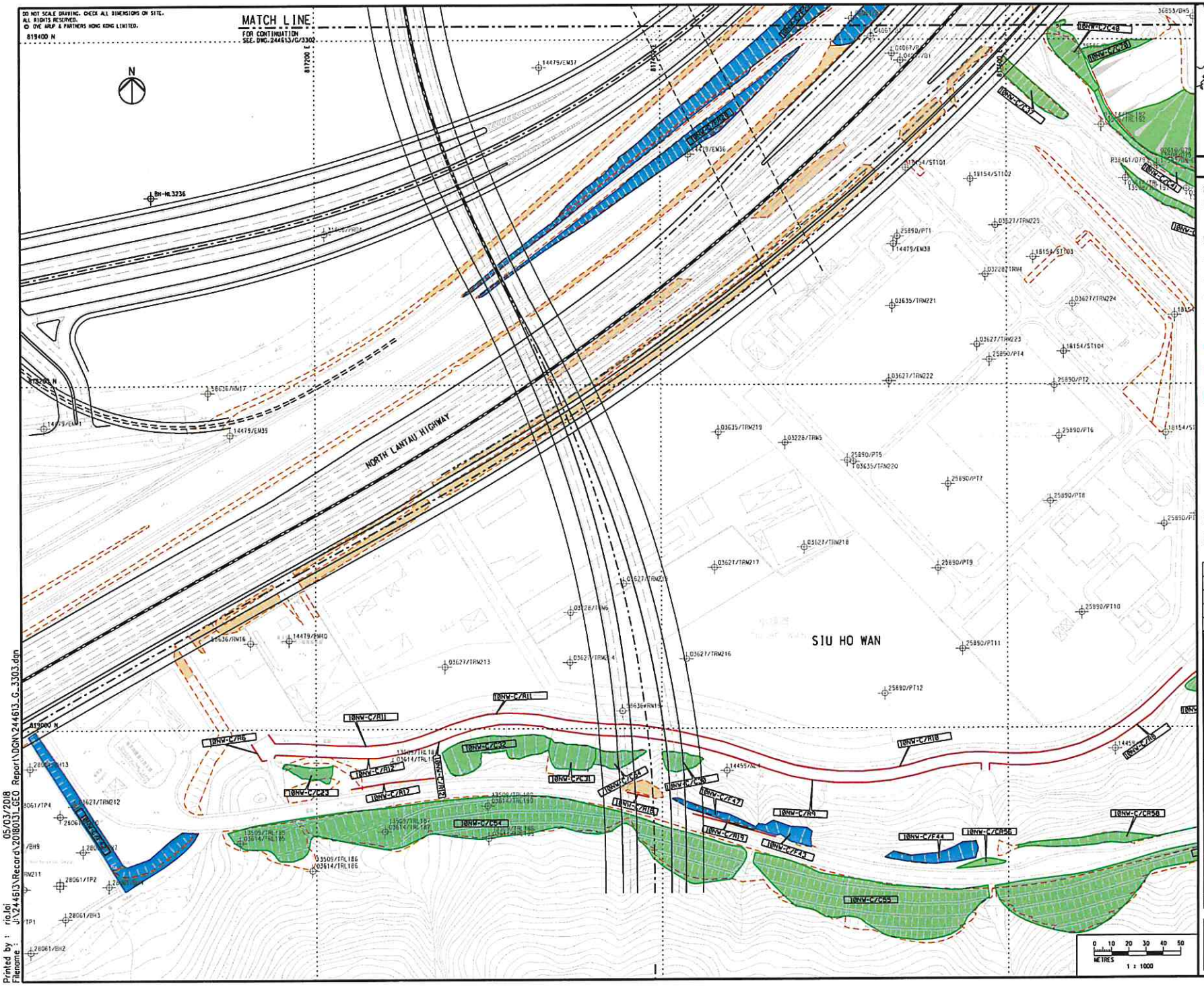

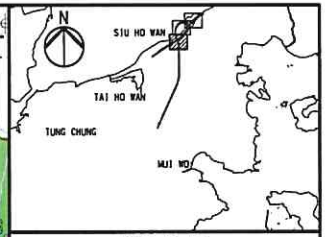

KEY PLAN

NOTE

1. REFER TO DRAWING NO. 244613/H/2201-2211 FOR THE DETAILS OF SIU HO WAN TO MUI WO OPTION ROUTE 3a.

LEGEND

- EXISTING SLOPE FEATURE
- AFFECTED UNREGISTERED SLOPE
- EXISTING CUT SLOPE (REGISTERED FEATURES)
- EXISTING FILL SLOPE (REGISTERED FEATURES)
- EXISTING DISTURBED TERRAIN (REGISTERED FEATURES)
- EXISTING RETAINING WALL (REGISTERED FEATURES)
- GAZETTED COUNTRY PARK BOUNDARY
- EXISTING BOREHOLES
- EXISTING INCLINED BOREHOLES
- EXISTING TRAIL PIT
- EXISTING VIBROCORE
- EXISTING CONE PENETRATION TEST
- PROPOSED CARRIAGEWAY
- PROPOSED CARRIAGEWAY TUNNEL

Rev	Description	By	Date
B	SECOND ISSUE	KYL	10/16
A	FIRST ISSUE	HC	08/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) -
Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SLOPE LAYOUT PLAN OF STRATEGIC LINK SCENARIO H2 (SIU HO WAN TO SOUTHEAST LANTAU, POSSIBLY VIA MUI WO) OPTION ROUTE 4 (SHEET 3)

Drawing no.	Rev.
244613/G/3303	B

Drawn	Date	Checked	Approved
MYC	08/16	HC	HS

Scale 1:1000 @A1

Status PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

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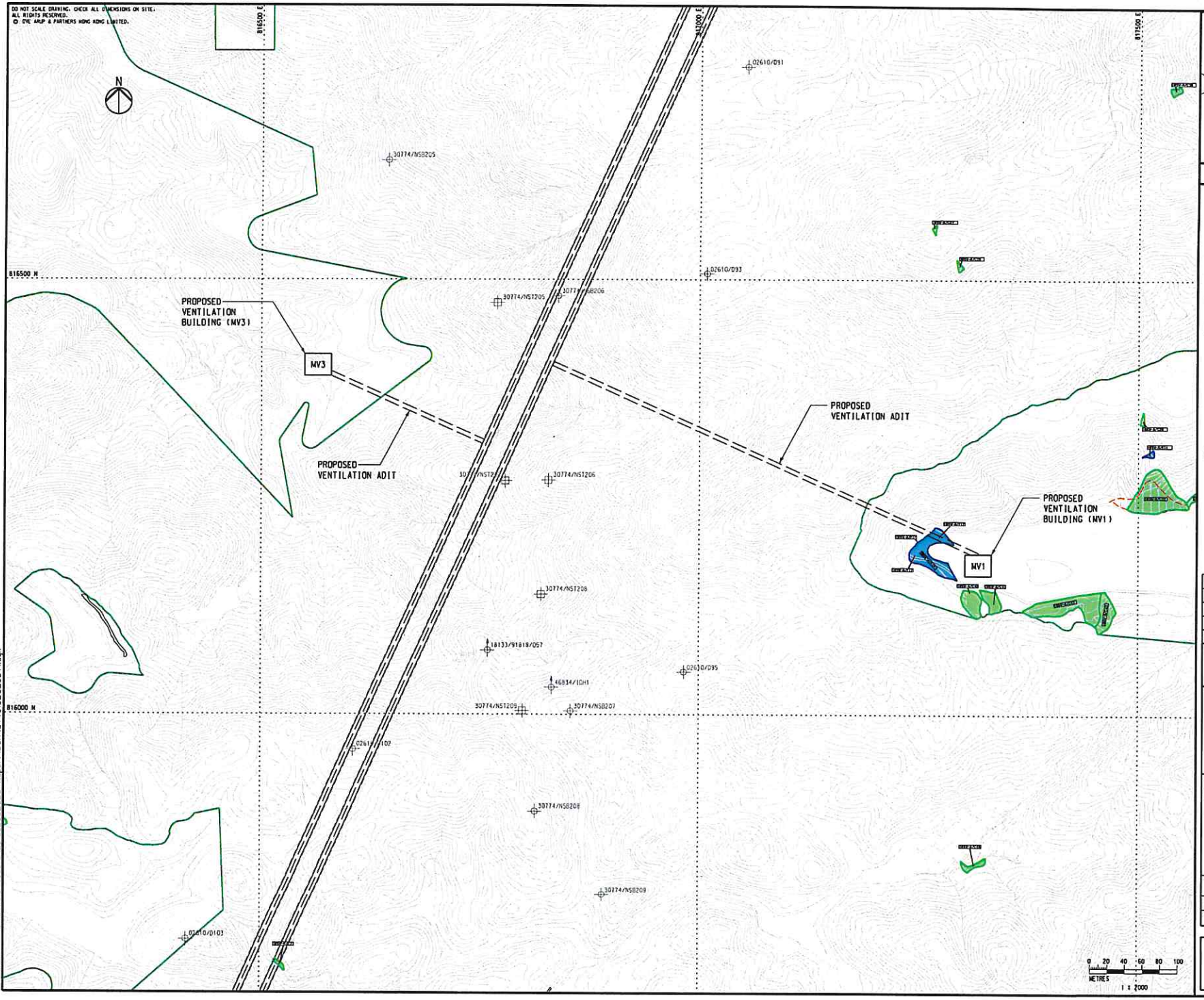
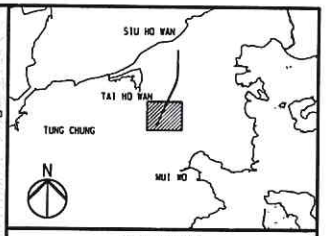
05/03/2018





KEY PLAN

LEGEND

- EXISTING SLOPE FEATURE
- EXISTING CUT SLOPE (REGISTERED FEATURES)
- EXISTING FILL SLOPE (REGISTERED FEATURES)
- EXISTING DISTURBED TERRAIN (REGISTERED FEATURES)
- EXISTING RETAINING WALL (REGISTERED FEATURES)
- GAZETTED COUNTRY PARK BOUNDARY
- EXISTING BOREHOLES
- EXISTING INCLINED BOREHOLES
- EXISTING TRAIL PIT
- EXISTING VIBROCORE
- EXISTING CONE PENETRATION TEST
- PROPOSED CARRIAGEWAY TUNNEL

Rev	Description	By	Date
A	FIRST ISSUE	KYL	10/16

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

SLOPE LAYOUT PLAN AT VENTLATION BUILDING

Drawing no.		Rev.
244613/G/3341		A
Drawn: MYC	Date: 09/16	Checked: HC / Approved: HS
Scale: 1:2000 @A1	Status: PRELIMINARY	

CEDD 土木工程拓展署 Civil Engineering and Development Department

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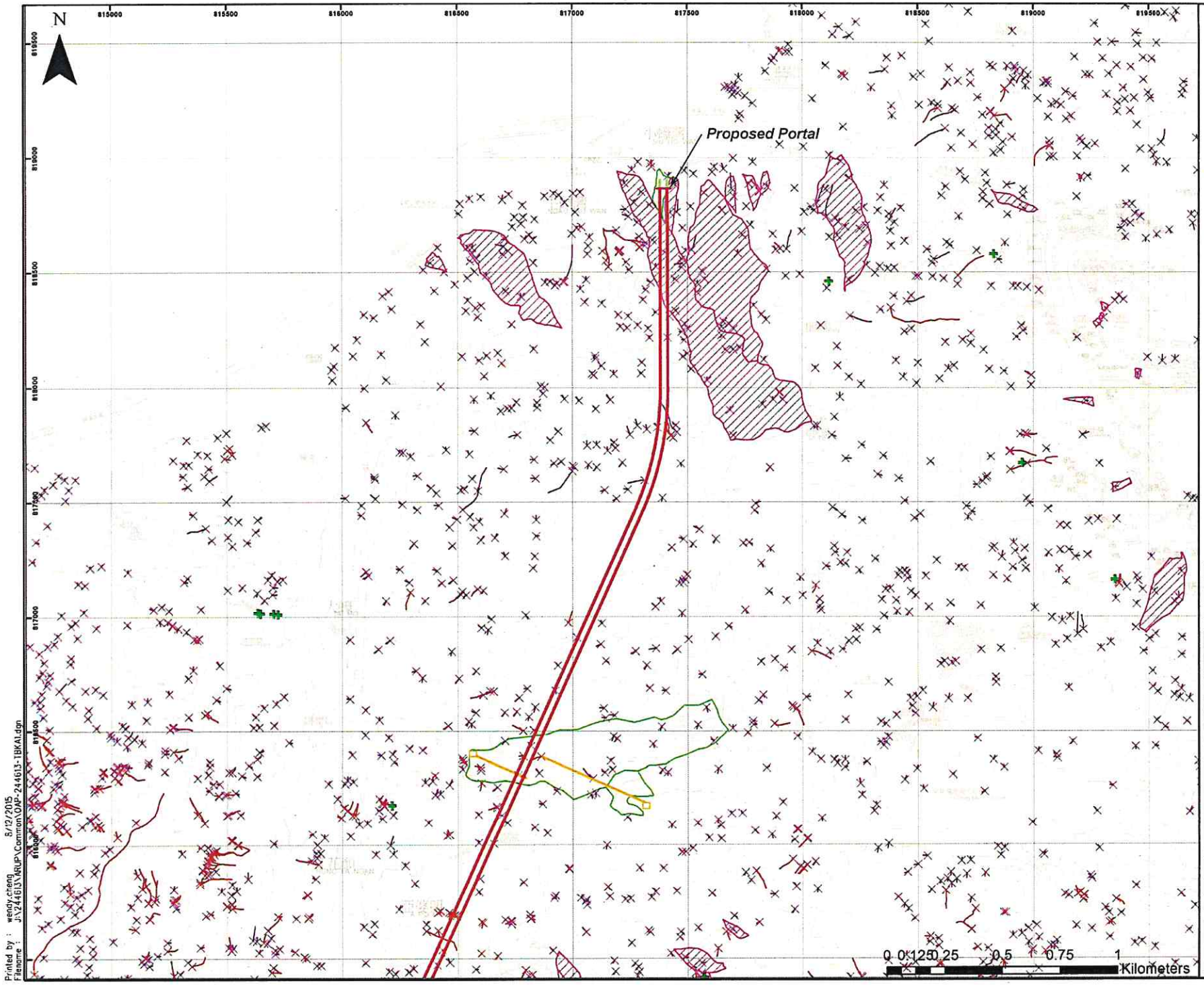

Legend

Proposed Alignments

- Road Tunnel (Route 3A, 3B, 4B, 4C)
- Proposed Locations of NTHS Catchment and Man Made Slope Features (Indicative)
- Proposed Ventilation Building and Adit

Instability Records

- Recent ENTLI record
- Relict ENTLI record
- Landslide Incident Record
- Historical Landslide Catchment

Rev	Description	By	Date
C	REVISED	-	10/16
B	SECOND ISSUE	-	08/16
A	FIRST ISSUE	-	12/15

Consultant

ARUP

Contract No. and Title

Agreement No. CE12/2015(CE) - Technical Study on Developments at Siu Ho Wan and the Associated Transport Infrastructures - Feasibility Study

Drawing title

Plan of Natural Terrain and Landslide Incidents (Siu Ho Wan Area)

Drawing no.	Rev.
244613/G/3032	C

Drawn	Date	Checked	Approved
ML	09/16	HC	HS

Scale: 1:15,000 Status: PRELIMINARY

CEDD 土木工程拓展署 Civil Engineering and Development Department

Printed by : wendy.cheng
Filename : J:\244613\NRLP\Common\OAP-244613-TBKAI.dgn
8/12/2015

Table 1 - Summary of Exisiting Man Made Features

Feature Details			Slope Details				Wall Details		Current Facility Details		Maintenance	
Type	Registration Number	Consequence Category	Slope Material	Slope Length	Slope Height	Slope Angle	Wall Length	Wall Height	Facility at Toe	Facility at Crest	Responsible Party	Stage 2/3 Study
Cut Slope	10NW-C/C2	2	Soil & Rock	255	42	28	-	-	Road/footpath with heavy traffic density	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C11	3	Soil	19	4.5	28	-	-	Road/footpath with low traffic density	Undeveloped green belt	DD360LLOT113	-
Cut Slope	10NW-C/C22	2	Soil	39	20	32	-	-	Road/footpath with heavy traffic density	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C26	2	Soil & Rock	212	46	48	-	-	Road/footpath with heavy traffic density	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C27	2	Soil & Rock	73	23	38	-	-	Road/footpath with heavy traffic density	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C28	2	Soil	95	53	37	-	-	Road/footpath with heavy traffic density	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C30	3	Soil	25	9	45	-	-	Remote area or abandoned facilities	Undeveloped green belt	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Cut Slope	10NW-C/C34	3	Soil	30	6.5	50	-	-	Remote area or abandoned facilities	Undeveloped green belt	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Cut Slope	10NW-C/C35	3	Soil & Rock	78	4	60	-	-	Remote area or abandoned facilities	Undeveloped green belt	HyD	-
Cut Slope	10NW-C/C37	3	Soil & Rock	50	5	50	-	-	Road/footpath with very low traffic density	Undeveloped green belt	WSD	-
Cut Slope	10NW-C/C40	3	Soil & Rock	48	6	44	-	-	Lightly-used open area/facilities	Undeveloped green belt	WSD	-
Cut Slope	10NW-C/C54	2	Soil & Rock	240	24.5	50	-	-	Road/footpath with moderate traffic density	Undeveloped green belt	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Cut Slope	10SW-C/C41	1	Soil	24	4.2	60	-	-	Residential	Densely-used open area/facilities	Lands D	Stage 3
Cut Slope	10SW-C/C45	2	Soil	80	11	50	-	-	Road/footpath with moderate traffic density	Undeveloped green belt	HyD	Stage 3
Cut Slope	10SW-C/C105	2	Soil	5	10	50	-	-	Road/footpath with moderate traffic density	Undeveloped green belt	HyD	Stage 3
Cut Slope	10SW-C/C110	2	Soil	28	6	40	-	-	Other non-crowded built-up facilities	Non-dangerous goods storage site	DD4 MW Lot590A	Stage 2
Cut Slope	10SW-C/C151	3	Soil	30	4	60	-	-	Road/footpath with low traffic density	Undeveloped green belt	HyD	-
Fill Slope	10NW-C/F2	3	Soil	140	7	35	-	-	District open space	Undeveloped green belt	HyD	-
Fill Slope	10NW-C/F23	2	Soil	100	5	38	-	-	Construction sites	Road/footpath with heavy traffic density	MTRL2	-
Fill Slope	10NW-C/F24	3	Soil	160	7	25	-	-	District open space	Undeveloped green belt	Lands D	-
Fill Slope	10NW-C/F27	2	Soil	365	7.3	40	-	-	Railway/tramway	Railway/tramway	MTRL2	-
Fill Slope	10NW-C/F41	2	Soil	60	8	45	-	-	District open space	Road/footpath with moderate traffic density	HyD, Lands D	-
Fill Slope	10NW-C/F42	1	Soil	130	3.5	30	-	-	Factory	Road/footpath with low traffic density	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Fill Slope	10NW-C/F47	3	Soil	40	8	35	-	-	Undeveloped green belt	Road/footpath with low traffic density	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Fill Slope	10NW-C/F51	2	Soil	800	3.2	20	-	-	Road/footpath with heavy traffic density	Road/footpath with heavy traffic density	HyD	-
Fill Slope	10SW-C/F12	2	Soil	32	5	30	-	-	Undeveloped green belt	Road/footpath with moderate traffic density	HyD	-
Fill Slope	10SW-C/F36	3	Soil	25	6	32	-	-	Undeveloped green belt	Remote area or abandoned facilities	Lands D	-
Fill Slope & Retaining Wall	10NW-C/FR26	1	Soil	306	7.7	46	120	3	Road/footpath with very heavy traffic density	Railway/tramway	MTRL2	-
Fill Slope & Retaining Wall	10NW-C/FR28	2	Soil	240	4.5	42	70	5	Railway/tramway	Railway/tramway	MTRL2	-
Fill Slope & Retaining Wall	10NW-C/FR34	3	Soil	24	3	30	24	4	District open space	Road/footpath with very low traffic density	DD360L LOT113	-
Fill Slope & Retaining Wall	10NW-C/FR35	3	Soil	24	3.5	25	37	6.7	Remote area or abandoned facilities	Road/footpath with low traffic density	Lands D	-
Fill Slope & Retaining Wall	10SW-C/FR11	2	Soil	225	9	38	225	1.8	District open space	Road/footpath with moderate traffic density	HyD	Stage 3
Retaining Wall	10NW-C/R9	3	-	-	-	-	250	5	Remote area or abandoned facilities	District open space	DSD	-
Retaining Wall	10NW-C/R10	3	-	-	-	-	337	5	Remote area or abandoned facilities	District open space	DSD	-
Retaining Wall	10NW-C/R11	3	-	-	-	-	260	5	Remote area or abandoned facilities	District open space	DSD	-
Retaining Wall	10NW-C/R12	3	-	-	-	-	200	5	Remote area or abandoned facilities	District open space	DSD	-
Retaining Wall	10NW-C/R15	3	-	-	-	-	110	8	Road/footpath with low traffic density	Lightly-used open area/facilities	GPA	-
Retaining Wall	10NW-C/R16	3	-	-	-	-	115	6	Road/footpath with low traffic density	Undeveloped green belt	HyD	-
Retaining Wall	10NW-C/R18	2	-	-	-	-	13	3.8	Remote area or abandoned facilities	Road/footpath with moderate traffic density	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Retaining Wall	10NW-C/R19	2	-	-	-	-	51	6	Undeveloped green belt	Road/footpath with moderate traffic density	DISCOVERY BAY ROAD TUNNEL CO. LTD.	-
Disturbed Terrain	10SW-A/DT2	1	Soil	30	5	25	-	-	Cottage, licensed and squatter area	Undeveloped green belt	DD2MW Lot640	-
Disturbed Terrain	10SW-C/DT4	3	Soil	40	18	26	-	-	Remote area or abandoned facilities	Undeveloped green belt	Lands D	-
Disturbed Terrain	10SW-C/DT34	1	Soil	60	37	25	-	-	Road/footpath with very low traffic density	Cottage, licensed and squatter area	Lands D	-
Disturbed Terrain	10SW-C/DT35	3	Soil	27	8	25	-	-	Remote area or abandoned facilities	Undeveloped green belt	Lands D	-

Table 2 - Summary of Exisiting Man Made Features

Feature Details					
Type	Registration Number	Consequence Category	Potential Impact	Related Site Formation	Past Instability
Cut Slope	10NW-C/C2	2	To be modified	Siu Ho Wan Interchange and Realignment of Cheung Tung Road	At the Footslope of Large Landslide Dataset 10NWCL006
Cut Slope	10NW-C/C11	3	To be modified	Realignment of Cheung Tung Road	At the Footslope of Large Landslide Dataset 10NWCL007
Cut Slope	10NW-C/C22	2	To be modified	Realignment of Cheung Tung Road	Nil
Cut Slope	10NW-C/C26	2	To be modified	Realignment of Cheung Tung Road	At the Footslope of Historical Landslide Catchment 10NW-C/DF2 and partially within Large Landslide Dataset 10NWCL004
Cut Slope	10NW-C/C27	2	To be modified	Realignment of Cheung Tung Road	At the Footslope of Historical Landslide Catchment 10NW-C/DF2
Cut Slope	10NW-C/C28	2	To be modified	Realignment of Cheung Tung Road	Nil
Cut Slope	10NW-C/C30	3	To be modified	Possible Piling of Viaduct at Siu Ho Wan Interchange	Nil
Cut Slope	10NW-C/C34	3	To be modified	Possible Piling of Viaduct at Siu Ho Wan Interchange	Nil
Cut Slope	10NW-C/C35	3	To be modified/ removed	Realignment of Cheung Tung Road	Nil
Cut Slope	10NW-C/C37	3	To be modified	Realignment of Cheung Tung Road	Nil
Cut Slope	10NW-C/C40	3	To be modified	Realignment of Cheung Tung Road	Nil
Cut Slope	10NW-C/C54	2	To be modified	Possible Piling of Viaduct at Siu Ho Wan Interchange	Partially within Historical Landslide Catchment 10NW-C/DF4 and 10NW-C/DF5
Fill Slope	10NW-C/F2	3	To be modified	Interchange and Realignment of Cheung Tung Road	Nil
Fill Slope	10NW-C/F23	2	To be modified	Interchange	Nil
Fill Slope	10NW-C/F24	3	To be modified	Realignment of Cheung Tung Road	Nil
Fill Slope	10NW-C/F27	2	To be modified	Possible Piling of Interchange	Nil
Fill Slope	10NW-C/F41	2	To be modified	Realignment of Cheung Tung Road	At the Footslope of Large Landslide Dataset 10NWCL006
Fill Slope	10NW-C/F42	1	To be modified	Realignment of Cheung Tung Road	Nil
Fill Slope	10NW-C/F47	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Fill Slope	10NW-C/F51	2	To be modified	Realignment of North Lantau Highway and Cheung Tung Road	Nil
Fill Slope & Retaining Wall	10NW-C/FR26	1	To be modified	Realignment of North Lantau Highway	Nil
Fill Slope & Retaining Wall	10NW-C/FR28	2	To be modified	Possible Piling of Interchange Viaduct	Nil
Fill Slope & Retaining Wall	10NW-C/FR34	3	To be modified	Realignment of Cheung Tung Road	At the Footslope of Large Landslide Dataset 10NWCL006
Fill Slope & Retaining Wall	10NW-C/FR35	3	To be modified	Realignment of Cheung Tung Road	Nil
Retaining Wall	10NW-C/R9	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R10	3	To be modified	Possible Piling of Interchange Viaduct	Partially at the Footslope of Large Landslide Dataset 10NWCL002
Retaining Wall	10NW-C/R11	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R12	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R15	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R16	3	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R18	2	To be modified	Possible Piling of Interchange Viaduct	Nil
Retaining Wall	10NW-C/R19	2	To be modified	Possible Piling of Interchange Viaduct	Nil