

**Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link –
Northern Connection Sub-sea Tunnel
Section**

Contract Specific EM&A Manual

5 December 2013

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Contract No. HY/2012/08


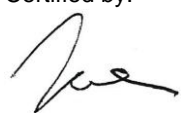


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Contract Specific EM&A Manual

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Summary: This document presents the Contract Specific EM&A Manual for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.		Date: 5 December 2013			
		Approved by: 			
		Mr Craig Reid Partner			
		Certified by: 			
		Mr Jovy Tam ET Leader			
	Contract Specific EM&A Manual	VAR	JT	CAR	05/12/13
Revision	Description	By	Checked	Approved	Date
<p>This report has been prepared by Environmental Resources Management the trading name of 'ERM Hong-Kong, Limited', with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.</p> <p>We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.</p>		<p>Distribution</p> <p><input type="checkbox"/> Internal</p> <p><input checked="" type="checkbox"/> Public</p> <p><input type="checkbox"/> Confidential</p> <div style="text-align: right;">   </div>			

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10 December 2013

AECOM
Supervising Officer Representative's Office
Room 201, 2nd Floor,
River Trade Terminal Office Building,
201 Lung Mun Road, Tuen Mun, Hong Kong

By Fax (2450 3099) and By Post

Attention: Messrs. Edwin Ching / Mr. Andy Westmorelan

Dear Sir,

**Re: Agreement No. CE 48/2011 (EP)
Environmental Project Office for the
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities,
and Tuen Mun-Chek Lap Kok Link – Investigation**

**Contract No. HY/2012/08 TM-CLKL Northern Connection Sub-sea Tunnel Section
Contract Specific EM&A Manual (Revised)**

We refer to the captioned submission of a revised Contract Specific EM&A Manual certified by environmental team (ERM's ref: "0212330_EM&A Manual_20131205.docx" dated on 5 December 2013) provided to us via email on 9 December 2013.

We are pleased to inform you that we have no adverse comments on the captioned Manual.

Thank you for your kind attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y H Hui should you have any queries.

Yours sincerely,



Tony Cheng
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

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1 INTRODUCTION

1.1 BACKGROUND INFORMATION

- 1.1.1.1 According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway (NLH) will be operating beyond capacity after 2016 due to the increase in cross boundary traffic, developments in the NWNT, and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new connections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.
- 1.1.1.2 The proposed TM-CLKL if combined with the TMWB will provide a direct route linking NWNT and North Lantau, from north to south, the Kong Sham Western Highway (KSWH), port back-up areas in NWNT, Tuen Mun River Trade Terminal, the existing EcoPark in Tuen Mun Area 38, the Airport, the proposed LLP, HZMB and North Lantau developments. The new connection will significantly reduce the travelling time between the KSWH and the NWNT region at its northern side, and North Lantau at its southern side.
- 1.1.1.3 In 2005, Highways Department (HyD) commissioned an engineering feasibility study (FS), namely Tuen Mun Chek Lap Kok Link and Tuen Mun Western Bypass – Feasibility Study (*Agreement No. CE 28/2005 (HY)*), to evaluate the technical feasibility and impacts of the Project. The FS recommended that the TM-CLKL should be a dual 2-lane road with a total length of about 9 km with about 4 km long submarine tunnel and 5 km long elevated structure.
- 1.1.1.4 In order to progress this project, Maunsell Consultants Asia Ltd. were appointed by HyD to carry out the Assignment on Tuen Mun – Chek Lap Kok Link – Investigation under *Agreement No. CE 52/2007 (HY)*. The Assignment commenced on 19 May 2008 and shall be completed within 24 months, i.e. by mid-May 2010.
- 1.1.1.5 The Feasibility Study initially proposed an alignment of the TM-CLKL comprising a toll plaza island at Tai Mo To and this alignment formed the basis of the EIA Study Brief (ESB 175/2007). However, subsequent to these documents being prepared and based upon the proposed schemes for the Hong Kong-Zhuhai- Macao Bridge (HZMB) and Hong Kong Boundary Crossing Facilities (HKBCF), it was decided to integrate the TM-CLKL southern landfall reclamation with the HKBCF reclamation. It was considered that this arrangement would also provide a cost-effective connection between the HKBCF and North Lantau. Following a full option assessment, the preferred scheme was selected, as detailed in *Section 2* of this EM&A Manual.

- 1.1.1.6 The project is a designated project under *Section A.1 of Schedule 2* of the Environmental Impact Assessment Ordinance (EIAO). As such, the statutory procedures under the EIAO need to be followed and an environmental permit (EP) will be required prior to the commencement of construction. Thus, as part of this assignment, an Environmental Impact Assessment (EIA) has been undertaken.
- 1.1.1.7 The EIA for the project has recommended comprehensive Environmental Monitoring and Audit requirements to be undertaken during the design, construction and operational stages of the project. This Report constitutes the Environmental Monitoring and Audit (EM&A) Manual for the proposed Tuen Mun - Chek Lap Kok Link (TM-CLKL) Project, providing details of the EM&A recommendations.
- 1.1.1.8 The Hong Kong SAR Government's applicable environmental regulations for noise, air quality, ecology, water quality, landscape and visual resources and waste management and heritage protection, the Hong Kong Planning Standards and Guidelines and recommendations in the TM-CLKL EIA Report have served as guidance documents in the preparation of this Manual. This EM&A Manual fulfills the requirements of the Study Agreement and follows the approach recommended in EPD's Generic EM&A Manual, Annex 21 of the Technical Memorandum on the EIA Process and EM&A Guidelines for Development Projects in Hong Kong.

1.2 POLICY

- 1.2.1.1 The Supervising Officer's Representative (SOR) and the Contractor shall adopt Environmental Policy Statements in accordance with the requirements of this Manual in order to foster a sound EM&A programme to protect the environment. The following policy statements shall be adopted:
- establish a commitment to environmental excellence in all activities arising from the development project;
 - encourage the adoption of environmental management principles to prevent potential impacts and minimise adverse impacts; and
 - commit to the recommendations in the EIA study report and related EIA process requirements.

1.3 EM&A PROGRAMME OBJECTIVES

- 1.3.1.1 The broad objective of this EM&A Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the TM-CLKL project during design, construction and implementation.
- 1.3.1.2 The manual provides details of the environmental monitoring requirements arising from the EIA including air, noise and water quality, as well as audit

recommendations for the noise, air, water quality, ecology, landscape and visual, waste and cultural heritage. The purposes of the defined EM&A programme are as follows:

- to ensure the specified mitigation recommendations of the EIA are included in the design of the project;
- to clarify and identify sources of pollution, impact and nuisance arising from the works;
- to confirm compliance with legal, contract specifications and EIA study recommendations;
- to provide an early warning system for impact prevention;
- to provide a database of environmental parameters against which to determine any short term or long term environmental impacts;
- to propose timely, cost-effective and viable solutions to actual or potential environmental issues;
- to monitor performance of the mitigation measures and to assess their effectiveness and, whenever necessary, identify any further need for additional measures;
- to verify the EIA predicted impacts;
- to collate information and evidence for use in public, District Council and Government consultation; and
- to audit environmental performance.

1.3.1.3 EM&A procedures are required during the design, construction and operational phases of the project implementation and a summary of the requirements for each of the environmental parameters is detailed in **Table 1.1** below.

Table 1.1 **Summary of EM&A Requirements**

Parameter	EM&A Phase		
	Design	Construction Phase	Operational Phase
Air Quality		Y	
Noise	Not relevant to the Northern Connection Sub-sea Tunnel Section since there is no noise sensitive receiver identified for the Project area at Tuen Mun.		
Ecology	Y	Y	Y
Water Quality		Y	Y
Landscape and Visual	Y	Y	Y
Waste/ Contaminated Land		Y	
Cultural Heritage	Not relevant to the Northern Connection Sub-sea Tunnel Section since cultural heritage resource is not identified for the works area of the Contract which is marine waters in nature.		

1.4 **SCOPE OF THE EM&A PROGRAMME**

1.4.1.1 The scope of the EM&A programme is to undertake the following, which follows the demarcation of monitoring responsibilities set out in Environmental Project Office's letter dated 29.10.2013:

a) Implement monitoring and audit activities for each environmental parameter as follows:

- | | |
|----------|--|
| Dust: | <ul style="list-style-type: none"> i) Establish baseline dust levels at specified locations and review these levels on a regular basis. ii) Implement construction dust impact monitoring programme. |
| Noise: | <ul style="list-style-type: none"> i) Establish baseline noise, levels at specified locations and review these levels on a regular basis (Not relevant to the Northern Connection Sub-sea Tunnel Section). ii) Implement construction noise impact monitoring (Not relevant to the Northern Connection Sub-sea Tunnel Section). |
| Ecology: | <ul style="list-style-type: none"> i) Implement design phase audit for ecological dolphin protection specifications, ecological translocation specifications and design integrated ecological mitigation measures. ii) Implement baseline survey to establish existing ecological conditions. iii) Implement construction phase monitoring and audit requirements for ecology resources. |

- | | |
|-----------------------|--|
| | iv) Implement operational phase monitoring. |
| Water Quality: | <ul style="list-style-type: none"> i) Establish baseline water quality levels at specified locations and review these levels on a regular basis. ii) Implement construction water quality impact monitoring programme. iii) Implement operational phase water quality impact monitoring programme. iv) Implement silt curtain efficiency test. |
| Landscape and Visual: | <ul style="list-style-type: none"> i) Design detailed landscape specifications. ii) Implement baseline survey to establish/confirm existing landscape and visual conditions. iii) Implement construction phase audit requirements for landscape and visual resources. iv) Implement operational phase audit requirements for landscape and visual aspects. |
| Waste: | <ul style="list-style-type: none"> i) Implement construction phase audit requirements for waste aspects. |
| Heritage: | <ul style="list-style-type: none"> i) Implement design phase audit for toll plaza design to ensure set back from grave has been integrated (Not relevant to the Northern Connection Sub-sea Tunnel Section). ii) Implement walkover survey to confirm existing conditions (Not relevant to the Northern Connection Sub-sea Tunnel Section). iii) Implement construction phase audit requirements for historical resources (Not relevant to the Northern Connection Sub-sea Tunnel Section). |
-
- b) Liaison and provision of advice to construction site staff on the purposes and implementation of the EM&A programme.
 - c) Identify and resolve environmental issues that may arise from the project.
 - d) Check and quantify the Contractor's overall performance, implement Event/ Action Plans and recommend and implement remedial actions to mitigate adverse environmental effects as identified by the EM&A programme and EIA.
 - e) Conduct monthly reviews of monitored impact data during the construction phase and bi-monthly reviews during the operational phase as the basis for assessing compliance with defined criteria and ensuring

that necessary mitigation measures are identified, designed and implemented and to undertake additional *ad hoc* monitoring and audit as required by particular circumstances.

- f) Evaluate and interpret all environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards and to verify the environmental impacts predicted in the EIA.
- g) Manage and liaise with other individuals or parties concerning any relevant environmental issues.
- h) Audit the effectiveness of the Environmental Management System (EMS) practices and procedures and implement any changes as appropriate.
- i) Conduct regular site audits of formal or informal nature to assess:
 - the level of the Contractor's general environmental awareness;
 - the Contractor's implementation of the recommendations in the EIA;
 - the Contractor's performance as measured by the EM&A;
 - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed; and
 - to advise the site staff of any identified potential environmental issues.
- j) Submit EM&A reports which summarise project monitoring and auditing data, with full interpretation, illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.4.1.2 Thus, this EM&A Manual provides the following information:

- a) Description of the project.
- b) Identification and recommendations for monitoring requirements for all phases of development, including:
 - identification of sensitive receivers;
 - monitoring locations;
 - monitoring parameters and frequencies;
 - monitoring equipment to be used;
 - programmes for baseline monitoring and impact monitoring; and

- data management of monitoring results.

- c) The organisation management structure, and procedures for auditing of the Project and implementation of mitigation measures that are recommended for the Project.
- d) The environmental quality performance limits for compliance auditing for each of the recommended monitoring parameters to ensure compliance with relevant environmental quality objectives, statutory or planning standards.
- e) Organisation and management structure, and procedures for reviewing the design submissions, monitoring results and auditing the compliance of the monitoring data with the environmental quality performance limits, contractual and regulatory requirements, and environmental policies and standards.
- f) Event and Action plans for impact and compliance procedures.
- g) Complaints handling, liaison and consultation procedures.
- h) Interim notification of exceedances, reporting procedures, report formats and reporting frequency including periodical quarterly summary reports and annual reviews to cover all construction, post-Project and operational phases of the development.
- i) Implementation schedules, summarising all recommended mitigation measures.

1.4.1.3 This Manual is considered to be a working document and should be reviewed periodically and revised once substantial changes have been made.

1.5 PROJECT ORGANIZATION

1.5.1.1 For the purpose of this EM&A Manual, the Highways Department of the Hong Kong SAR Government is referred to as the “Employer” and the Project “Supervising Officer” defined as the Supervising Officer’s Representative (SOR), who will be responsible for the supervision of the construction of the Project.

1.5.1.2 The mitigation/enhancement measures recommended by the TM-CLKL EIA that will require a design audit or preparation of specifications during the detailed design phase of the project will include:

- bored piling monitoring programme (Not relevant to the Northern Connection Sub-sea Tunnel Section);
- pre, during and post construction dolphin monitoring;
- 250m dolphin exclusion zone for use during dredging, reclamation, sheet

and bored piling works;

- acoustic decoupling methods for use during reclamation and dredging works;
- marine vessel control specifications;
- deployment of an artificial reef (Not relevant to the Northern Connection Sub-sea Tunnel Section);
- installation of hoarding for the protection of the pitcher plants and surrounding habitat (Not relevant to the Northern Connection Sub-sea Tunnel Section);
- coral translocation;
- design of toll plaza for grave G1 set back and protection (Not relevant to the Northern Connection Sub-sea Tunnel Section); and
- landscape design drawings.

1.5.1.3 In respect of the design phase EM&A, the Consultant commissioned to undertake the Detailed Design contract will be required to designate an auditor(s) to undertake the preparation of the design specifications as detailed above, in addition to an environmental audit of the design of the specified landscape measures in order to ensure that the recommendations of the EIA have been fully and properly specified. The Consultant shall use suitably qualified staff to undertake the audit requirements to the satisfaction of the EPD and the AFCD as appropriate. A flow chart of the design phase EM&A procedures is shown in **Figure 1.1**.

1.5.1.4 During the construction and operational phases of the project, an Environmental Team (ET) is to be employed by the Contractor. The ET will be headed by an Environmental Team Leader (ETL). He shall ensure the Contractor's compliance with the project's environmental performance requirements during construction and undertake the post construction EM&A works and his responsibilities will include field measurements, sampling, analysis of monitoring results, reporting and auditing. The ETL shall be approved by the SOR and the Director of Environmental Protection (DEP) and shall be competent and shall have at least 7 years relevant environmental monitoring and audit experience on projects of a similar scale and nature.

1.5.1.5 The ET will comprise suitably qualified support staff to carrying out the EM&A programme. The ET shall be independent and shall not be in any way connected to the Contractor's company. Due to the specialist nature of some of the EM&A works required for this project, the ET should comprise professionals proficient to undertake the tasks involved. Thus, the ET should include personnel experienced in noise, dust and water quality monitoring and mitigation, supervision of waste management, compensatory tree planting, coral relocation and dolphin monitoring and supervision.

- 1.5.1.6 Accordingly, a qualified dolphin specialist(s), together with a suitably experienced team of dolphin spotters, and a coral specialist, to the satisfaction of AFCD, will be required as part of the ET to undertake the dolphin abundance monitoring, implement the dolphin exclusion zones and undertake the coral relocation process. In addition, a Registered Landscape Architect, as defined by the Landscape Architect's Registration Board, will be required on the ET to monitor and audit the landscaping installation works and assist in the audit of the ecological transplantation and restoration works.
- 1.5.1.7 The overall duties of ETL and the team are as follows:
- Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements in respect of noise, dust and water quality.
 - Environmental site surveillance
 - Audit of compliance with environmental protection and pollution prevention and control regulations.
 - Monitor the implementation of environmental mitigation measures.
 - Monitor compliance with the environmental protection clauses/specifications in the Contract.
 - Review construction programme and comment as necessary.
 - Review construction methodology and comment as necessary.
 - Complaint investigation, evaluation and identification of corrective measures.
 - Audit of the EMS and recommend and implement any changes as appropriate.
 - Liaison with the Independent Environmental Checker (IEC) on all environmental performance matters.
 - Advice to the Contractor on environmental improvement, awareness, enhancement matter, etc., on site.
 - Timely submission of the designated EM&A reports to the SOR, the IEC, the DEP, the AFCD and the AMO as appropriate.
- 1.5.1.8 In addition to the ETL and ET, an Independent Environmental Checker (IEC) shall be employed to advise the SOR on environmental issues related to the project. The role of the IEC shall be independent from the management of construction works, but the IEC shall be empowered to audit the environmental performance of the construction activities and operational mitigation. The IEC shall have project management experience in addition to the requirements of the ET specified above and the appointment of the IEC

will be subject to the approval of the SOR and the DEP. The IEC may require specialist support staff in order to properly carry out his duties, which shall include the following:

- Review and audit all aspects of the EM&A programme.
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers.
- Carry out random sample check and audit on monitoring data and sampling procedures, etc.
- Conduct random site inspection.
- Audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site.
- Review the effectiveness of environmental mitigation measures and project environmental performance.
- Audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET and the Contractor.
- Check complaint cases and the effectiveness of corrective measures.
- Review EM&A report submitted by the ET.
- Feedback audit results to ET by signing off relevant EM&A proformas.

1.5.1.9 An organisation chart showing the lines of communication between the key parties with respect to the EM&A works is provided on **Figure 1.2**. Both the ET and IEC shall be retained for the duration of the EM&A works which will span both the construction phase and one year into the operational phase of the project. The operational EM&A works will be the responsibility of the Contractor and will be undertaken in parallel to the maintenance period after the completion of construction.

1.5.1.10 Notwithstanding the above, given that the TM-CLKL, HKBCF and HKLR will be constructed concurrently, an Environmental Project Office (ENPO) or equivalent to oversee the cumulative construction projects in North Lantau area will be established by the Project Proponent. The responsibility of the ENPO would be similar to that of the IEC but should also include:

- coordination of the monitoring and auditing works for all the on-going projects in the area in order to identify possible sources/causes of exceedances and recommend suitable remedial actions where appropriate;
- identify and assess cumulative impacts including possible sources/causes of exceedance and recommending suitable remedial actions;
- undertake liaison with the mainland project teams counterparts to identify and

assess any cross-boundary cumulative impacts; and

- coordinate the assessment and response to complaints/enquires from locals, green groups, district councils or the public at large.

1.5.1.11 The exact responsibilities and organisation of the ENPO will be defined during the detailed design stage.

1.6 TERMINOLOGY

1.6.1.1 To clarify the terminology for impact monitoring and audit, key definitions are specified below and are used throughout this Manual.

1.6.1.2 Monitoring refers to the systematic collection of data through a series of repetitive measurements. The stages of monitoring are defined in this document as follows:

- a) Baseline Monitoring refers to the measurement of parameters, such as noise and air quality impact parameters, during a representative pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change.
- b) Impact Monitoring involves the measurement of environmental impact parameters, such as noise and air quality, during Project construction and implementation so as to detect changes in these parameters which can be attributed to the Project.

1.6.1.3 Audit is a term that infers the verification of a practice and certification of data.

The types of audit are defined below:

- a) Compliance audit is defined as follows:
 - the process of verification that all or selected parameters measured by a noise or air quality impact monitoring programme or levels of an operation are in compliance with regulatory requirements and internal policies and standards; and
 - the determination of the degree and scope of any necessary remediation in the event of exceedance of compliance.
- b) Post Project Audit is carried out after the implementation and commissioning of a Project.

1.6.1.4 For the purpose of noise, air and water quality impact monitoring and audit, the Action and Limit Levels are defined as follows:

- a) The Action Level is the level defined in which there is an indication of a deteriorating ambient level for which a typical response could be an increase in the monitoring frequency.

- b) The Limit Level is the level beyond the appropriate remedial pollution control ordinances, noise and air quality impact objectives or Hong Kong Planning Standards and Guidelines established by the EPD for a particular project, such that the works should not proceed without appropriate remedial action, including a critical review of plant and work methods.

2 *PROJECT DESCRIPTION*

2.1 *SCOPE OF THE PROJECT*

2.1.1.1 Further to the recommendations of the Option Assessment and subsequent alignment developments detailed in *Section 2* of the EIA report, the preferred TM-CLKL scheme comprises Northern Connection Option N1b, Main Connection Option M3 and Southern Connection Option S1. This preferred alignment is shown in **Figure 2.1** and will comprise:

- (a) construction of approximately 5.0 km long dual 2-lane road tunnel between Tuen Mun Area 40 and the HZMB HKBCF at north-east of HKIA;
- (b) construction of approximately 4.2km seawalls and approximately 35.6 ha of reclamation to the Government foreshore and sea-bed at Tuen Mun Area 40 and Lantau for the tunnel portals and the associated roads, as shown in **Figures 2.2a and 2.2b**;
- (c) construction of approximately 1.6km long dual 2-lane viaduct between HZMB HKBCF and NLH and the associated roads at Tai Ho;
- (d) construction of a toll plaza at Tuen Mun Area 46 and the associated roads at Tuen Mun;
- (e) construction of footpaths areas;
- (f) construction of administration building, ventilation buildings and other ancillary buildings to facilitate ventilation and tunnel control operation serving the proposed road tunnel in (a) above and toll plaza in (d) above;
- (g) modification and realignment of sections of Lung Fu Road and Lung Mun Road at Tuen Mun;
- (h) modification and realignment of sections of North Lantau Highway and Cheung Tung Road at Tai Ho;
- (i) permanent closure and demolition of sections of existing at-grade carriageways, footpaths and central median/refuge islands;
- (j) temporary closure and reconstruction/modifications of sections of existing at-grade carriageways, footpaths and central median/refuge islands; and
- (k) ancillary works including site formation, slope, drainage, utilities, footbridge, noise barriers, retaining walls, berths and temporary pontoon.

2.1.1.2 Details of the various elements of the selected TM-CLKL alignment are detailed in the sections below.

2.2 *NORTHERN SECTION IN TUEN MUN*

2.2.1 *Northern Reclamation*

- 2.2.1.1 At the northern landfall in Tuen Mun, adjacent to the River Trade Terminal at Pillar Point, the construction of TM-CLKL requires a reclamation of about 16.5 ha of land area when calculated to the cope line, or 21.1 ha of land for the footprint area to the bottom of the seawall where it intersects the seabed. The general layout and typical sections of the proposed reclamation scheme in this location are shown in **Figures 2.3a to 2.3c**.
- 2.2.1.2 Unlike the southern landfall reclamation where sand fill is proposed below +2.5mPD, public fill will be used for the entire reclamation to maximize the use of public fill. Though this may result in worse impact to water quality during construction, in view of its relatively smaller scale in comparison with the HKBCF reclamation, the type of fill material is adopted to achieve an overall balance among environmental, technical and other aspects.
- 2.2.1.3 The northern landfall reclamation is essentially required to provide a land area for construction of the launching shaft for the tunnel boring machine (TBM) and ultimately, protection to the tunnel structure when constructed.
- 2.2.1.4 During the detailed design phase of the Contract, the latest development of the tunnels' design requires Portion N-a of the reclamation to be ready first in order to reduce the construction risks. The latest construction sequence is presented in **Annex C**. Under the latest sequence, it is proposed to commence reclamation at Portion N-a, followed by reclamation at Portions N-b and N-c, which is a reverse of the original sequence of the EIA Report and EP-354/2009A. The latest construction sequence has been proposed and a *Notification of Changes in Construction Sequence* (the "Notification") was submitted to EPD on 25 September 2013. Summary of the Notification is presented in **Annex C**. Sand Compaction Piles (SCP), in association with a non-dredged seawall foundation, have been considered for the construction in order to minimise the amount of marine sediment to be dredged, as described in *Section 2*. However, these techniques require a much longer construction time for the seawall which would not be quick enough to allow the land to be formed on time to allow the TBM to commence tunnel construction. Therefore, a fully dredged method is required for the seawall foundation construction. The southern tip of the reclamation will house the TBM tunnel shaft and the deeper portion of the cut-and-cover tunnel section. The marine deposits located above these deep structures would inevitably have been removed during excavation for the construction of these structures. Fully dredged method is therefore also proposed for this section of the reclamation in conjunction with the seawall construction.
- 2.2.1.5 Notwithstanding, a non-dredged reclamation is proposed for the inner portions of the reclamation denoted by N-a and N-b (**Figures 2.3a and 2.3b**). In these sections of the alignment, the cut-and-cover tunnel and open ramp will lie above the marine deposits layer and, in order to minimise the sediment removal and disposal quantities, it is proposed that the marine

deposits underneath the cut-and-cover tunnel and ramp be left in place, with the tunnel structures supported by deep foundation and diaphragm walls, where necessary. Band drains and sand blankets will be installed and surcharging will be applied to reduce the residual ground settlement associated with the non-dredged reclamation.

- 2.2.1.6 Construction of the northern reclamation, which partly abuts the existing seawall at Pillar Point, will affect the marine operations of the Government Berths at Tuen Mun River Trade Terminal, including Customs and Excise (C&E) and Immigration (ImmD) Departments and Fire Services Department's (FSD) Fire Boat Station. Provisions have been made to relocate these facilities to the new reclamation alongside the eastern seawall (see **Figure 2.2a**).

2.2.2 *Viaduct Connection and Slip Roads*

- 2.2.2.1 An elevated viaduct at the northern section of TM-CLKL connects the submarine tunnel as it emerges on the northern landfall to the south of the TMWB alignment at the north. Commencing from the reclamation for the tunnel landfall, the viaduct curves up and over Lung Mun Road, crossing above a sawmill factory and then abuts to the retaining wall structures at the western side of the proposed toll plaza in Area 46, as described in *Section 2.2.3* below. Layout of the viaduct is shown in **Figure 2.4**.
- 2.2.2.2 The structural form of the viaduct will consist of a pair of pre-stressed concrete box girders supported on reinforced concrete piers. Each box girder commences at around 14.6 m wide at the reclamation to accommodate a 2-lane carriageway, before widening out to accommodate additional lanes for connection with the toll plaza. Span lengths will typically be 60m using a constant structural deck depth of 3.2 m. In order to cross over the Lung Mun Road and the existing fire station, slightly longer spans of around 75m are used with a haunched deck of a depth of around 6m at the piers. The piers supporting the viaducts will sit on bored piles founded on rock at some 20m below ground level, with pile caps below ground level.

2.2.3 *Toll Plaza*

- 2.2.3.1 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.2 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.3 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.4 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.5 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.6 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.7 Not relevant to the Northern Connection Sub-sea Tunnel Section.

- 2.2.3.8 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.9 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.10 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.11 Not relevant to the Northern Connection Sub-sea Tunnel Section.
- 2.2.3.12 Not relevant to the Northern Connection Sub-sea Tunnel Section.

2.2.4 Other Construction Works

- 2.2.4.1 Site formation and associated slopes and retaining walls will be required to form the toll plaza and associated road carriageways. In general, soil and rock cut slopes would be involved. All slopes will be formed in a stable slope angle with proper maintenance access and drainage surface channels. If necessary, soil nails will be installed to ensure adequate current safety standard. Fill slope formation will unlikely be required according to the current road alignment. The feasible retaining wall structures could be mass concrete, reinforced concrete L-shape or crib walls and reinforced earth for road embankment.

2.3 SUBMARINE TUNNEL

2.3.1 Alignment and Construction

- 2.3.1.1 The preferred horizontal alignment of the proposed submarine tunnel, shown in **Figure 2.1**, is 5km long and crosses the Urmston Road sea channel, connecting Tuen Mun to the TM-CLKL southern landfall at the HKBCF reclamation, east of the airport island. As described in *Section 2*, the tunnel is proposed to be constructed using a TBM in order to avoid disturbance to the seabed and minimise amount of dredged material to be removed.
- 2.3.1.2 The tunnel begins at the northern portal situated at the northern landfall where the ground level will be approximately +6.0mPD. The submarine tunnel then runs southward under Urmston Road, where the lowest tunnel bottom level will reach approximately -49mPD, towards the reclamation attached to the east of the proposed HKBCF where it ends at the southern portal. Reclamation works for the TM-CLKL southern landfall will bring the new ground level to around +6mPD. The vertical alignment of the tunnel is shown in **Figures 2.5a to 2.5c**. As shown in these figures, as the tunnel rises up to the portals, any seabed disturbance will be contained within the reclamation areas at either end of the tunnel and, as such, further seabed loss and disturbance will not occur from the tunnel itself. Construction of the TBM tunnel will commence at the northern landfall reclamation where a land area is required for construction of the launching shaft for the TBM. The TBM will start boring from the launching shaft towards the southern reclamation adjacent to HKBCF where a TBM retrieval shaft will be constructed for the removal of the TBM.

2.3.2 Ventilation Buildings

2.3.2.1 Two ventilation buildings have been proposed at either end of the submarine tunnel to discharge the polluted tunnel air. Location of the north ventilation buildings is shown in **Figure 2.2a** and described below.

2.3.2.2 The North Ventilation Building (NVB) will be located at the southern end of the northern landfall reclamation of the TM-CLKL tunnel, and will be used to extract polluted tunnel air from the northbound tunnel. The cross-sectional area of stack will be about 94m², and the exit velocity of the emissions will be about 4m/s. The building has three storeys above ground and two levels of basement. The mid-discharge height from the stack is 16.15m above ground, which equates to between 14.15m and 18.15m high. The exhaust direction will be towards the sea and is proposed to be inclined at 45 degree upward.

2.3.2.3 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.4 SOUTHERN SECTION AT HKBCF/NORTH LANTAU

2.4.1 Southern Reclamation

2.4.1.1 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.4.1.2 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.4.1.3 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.4.1.4 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.4.1.5 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.5 WORKS AREA

2.5.1.1 Six works areas have been identified for use during the construction period of TM-CLKL, and will be used for locating site offices and for storage of materials and viaduct segments, etc. The locations of the works areas are shown in **Figure 2.8a** and described in **Table 2.1** below.

Table 2.1 Details of TM-CLK Proposed Works Area

Works Area	Location	Proposed Use
Lantau*		
Tuen Mun		
WA18	At the existing River Trade Golf at Pillar Point in Tuen Mun	Works area for storage of materials and viaduct segment and site office
WA19	At the existing closed Pillar Point Valley Landfill at Pillar Point in Tuen Mun	Works area for storage of materials and viaduct segment and site office

* Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.5.1.2 All the works areas are currently formed on developed land, with some already being used as works areas for on-going construction projects. The exception to this is WA19 which is within the Pillar Point landfill area, and the site as a whole is largely covered with vegetation with only a relatively small portion formed and utilised. However, the terms for use of this site during the TM-CLKL construction requires that no trees will be removed and therefore, only the already formed areas will be utilised. In addition, all the sites are located away from any residential areas.

2.6 SEWAGE & DRAINAGE

2.6.1.1 Stormwater drainage systems will be provided to collect stormwater from the carriageway surfaces. The stormwater will enter into gullies along the kerb lines. The gullies will be fitted with sumps to trap silt and grit prior to discharging the stormwater into the stormwater drainage systems. The drainage systems will eventually discharge the stormwater into the sea at discrete locations. Similar systems will be provided along the marine viaduct. Sump traps will be built into the deck structure, and the collected stormwater will discharge into the sea at the column locations.

2.6.1.2 Operational sewage will be generated but, again, in relatively small quantities as summarised in **Table 2.2** below, based upon the staffing estimates required for the TM-CLKL project.

Table 2.2 Estimated Sewage Generation

Location	Staff	Average Dry Weather Flow (m ³ /day)
Northern Landfall	400	140

2.6.1.3 In Tuen Mun, the sewage (Average Dry Weather Flow (ADWF)) from the toll plaza and northern ventilation building is estimated to be about 178m³ per day and with about 510 personnel on site in total. The sewage will be discharged to the existing sewerage system and it is expected that that adequate capacity in the local system to accommodate this amount is available

2.6.1.4 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.7 PROJECT PROGRAMME

2.7.1.1 It is anticipated that construction for the TM-CLKL Northern Connection Sub-sea Tunnel Section will commence in November 2013, with a target opening date for the entire road link at the end of 2018. An indicative construction programme showing the key activities in different major construction areas is shown in **Figure 2.9a**. Locations of the construction areas referenced in the construction programme are shown in **Figure 5.1**. This is based upon working 12 hours per day for all land works and 16 hours per day for the marine works, although piling works for the marine sheet piled wall will, also, be restricted to 12 hours per day.

2.7.1.2 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme

2.7.1.3 A *Notification of Changes in Construction Sequence* (the “Notification”) was submitted to EPD on 25 September 2013. Summary of the Notification is presented in **Annex C**.

2.7.1.4 Not used.

2.7.1.5 Not used.

2.8 CONCURRENT PROJECTS

2.8.1 Interface with HKBCF and HZMB, HKLR

2.8.1.1 Not used.

2.8.1.2 As the HKBCF, HKLR and TM-CLKL projects are proposed to be constructed concurrently and will be operational at the same time, cumulative impacts are possible and have been assessed.

2.8.2 *Interface with Tuen Mun Western By-pass*

2.8.2.1 As the TMWB and TM-CLKL projects are proposed to be constructed concurrently and will be operational at the same time, cumulative impacts are possible and have been assessed.

2.8.3 *Other Concurrent Projects*

2.8.3.1 In addition to the interface with the major concurrent projects described above, details of other concurrent projects during either the construction and/or the operational phases, together with details of how these are assessed in the EIA, are described in the summary table of concurrent projects included as **Appendix A2** of the EIA report.

2.9 *TRAFFIC DATA AND ASSUMPTIONS*

2.9.1.1 A Local Area Model was developed to provide traffic forecasts for EIA purposes. The EIA requires cumulative traffic forecasts and, hence, EIA flows were produced assuming the HZMB, HKLR, HKBCF, TMWB and TM-CLKL were all in place. In order to achieve consistency, a consistent set of model input assumptions have been adopted for the interfacing studies of TM-CLKL, HKBCF, HKLR and TMWB.

2.9.1.2 The TMWB was assumed to be “non tolled” for the purposes of the TM-CLKL EIA forecasts. This would make a marginal difference to the predicted TM- CLKL traffic forecasts, increasing the traffic flows slightly and, therefore, would represent a potentially worst case for assessing the environmental impacts. The traffic flows have been divided into the 16 vehicle classes required to determine the emissions of the traffic.

2.9.1.3 The opening year for the whole TM-CLKL, i.e. both northern and southern sections, was assumed to be 2016. Design year peak hour traffic forecasts have, therefore, been prepared for the years 2016, 2021 and 2031 which reflect the full operation of the TM-CLKL. In addition, to assess the environmental impacts at the interim year of 2014, when the southern section will be opened to form part of the new road network servicing the HKBCF Phase 1 commissioning, the relevant traffic forecasts for this year have also been prepared. A summary of the traffic data for the prevailing year of 2007 and the future years of 2014, 2016, 2021 and 2031 and the road links are included in the EIA Report.

3 AIR QUALITY

As per Condition 2.4 of the EP of TM-CLKL, an enhanced monitoring plan on TSP level at Tuen Mun (“the Enhanced TSP Monitoring Plan”) is required to be submitted to the DEP for approval at least 1 month before the commencement of construction of the Project. Details of the Enhanced TSP Monitoring Plan are provided in this Contract specific EM&A Manual.

3.1 AIR QUALITY PARAMETERS

- 3.1.1.1 Monitoring of the Total Suspended Particulates (TSP) levels shall be carried out by the Environmental Specialist (ET) (see Section 1) to ensure that construction works are not generating dust which exceeds the acceptable level. Timely action should be taken to rectify the situation if an exceedance is detected.
- 3.1.1.2 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B*. Upon approval by the SOR and the DEP, 1-hour TSP levels may be measured by direct reading methods for ad hoc measurements.
- 3.1.1.3 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, any other special phenomena and work progress of the concerned site shall be recorded in detail by the ET. A sample data sheet is shown in **Figure 3.1**.

3.2 MONITORING EQUIPMENT

- 3.2.1.1 A high volume sampler in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:
- (i) 0.6-1.7 m³/min (20-60 SCFM) adjustable flow range;
 - (ii) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
 - (iii) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
 - (iv) capable of providing a minimum exposed area of 406 cm² (63 in²);
 - (v) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
 - (vi) equipped with a shelter to protect the filter and sampler;
 - (vii) incorporated with an electronic mass flow rate controller or other equivalent devices;

- (viii) equipped with a flow recorder for continuous monitoring; (ix) provided with a peaked roof inlet;
- (x) equipped with a manometer;
- (xi) able to hold and seal the filter paper to the sampler housing in a horizontal position;
- (xii) easy to change the filter; and
- (xiii) capable of operating continuously for 24-hr period.

- 3.2.1.2 The Contractor is responsible for provision of the monitoring equipment and shall ensure that sufficient number of high volume samplers with an appropriate calibration kit are available for carrying out the baseline monitoring, impact monitoring and ad hoc monitoring. The high volume samplers shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled by the ET.
- 3.2.1.3 Calibration of dust monitoring equipment shall be conducted by the ET upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by concerned parties, such as the IEC. All the data shall be converted into standard temperature and pressure condition.
- 3.2.1.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and recorded in the data sheet as described in *Section 3.1*.
- 3.2.1.5 If the ET proposes to use a direct reading dust meter to measure 1-hr TSP levels on an ad hoc basis, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the High Volume Sampler (HVS) and may be used for the 1-hr sampling. The instrument should also be calibrated regularly and the 1-hr sampling shall be checked periodically by the HVS to check the validity and accuracy of the results measured by the direct reading method.
- 3.2.1.6 Wind data monitoring equipment shall also be provided and set up at suitable locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the SOR, in consultation with the IEC.
- 3.2.1.7 For installation and operation of wind data monitoring equipment, the following points shall be observed:
- (i) the wind sensors should be installed on masts at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings;

- (ii) the wind data should be captured by a data logger to be down-loaded for processing at least once a month;
- (iii) the wind data monitoring equipment should be re-calibrated at least once every six months; and
- (iv) wind direction should be divided into 16 sectors of 22.5 degrees each.

3.2.1.8 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the SOR and agreement from the IEC.

3.3 *LABORATORY MEASUREMENT/ANALYSIS*

- 3.3.1.1 A clean laboratory with constant temperature and humidity control and equipped with necessary measuring and conditioning instruments shall be used for sample analysis and equipment calibration and maintenance. The laboratory shall be HOKLAS accredited.
- 3.3.1.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the SOR, in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the SOR and the IEC. The IEC shall conduct regular audits of the measurements performed by the laboratory to ensure the accuracy of the results. The ES shall provide the SOR and the IEC with one copy each of the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B* for reference.
- 3.3.1.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.
- 3.3.1.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 3.3.1.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

3.4 *MONITORING LOCATIONS*

- 3.4.1.1 The air quality sensitive receivers and air quality monitoring stations, as proposed in the Enhanced TSP Monitoring Plan, are shown in **Figure 3.2a** and listed in **Table 3.1**. The status and locations of dust sensitive receivers may change after issue of this Enhanced TSP Monitoring Plan. If this happens, the ET shall agree with the SOR, in consultation with the IEC, to propose the alternative/updated air quality monitoring station(s).

Table 3.1 **Enhanced TSP Monitoring Plan – Monitoring Stations**

Air quality monitoring station	Location	Landuse	No. of Storey	Horizontal Distance to the Major Construction Area (m)	
				Northern Lanfall	Toll Plaza
ASR1	Tuen Mun Fireboat Station	Office	1	< 50	< 50
ASR5	Pillar Point Fire Station	Office	5	< 50	> 500
AQMS1	Previous River Trade Golf	Bare ground	0	270	60
AQMS2	Bare ground at Ho Suen Street	Bare ground	0	350	< 50
ASR10	Butterfly Beach Park	Recreational uses	0	> 1000	170

3.4.1.2 When alternative monitoring locations are proposed, the following preferred locations and factors shall be considered:

- (i) the site boundary or locations close to the major dust emission source;
- (ii) close to the sensitive receptors; and
- (iii) the prevailing meteorological conditions.

3.4.1.3 The ET shall agree with the SOR, in consultation with the IEC, the position of the high volume samplers. When positioning the samplers, the following points shall be noted:

- (i) a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
- (ii) the distance between the sampler and an obstacle, such as buildings, shall be at least twice the height that the obstacle protrudes above the sampler;
- (iii) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- (iv) a minimum of 2 metres separation from any supporting structure, measured horizontally is required;
- (v) no furnace or incinerator flue is nearby;
- (vi) airflow around the sampler is unrestricted;
- (vii) the sampler is more than 20 metres from the dripline;

- (viii) any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
- (ix) permission must be obtained to set up the samplers and to obtain access to the monitoring stations;
- (x) a secured supply of electricity is needed to operate the samplers; and
- (xi) no two samplers should be placed less than 2 metres apart.

3.4.1.4 Prior to construction, the dust monitoring schedule shall be developed by the ET based upon the construction schedule supplied by the Contractor. The ET shall inform the IEC of the impact monitoring programme such that he can conduct on- site audits to ensure accuracy of the impact monitoring results. The environmental monitoring schedule shall be approved by the SOR.

3.5 ***BASELINE MONITORING***

Baseline monitoring will be conducted to collect representative TSP data from the five monitoring stations. This baseline monitoring will provide data for comparison with TSP data collected during the construction phase.

The baseline monitoring will be conducted at the air quality monitoring stations showed in **Figure 3.2a** for 14 consecutive days prior to the start of the construction works to obtain daily 24-hour TSP samples. 1-hour sampling shall also be undertaken at least 3 times per day during the same period. Monitoring shall take place prior to the commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and traffic control surveillance system (TCSS). The proposed monitoring frequency is detailed in Table 3.2.

Table 3.2 Monitoring Frequency of Baseline Enhanced TSP Monitoring Plan

Monitoring Parameter	Monitoring Location	Frequency	Monitoring Condition
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2 ⁽¹⁾	3 times per day for 14 consecutive days	Before commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and TCSS
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily for 14 consecutive days	Before commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and TCSS

The monitoring schedule for baseline monitoring shall be developed by the ET and provided to the SOR and IEC for agreement prior to the monitoring works.

In the event that insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the DEP to agree on an appropriate set of data to be used as a baseline reference and submit this data to the SOR and IEC for approval.

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET considers that the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the TSP Action and Limit Levels criteria, shall be revised. The revised baseline levels and TSP Action and Limit Levels shall be agreed with the DEP and supplied to the IEC.

3.6 IMPACT MONITORING

The Enhanced TSP Monitoring Plan will be implemented simultaneously with the air quality impact monitoring in the EM&A programme. In addition to the TSP monitoring at ASR1 and ASR5, monitoring will also be undertaken at the additional monitoring stations AQMS1, AQMS2 and ASR10 following the frequency of air quality impact monitoring stated in the EM&A Manual. The data collected will be used to provide an indication of whether there is any significant increase in TSP levels upon commencement of construction activities of the Northern Connection, toll plaza and tunnel buildings. TSP monitoring, including those required under the approved EM&A Manual (ie for ASR1 and

⁽¹⁾ AQMS2 is an alternative monitoring station for Butterfly Laundry which is an ASR (ie ASR6) identified in the approved EIA Report. AQMS2 is being proposed for monitoring since access to Butterfly Laundry is not granted to the ET at the moment to undertake the air quality monitoring. Should access be granted to the ET, air quality monitoring will be undertaken at Butterfly Laundry instead of AQMS2 in the impact monitoring phase.

ASR5 only) and this Enhanced TSP Monitoring Plan, will not be implemented during the TCSS installation works which will not involve any civil works.

The major sources of dust nuisance arising from the Northern Connection, toll plaza and tunnel buildings are related to excavation, slope works, foundation works, construction of road and superstructures, wind erosion from reclaimed areas, open sites and stockpiling areas. Therefore during these construction activities, the TSP monitoring frequency will be increased at all air quality monitoring stations such that any deteriorating air quality can be readily detected and timely action taken to rectify the situation. The Enhanced TSP Monitoring Plan during construction phase is summarized in **Table 3.3**.

Table 3.3 *Enhanced TSP Monitoring Plan – Construction Phase*

Monitoring Parameter	Monitoring Location	Frequency	Monitoring Condition ⁽¹⁾
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	3 times per day every six days	Throughout the Northern Connection, toll plaza and tunnel buildings construction works
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily every six days	Throughout the Northern Connection, toll plaza and tunnel buildings construction works
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	3 times per day every three days	<p>Northern Connection</p> <p>During excavation works for launching shaft, excavation work for Cut and Cover Tunnel and Cut and Cover Tunnel Construction</p> <p>Toll Plaza</p> <p>During excavation, slope works, construction of road and superstructures and wind erosion from open sites and stockpiling areas</p> <p>Tunnel Buildings</p> <p>During excavation, foundation works, construction of superstructures and wind erosion from open sites and stockpiling areas</p>

Monitoring Parameter	Monitoring Location	Frequency	Monitoring Condition ⁽¹⁾
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily every three days	<p>Northern Connection</p> <p>During excavation works for launching shaft, excavation work for Cut and Cover Tunnel and Cut and Cover Tunnel Construction</p> <p>Toll Plaza</p> <p>During excavation, slope works, construction of road and superstructures and wind erosion from open sites and stockpiling areas</p> <p>Tunnel Buildings</p> <p>During excavation, foundation works, construction of superstructures and wind erosion from open sites and stockpiling areas</p>

Note:

(1) The Enhanced TSP Monitoring Plan will be undertaken when any of the monitoring condition(s) is triggered.

The ET will notify the SOR and IEC at least one month before the monitoring frequency will be increased according to the Enhanced TSP Monitoring Plan (ie at least one month before commencement of relevant works for which increased monitoring frequency is required in accordance with **Table 3.3**).

3.7

EVENT AND ACTION PLAN FOR AIR QUALITY

The baseline monitoring results will form the basis for determining the Action and Limit Levels (A/L Levels) for the impact monitoring of the 24-hour TSP and 1-hour TSP levels. According to the *Supplementary Information on Construction Air Quality in Tuen Mun* ⁽¹⁾ (“the *Supplementary Information*”) submitted under Section 8.(1) of the EIAO for the Project, the annual average TSP results from EPD monitoring station in Yuen Long is ranged from 100 to 103 µg/m³ between 2003 to 2008 which exceeded the AQO criterion of annual TSP (80 µg/m³). More recent information on annual average TSP levels, however, showed that exceedance of the AQO criterion was only recorded in 2011 during the period of 2009 to 2012 (2009: 77 µg/m³; 2010: 78 µg/m³; 2011: 86µg/m³; 2012: 68 µg/m³). This annual AQO TSP criterion of 80 µg/m³ will also be adopted as the A/L Level of the Enhanced TSP Monitoring. The method of derivation and the proposed Action and Limit Levels are shown in **Tables 3.4a-b**, respectively.

(1) EIA reports related to HZMB. *Supplementary Information on Construction Air Quality in Tuen Mun*. Further information submitted under Section 8.(1) of the Ordinance. Available from http://www.epd.gov.hk/eia/register/report/eiareport/eia_1742009/further_info/pdf/Supplementary%20Details%20for%20ACE%20R6%20-%20marked%20up%20EPD%202509.htm

Table 3.4a *Method of Derivation of TSP Action and Limit Levels*

Parameter	Action Level	Limit Level
24-hour TSP Level in $\mu\text{g}/\text{m}^3$	<p>For baseline level $\leq 200 \mu\text{g}/\text{m}^3$ Action level = (Baseline*1.3+ Limit level)/2</p> <p>For baseline level $>200 \mu\text{g}/\text{m}^3$ Action level = Limit level</p>	260
1-hour TSP Level in $\mu\text{g}/\text{m}^3$	<p>For baseline level $\leq 384 \mu\text{g}/\text{m}^3$ Action level = (Baseline*1.3+ Limit level)/2</p> <p>For baseline level $> 384 \mu\text{g}/\text{m}^3$ Action level = Limit level</p>	500
Annual Average 24-hour TSP Level in $\mu\text{g}/\text{m}^3$	Action level = Limit level	80

Table 3.4b *TSP Action and Limit Levels for Impact Air Quality Monitoring*

Parameter	Air Quality Monitoring Stations	Action Level ($\mu\text{g}/\text{m}^3$)	Limit Level ($\mu\text{g}/\text{m}^3$)
24-hour TSP ($\mu\text{g}/\text{m}^3$)	ASR1	213	260
	ASR5	238	260
	AQMS1	213	260
	AQMS2	238	260
	ASR10	214	260
1-hour TSP ($\mu\text{g}/\text{m}^3$)	ASR1	331	500
	ASR5	340	500
	AQMS1	335	500
	AQMS2	338	500
	ASR10	337	500

The above A/L Levels are used to determine whether operational modifications are necessary to mitigate construction dust impacts, particularly in relation to reducing the TSP levels. The impact monitoring results will be evaluated against the A/L Levels. In the event that the A/L Levels are exceeded, appropriate actions in Event and Action plan (**Table 3.5**) should be undertaken and a review of works should be carried out by the Contractor(s).

Any noticeable change to air quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Should exceedance be confirmed to be related to the works of the TM-CLKL Project, additional mitigation measures recommended in the *Supplementary Information* should be considered for implementation, including but not limited to the following:

- More frequent watering at the areas of exposed soil ⁽¹⁾ ;
- Requiring that temporary hydroseeding of exposed surfaces which are

(1) Currently, the Contractor is required to undertake watering at least 12 times per day for the Tuen Mun area. The time intervals between each watering should not exceed 1.5 hours.

not proposed to be touched for a period of time be undertaken;

- Implementing further dust suppression or screening measures at the concerned ASRs;
- Scheduling the works to avoid key dusty construction activities of concurrent contracts where possible; and
- Stoppage of construction works would be taken if deemed necessary to mitigate any project-related upsurge of TSP level.

Particular attention will be paid to the Contractor(s)'s implementation of the recommended dust-reducing mitigation measures.

3.8 *DUST MITIGATION MEASURES*

3.8.1.1 The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of the following measures. The recommended construction dust mitigation measures are summarised in the *Air Quality Environmental Mitigation Implementation Schedule* provided in **Appendix A**.

- a. All unpaved roads/exposed area shall be watered which results in dust suppression by forming moist cohesive films among the discrete grains of road surface material. An effective watering programme of twice daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;
- b. Watering on all exposed soil within the Project site and associated work areas in Tuen Mun area throughout the construction phase for at least 12 times per day;
- c. The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels;
- d. The Contractor shall not burn debris or other materials on the works areas;
- e. In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet;
- f. Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;

- g. Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading;
- h. During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards;
- i. No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site;
- j. Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable; and
- k. All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.

3.8.1.2 If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of the ET, the Contractor shall liaise with the ET regarding other mitigation measures and consult the IEC for their effectiveness, and then propose these measures to the SOR for approval prior to the implementation of the measures.

Table 3.5 *Enhanced TSP Monitoring Plan – Event and Action Plan*

Action Level	Action			
	ET (a)	IEC (a)	SOR (a)	Contractor(s)
Exceedance recorded	<ol style="list-style-type: none"> 1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Action Level, the exceedance is then confirmed. 3. Inform the IEC and the SOR. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Discuss with the IEC and the Contractor on remedial actions required. 7. If exceedance continues, arrange meeting with the IEC and the SOR. 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> 1. Rectify any unacceptable practice 2. Amend working methods if appropriate 3. If the exceedance is confirmed to be Project related, submit proposals for remedial actions to IEC within 3 working days of notification 4. Implement the agreed proposals 5. Amend proposal if appropriate

Limit Level	Action			
	ET (a)	IEC (a)	SOR (a)	Contractor(s)
Exceedance recorded	<ol style="list-style-type: none"> 1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Limit Level, the exceedance is then confirmed. 3. Inform the IEC, the SOR, the DEP and the Contractor. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 7. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 8. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 9. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. If the exceedance is confirmed to be Project related after investigation, in consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance. 2. If the exceedance is confirmed to be Project related after investigation, submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Amend proposal if appropriate. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Note: (a) ET – Environmental Team; IEC – Independent Environmental Checker; SOR – Supervising Officer's Representative

4 NOISE

4.1 INTRODUCTION

The TM-CLKL EIA study concluded that no existing noise sensitive receiver (NSR) has been identified within the Study Area, and no planned NSR has been identified from the Project Site. Based upon this, no noise monitoring is necessary for either the construction or operation phases.

Regular site inspections and audits will be carried out during the construction phase in order to confirm compliance with the regulatory requirements and conformity of the Contractor with regard to noise control and contract conditions.

4.2 NOISE MITIGATION MEASURES

- 4.2.1.1 As no impacts are predicted during the construction stage at the existing NSRs in Tuen Mun, no specific mitigation measures have been recommended. However, the Contractor will be responsible for ensuring noise levels are minimized as far as possible through the application of good site practices, including maintenance of equipment. During the operational phase, no mitigation is required.

5 WATER QUALITY

5.1 INTRODUCTION

5.1.1.1 Since the marine works of TM-CLKL will be concurrent with HKBCF and HKLR and the southern landfall of TM-CLKL is indeed an integrated part of the HKBCF, the potential water quality impacts of TM-CLKL has been assessed jointly with HKBCF and HKLR. The EIA has, therefore, recommended that the water quality monitoring works of the three concurrent projects, also by the same project proponent, be conducted as a whole to enhance the efficiency and cost-effectiveness of the monitoring programme. Based on this, the water quality monitoring scheme designed assuming the monitoring will be implemented jointly and be coordinated with a project ENPO office.

5.2 MITIGATION MEASURES

5.2.1.1 The reclamation layout of TM-CLKL is presented in **Figure 5.1**. The EIA Report and the Notification have assessed the water quality impacts caused by the construction and operation stages. Mitigation measures have been recommended in the EIA, and subsequently adopted in the Notification, to ensure compliance with the relevant legislative requirements. These mitigation measures are summarised below.

- Closed grabs should be used for sediment dredging to reduce sediment loss when lifting the grabs to the barges.
- No more than one grab dredger with a maximum daily dredging rate of 7,200m³ shall be employed for the dredging operation.
- The decks of dredging barges should be clean and tidy to avoid any sediment to be washed into the sea.
- Loading of the dredged sediments to the barges should be carried out carefully to minimise splashing of sediments.
- Overloading of barge is not allowed and sufficient freeboard should be maintained to ensure no spill over of the dredged sediments during lifting and transport.
- The moving speed of construction vessels in the dredging area should be reduced to prevent disturbance to the seabed generating sediment plumes.
- A cage type silt curtain is proposed to be installed to enclose local pollution caused by the grab dredging. The grab dredging work should be carried out within the cage type silt curtain. Apart from the cage type silt curtain, it is recommended to deploy a floating type silt curtain around the site. Silt

curtains can be effectively applied when the current speeds are lower than 0.5 m/s. The velocity of current near the northern edge of reclamation site of HKBCF Phase 2 / TM-CLKL southern landfall is higher than 0.5 m/s, thus a sheet pile wall is proposed to protect the silt curtain along the northern edge. The proposed floating type silt curtain would be installed within the site area of TM-CLKL southern landfall, near shore section of TM-CLKL northern landfall (portion N-a), HKBCF and HKLR as far as practicable. Specially designed cage type silt curtain (with steel enclosure) is also proposed for the grab dredging at HKBCF and TM-CLKL southern landfall where localised flow can reach 0.5 m/s. The typical arrangement of the silt curtains are shown in **Annex A**.

- Pilot tests should be carried out during the early stage of seawall construction to confirm whether the silt removal efficiency of the cage type silt curtain and the floating type silt curtain can respectively achieve 80% and 45% silt removal efficiency for dredging and filling activities when deployed separately, and a combined reduction of 95% and 61% when the two type of silt curtains are used jointly. Pilot tests for cage type silt curtain (with steel enclosure) should be carried out in a similar time frame to see if the cage type silt curtain (with steel enclosure) can achieve 80% reduction when applied singly under current above 0.5 m/s.
- The pilot tests shall be conducted during the initial months of dredging and filling works of either TM-CLKL, HKBCF or HKLR. The silt-removal efficiency of the silt curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period of dredging work. Details of this pilot study shall be determined by the ENPO and agreed by EPD before the commencement of the monitoring, taking account of the Contractor's proposed actual locations of his initial period of dredging work. ET shall submit the pilot test proposal detailing the layout of silt curtains, monitoring location and testing arrangement for EPD's agreement before conducting the pilot tests.
- Reclamation filling for the northern landfall shall not proceed until at least 200m of leading seawall at the reclamation are formed above +2.5mPD unless otherwise agreed with the DEP, except for the 100m gaps for marine access.
- No more than 50% of public fill shall be used for filling of seawall below +2.5mPD, unless otherwise agreed by the DEP.
- No more than 16 filling barge trips shall be made each day with a maximum daily filling rate of 16,000m³ for the filling operation.
- The dredging and filling works shall be scheduled to spread the works evenly over a working day;

- Tunnel boring machine shall be used for the construction of the submarine tunnel; and
- The silt curtains should be maintained in good condition to ensure the sediment plume generated from dredging and filling be confined effectively within the site boundary.

5.2.1.2 Prior to the commencement of the construction work, a detailed site drainage management plan should be submitted to EPD. The plan should cover measures to minimize all potential water quality impact arising from the surface runoffs of all the related constructions.

5.2.1.3 The guidelines outlined in the Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN 1/94) should be adopted to control construction site runoff. Mitigation measures to minimise water quality impacts from construction site runoff and wastewater and sewage generated from construction activities are:

- Provision of site drainage systems over the entire construction site with sediment control facilities. Regular inspection and maintenance of the site drainage systems are required to ensure proper and efficient operation at all times.
- Sedimentation tanks or package treatment systems are required to treat the large amount of sediment-laden wastewater generated from foundation construction work, wheel washing, site runoff. Any construction activities that generate wastewater with high concentrations of SS should also be collected to these facilities for proper treatment prior to disposal. Treated wastewater can be reused for vehicle washing, dust suppression and general cleaning. Bentonite slurry used in bore-pile construction should be reconditioned and reused to minimise the disposal volume of the used slurry.
- The construction programme should be properly planned to avoid soil excavation in rainy seasons. Exposed stockpiles of excavated soils or construction materials should be covered with tarpaulin or impervious sheets to avoid release of pollutants into the drainage channels.
- Sewage generated from site toilets and canteen should be collected using a temporary storage system. Chemical toilets should be provided at different locations for use by the workers on site. Licensed waste collectors should be employed for collection and disposal of the sewage. The drainage system for collection of wastewater generated from canteen, if any, should be equipped with grease trap capable of providing at least 20 minutes retention during peak flow.
- Wheel washing facilities should be installed at all site entrances/exits.
- An emergency plan should be developed by the contractors to deal with

accidental spillage of chemicals.

- 5.2.1.4 Upon completion of the TM-CLKL / HKLR / HKBCF development, stormwater drainage systems would be completed to collect stormwater generated from the whole area including new roads. Additional mitigation measures would not be required.
- 5.2.1.5 As identified in the EIA Report, key water quality issues during construction phase will be dredging and filling works for the reclamation, backfilling of Mf sediment within the reclamation sites. However, handling of Mf sediment is not predicted for TM-CLKL. Thus, Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action be taken to rectify the situation.
- 5.2.1.6 The EIA Report has recommended construction and operational phase mitigation measures. All the prepared mitigation measures are summarised in the **Environmental Mitigation Implementation Schedules in Appendix A.**

5.3 *WATER QUALITY PARAMETERS*

- 5.3.1.1 As identified in the EIA Report, key water quality issues during construction phase will be dredging and filling works for the reclamation. Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action be taken to rectify the situation.
- 5.3.1.2 Dissolved oxygen (DO), turbidity (NTU), suspended solids (SS) levels and other general in-situ parameters shall be monitored at all designated marine water quality monitoring stations during the whole construction phase. DO and turbidity should be measured in-situ whereas SS should be determined by an accredited laboratory.
- 5.3.1.3 Other relevant data shall also be recorded in a Water Quality Monitoring Logs, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, weather conditions and any special phenomena or work underway at the construction site. A sample monitoring record sheet is shown in **Figure 5.4.**
- 5.3.1.4 According to the EIA report, there is low concentration for PAH, PCB, TBT, and chlorinated pesticides. Monitoring of these chemicals would not be required during the construction stage.
- 5.3.1.5 The proposed water quality monitoring schedule shall be submitted to EPD at least 2 weeks before the first day of the monitoring month. EPD shall also be notified immediately for any changes in schedule by fax.

5.3.1.6 Not relevant to Northern Connection Sub-sea Tunnel Section EM&A Programme.

5.4 MONITORING EQUIPMENT

5.4.1 Dissolved Oxygen and Temperature Measuring Equipment

5.4.1.1 The instrument should be a portable and weatherproof dissolved oxygen (DO) measuring instrument complete with cable and sensor, and use a DC power source. The equipment should be capable of measuring:

- DO level in the range of 0 - 20 mg/ L and 0 - 200% saturation; and
- Temperature of 0 - 45 degree Celsius.

5.4.1.2 It should have a membrane electrode with automatic temperature compensation complete with a cable.

5.4.1.3 Should salinity compensation not be built-in to the DO equipment, in-situ salinity should be measured to calibrate the DO equipment prior to each DO measurement.

5.4.2 Turbidity Measurement Instrument

5.4.2.1 The instrument should be a portable and weatherproof turbidity measuring instrument using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

5.4.3 Sampler

5.4.3.1 A water sampler is required. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (for example, Kahlsico Water Sampler or an approved similar instrument).

5.4.4 Water Depth Detector

5.4.4.1 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

5.4.5 Salinity

5.4.5.1 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

5.4.6 *pH Measuring Equipment*

- 5.4.6.1 A portable pH meter capable of measuring a range between 0.0 and 14.0 shall be provided to measure pH under the specified conditions (e.g., Orion Model 250A or an approved similar instrument).

5.4.7 *Sample Containers and Storage*

- 5.4.7.1 Water samples for SS should be stored in high density polythene bottles, packed in ice (cooled to 4°C without being frozen) and keep in dark during both on-site temporary storage and shipment to the testing laboratory. The samples shall be delivered to the laboratory within 24 hours of collection and be analysed as soon as possible after collection.

5.4.8 *Monitoring Position Equipment*

- 5.4.8.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message 'screen pop-up' facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

5.4.9 *Calibration of In-Situ Instruments*

- 5.4.9.1 The pH meter, DO meter and turbidimeter shall be checked and calibrated before use. DO meter and turbidimeter shall be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re- calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location.

5.4.10 *Back-up Equipment and Vessels*

- 5.4.10.1 Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when some equipment is under maintenance, calibration, etc. For the on site calibration of field equipment, the BS127:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.
- 5.4.10.2 The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions (within ± 1.75 hour of the predicted mid-ebb or mid-flood tides) in order to ensure the measurement/samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. It is, also, likely that more than one field survey vessels will be required simultaneously to ensure the monitoring are

conducted within the acceptable monitoring windows. The ET shall also consider the use of unattended automatic sampling/monitoring devices at fixed stations where monitoring are required throughout the construction period. The use of such unattended automatic devices, however, shall be subject to the approval of the SOR, IEC and EPD.

5.5 *LABORATORY MEASUREMENT/ANALYSIS*

5.5.1.1 Duplicate samples from each independent sampling event are required for all the suspended solids measurement, which shall be carried in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The laboratory determination work shall start within 24 hours after collection of the water samples. The analysis for SS is summarized in **Table 5.1**.

Table 5.1 *Laboratory analysis for SS, nutrient and heavy metals*

Parameters	Instrumentation	Reference Method	Reporting Limit	Detection Limit
Suspended Solids (SS)	Weighing	APHA 2540-D	0.5 mg/L	0.5 mg/L

5.5.1.2 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by EPD. All the analysis shall be witnessed by the SOR. The ET Leader shall provide the SOR with one copy of the relevant chapters of the “APHA Standard Methods for the Examination of Water and Wastewater” 19th edition and any other relevant document for his reference.

5.6 *MONITORING LOCATIONS*

5.6.1.1 The nine (9) water quality monitoring stations, control stations and locations for during the construction and operation phases of TM-CLKL – Northern Connection Sub-sea Tunnel Section are shown in **Figure 3.2b**. The demarcation of the monitoring stations for different projects will be further determined by the ENPO before the commencement of the construction. The selections of these stations are based on the following criteria:

- (i) Impact stations (IS/GG) within 250m – 500m envelope of the construction works and within the Mf sediment backfilling sites (i.e., 4 impact locations).
- (ii) Sensitive receiver (SR) stations near to key sensitive receivers (i.e. 3 impact stations).
- (iii) Control stations at representative locations with less influence by the projects (i.e. 2 Control stations). Control stations should be located, as far as practicable, both upstream and downstream of the works area.

(iv) Not used.

(v) Not used.

(vi) Mf receiving pit are not required based on the supporting documents for application for variation of environmental permit (EP 354/2009). Therefore, monitoring of nutrients and heavy metals of Mf Stations are no longer required.

5.6.1.2 The co-ordinates of the proposed monitoring stations during construction, post-construction and operation phases are listed in *Tables 5.2a-b* and their distribution shown in **Figure 3.2b**. As shown in **Figure 3.2b**, the proposed locations for the sensitive receiver monitoring stations represent the typical sensitive receivers around the project works.

Table 5.2a *Proposed Water Quality Monitoring Stations (Construction and Post-construction Phases)*

Station	Description	Easting	Northing	Parameters to be measured
IS12	Impact Station (Close to TMCLKL construction site)	813218	823681	DO, Turbidity, SS
IS13	Impact Station (Close to TMCLKL construction site)	813667	824325	DO, Turbidity, SS
IS14	Impact Station (Close to TMCLK construction site)	812592	824172	DO, Turbidity, SS
IS15	Impact Station (Close to TMCLK construction site)	813356	825008	DO, Turbidity, SS
SR8	Sensitive receiver (Gazettal beaches in Tuen Mun)	816306	825715	DO, Turbidity, SS
SR9	Sensitive receiver (Butterfly Beach)	813601	825858	DO, Turbidity, SS
SR10a	Sensitive receiver (Ma Wan FCZ)	823741	823495	DO, Turbidity, SS
CS4	Control Station	810025	824004	DO, Turbidity, SS
CS6	Control Station	817028	823992	DO, Turbidity, SS

Table 5.2b Proposed Water Quality Monitoring Stations (Operation Phase)

Station	Description	Easting	Northing	Parameters to be measured
SR3	Sensitive receivers (San Tau Beach SSSI)	810525	816456	DO, Turbidity, SS, pH, Salinity, Temperature
SR4	Sensitive receivers (Tai Ho Wan)	814760	817867	DO, Turbidity, SS, pH, Salinity, Temperature
CS2	Control Station	805849	818780	DO, Turbidity, SS, pH, Salinity, Temperature
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS, pH, Salinity, Temperature

- 5.6.1.3 Control stations (CS4 and CS6) are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works. The Control stations shown in **Figure 3.2b** are indicative subject to further review before construction phase. During the review, the location of the Impact stations for boundary of mixing zones will also be re-visited. If there are any changes to the monitoring locations, these shall be submitted 4 weeks before commencement of baseline monitoring for EPD approval.
- 5.6.1.4 In-situ monitoring (DO, temperature, turbidity, pH, salinity) and water sample for SS shall be taken at 3 water depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station will be monitored. No marine construction activities should be conducted in the vicinity of the stations during the Baseline Monitoring period. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such cases exist, the ET Leader shall propose with justification for changes to monitoring locations or other requirements of the EM&A programme, and seek approval from the IEC and EPD.
- 5.6.1.5 The ENPO may, depending on site conditions and monitoring results, decides whether additional monitoring locations shall be included or any monitoring locations could be removed/relocated during any stage of the construction phase, after getting approval from EPD.

5.7 BASELINE MONITORING FOR WATER QUALITY

- 5.7.1.1 Baseline conditions for marine water quality shall be established and agreed with EPD prior to the commencement of works. The purpose of the baseline

monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The baseline conditions shall normally be established by measuring the DO, temperature, turbidity, pH, salinity and SS at all designated locations specified in *Section 5.6* above. The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid- flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, for at least 4 weeks prior to the commencement of marine works. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database.

- 5.7.1.2 Baseline monitoring programme may overlap with other reclamation activities. The monitoring exercise should be scheduled as far as possible to avoid concurrent dredging / backfilling activities around the monitoring stations such that representative ambient data could be sampled.
- 5.7.1.3 Other relevant data shall also be recorded, such as monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena underway near the monitoring station. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring.
- 5.7.1.4 As this project will last for a few years, the ET Leader should seek approval from the IEC and EPD on an appropriate set of data to be used with the baseline data collected by this study to establish two set of AL levels respectively for the wet and dry season.
- 5.7.1.5 Baseline monitoring schedule shall be faxed to EPD 2 weeks prior to the commencement of baseline monitoring. The interval between two sets of monitoring shall not be less than 36 hours.
- 5.7.1.6 The Baseline Water Quality Monitoring was conducted during 6 and 31 October 2011. Monitoring results are presented in the Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao Bridge Hong Kong Projects – Investigation ⁽¹⁾. The baseline data were adopted for analysis in the current EM&A Programme.

5.8 *EFFICIENCY OF SILT CURTAIN*

- 5.8.1.1 The ET shall be responsible for conducting tests to confirm that their silt curtain systems to be adopted would satisfy the requirements in the EIA Report.
- 5.8.1.2 Pilot tests should be carried out during the early stage of construction to confirm whether the silt removal efficiency of the cage type silt curtain and the floating type silt curtains can achieve 80% and 45% silt removal efficiency for dredging

⁽¹⁾ Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao Bridge Hong Kong Projects-Investigation. http://www.hzmbenpo.com/ep_docs/HKBCF_HY201002/503/Baseline_Report_Version_C.pdf

and filling activities respectively when deployed separately, and a combined reduction of 95% and 61% when the two type of silt curtains are used jointly. Pilot tests for cage type silt curtain (with steel enclosure) should be carried out to see if the cage type silt curtain (with steel enclosure) can achieve 80% reduction when applied singly under current above 0.5 m/s.

- 5.8.1.3 The pilot test shall include basic measurements such as turbidity and suspended solids as well as current speed and direction. Where testing of cage type silt curtain (with steel enclosure) is to be conducted at relatively fast current, supplementary Acoustic Doppler Current Profiler (ADCP) measurement of the plumes shall be considered to provide a better characterization of instant suspended solids plumes. A method statement shall be submitted by the ET Leader to seek approval from the IEC and EPD.
- 5.8.1.4 Cage type silt curtains will be applied round all grab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works. Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM-CLKL southern reclamation.
- 5.8.1.5 The pilot tests shall be conducted during the initial period of dredging and filling works of either TM-CLKL, HKBCF or HKLR. The silt-removal efficiency of the silt curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period of dredging work. The details for the pilot study shall be determined by the ENPO and agreed with EPD, taking account of the Contractor's proposed actual locations of his initial period of dredging work. ET shall submit the pilot test proposal detailing the layout of silt curtains, monitoring location and testing arrangement for EPD's agreement before conducting the pilot tests.
- 5.8.1.6 Regardless of the measured efficiency of the silt curtain system, the event and action plan shall only be based on the monitoring results at the designed monitoring stations.

5.9 IMPACT MONITORING FOR WATER QUALITY

5.9.1 Reclamation

- 5.9.1.1 Reclamation would require dredging and filling activities during the construction. During this period, silt curtains would be installed to control sediment loss. **Annex A** shows the arrangement of the silt curtains for reclamation at Northern Landfall as stated in the Notification. During the construction period, monitoring shall be undertaken 3 days per week, at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, with sampling / measurement at the designated monitoring stations. Two in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The interval between two sets of monitoring

shall not be less than 36 hours except where there are exceedances of Action and / or Limit levels, in which case the monitoring frequency will be increased. Two consecutive measures of DO concentration, DO saturation, pH, salinity, temperature, turbidity and water samples for SS will be taken in situ at 1 m below the surface, mid-depth and 1 m above the seabed at each location. If the water depth is less than 6 m, the mid- depth measurement may be omitted subject to the approval of the SOR. If the depth is less than 3 m, only the mid-depth measurements need to be taken subject to the approval of the SOR. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second readings of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken.

5.9.1.2 Not used.

5.9.1.3 If the Impact Monitoring results indicate that dredging / filling works have caused adverse impacts on water quality at the monitoring stations, appropriate actions (including the lowering of production rates for dredging and filling) should be taken and additional mitigation measures should be implemented as necessary. Under this circumstance, water quality monitoring frequency has to be increased to once per day when dredging / filling is undertaken. 24-hour monitoring of turbidity should be implemented as and when necessary. The monitoring results should be made available within a reasonable short period to be agreed with the EPD, SOR and IEC.

5.9.2 *Relocation of Mf Sediment with Reclamation Area*

5.9.2.1 The preliminary ground investigation conducted for TM-CLKL did not detected Mf material (ie. Category M Sediment which fails the biological test as per ETWB TC 34/2002) in the project site and no handling of Mf has been predicted. Therefore, this sub-section is only relevant to HKBCF and HKLR projects.

5.9.2.2 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme.

5.9.2.3 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A programme.

5.9.3 *Water Quality Monitoring along the Water Boundary of Hong Kong and Mainland*

5.9.3.1 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme.

5.10 *POST-CONSTRUCTION MONITORING*

5.10.1.1 Upon completion of all marine-based construction activities, a post-project monitoring exercise on water quality shall be carried out for 4 weeks in the same

manner as the Baseline Monitoring. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The measurement parameters for Post- construction monitoring shall include DO, temperature, turbidity, pH, salinity and SS. The measurement shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, for at least 4 weeks.

- 5.10.1.2 Since the southern and northern landfalls of TM-CLKL are distant from each other and based on the tentatively programme available during the EIA stage the two landfall has a different construction time frame, the Post-construction monitoring for each landfalls may conducted separately. The ET should review the actual implantation programme and recommend if a separate post-construction monitoring for each landfall is required.

5.11 *OPERATIONAL PHASE MONITORING*

- 5.11.1.1 The marine water quality monitoring shall be performed monthly during the first year of Project operation at all designated monitoring stations including control stations. Each monthly monitoring event shall consist of one monitoring and sampling event during both mid-ebb (within ± 1.75 hour of the predicted time) and mid-flood (within ± 1.75 hour of the predicted time) tides of the same monitoring day.. The operation phase monitoring shall be ceased after the first year of operation of the Project subject to the first year review. No marine construction activities should be conducted in the vicinity of the stations during the Operational Phase monitoring period.
- 5.11.1.2 Sampling shall be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. If the water depth be less than 3m, only the mid-depth station will be monitored. In-situ measurements at DO, turbidity, SS, pH, salinity and temperature shall be taken at all the monitoring stations SR2, SR3, CS2 and CS(Mf)5 (refer to **Table 5.2b**). A full set of in duplicated situ measurement and water samples shall be collected during each of the mid-ebb (within ± 1.75 hour of the predicted time) and mid-flood (within ± 1.75 hour of the predicted time) tides.

5.12 *EVENT AND ACTION PLAN*

- 5.12.1.1 The Action and Limit levels for water quality are defined in **Table 5.3**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 5.4** shall be carried out.
- 5.12.1.2 Not used.

Table 5.3 *Action & Limit Levels for Water Quality*

Parameter	Action Level#	Limit Level#
DO in mg/L ^(a)	<u>Surface and Middle</u>	<u>Surface and Middle</u>
	5.0 mg/L	4.2 mg/L
	<u>Bottom</u>	<u>Bottom</u>
	4.7 mg/L	3.6 mg/L
Turbidity in NTU (Depth-averaged ^{(b), (c)})	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e., 27.5 NTU	130% of upstream control station at the same tide of the same day and 99%-ile of baseline data, i.e., 47.0 NTU
SS in mg/L (Depth-averaged ^{(b), (c)})	120% of upstream control station at the same tide of the same day and 95%-ile of baseline data, i.e., 23.5 mg/L	130% of upstream control station at the same tide of the same day and 10mg/L for WSD Seawater Intakes at Tuen Mun and 99%-ile of baseline data, i.e., 34.4 mg/L

Notes:

Baseline data: data from HKZMB Baseline Water Quality Monitoring between 6 and 31 October 2011.

- (a) For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- (b) "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths
- (c) For turbidity and SS, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- (d) All figures given in the table are used for reference only, and EPD may amend the figures whenever it is considered as necessary
- (e) The 1%-ile of baseline data for surface and middle DO is 4.2 mg/L, whilst for bottom DO is 3.6 mg/L.

Table 5.4 Event & Action Plan for Water Quality

Event	ET Leader	IEC	SOR	Contractor
Action level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat <i>in situ</i> measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor and SOR; 4. Check monitoring data, all plant, equipment and Contractor's working methods. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working methods. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of non-compliance in writing; 2. Notify Contractor. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Amend working methods if appropriate.
Action level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 2. Identify source(s) of impact; 3. Inform IEC, contractor, SOR and EPD; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, SOR and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Action level; 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor's working method; 2. Discuss with ET and Contractor on possible remedial actions; 3. Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly; 4. Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC on the proposed mitigation measures; 2. Ensure mitigation measures are properly implemented; 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Inform the Supervising Officer and confirm notification of the non-compliance in writing; 2. Rectify unacceptable practice; 3. Check all plant and equipment and consider changes of working methods; 4. Submit proposal of additional mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR; 5. Implement the agreed mitigation measures.
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"> 1. Repeat measurement on next day of exceedance to confirm findings; 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the

Event	ET Leader	IEC	SOR	Contractor
	<ol style="list-style-type: none"> Identify source(s) of impact; Inform IEC, contractor, SOR and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, SOR and Contractor; 	<ol style="list-style-type: none"> Contractor's working method; Discuss with ET and Contractor on possible remedial actions; Review the proposed mitigation measures submitted by Contractor and advise the SOR accordingly. 	<ol style="list-style-type: none"> writing; Discuss with IEC, ET and Contractor on the proposed mitigation measures; Request Contractor to review the working methods. 	<ol style="list-style-type: none"> non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment and consider changes of working methods; Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR.
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"> Repeat measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IEC, contractor, SOR and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, SOR and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days; 	<ol style="list-style-type: none"> Check monitoring data submitted by ET and Contractor's working method; Discuss with ET and Contractor on possible remedial actions; Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the SOR accordingly; Supervise the implementation of mitigation measures. 	<ol style="list-style-type: none"> Discuss with IEC, ET and Contractor on the proposed mitigation measures; Request Contractor to critically review the working methods; Make agreement on the mitigation measures to be implemented; Ensure mitigation measures are properly implemented; Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level. 	<ol style="list-style-type: none"> Take immediate action to avoid further exceedance; Submit proposal of mitigation measures to SOR within 3 working days of notification and discuss with ET, IEC and SOR; Implement the agreed mitigation measures; Resubmit proposals of mitigation measures if problem still not under control; As directed by the Supervising Officer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

6 ECOLOGY

6.1 INTRODUCTION

6.1.1.1 The EIA has recommended that an EM&A for ecology is undertaken during the design, construction and operational phases of the project. The objectives of the design phase EM&A are to prepare detailed specifications for translocation works to be undertaken prior to construction. The construction and operational EM&A objectives are to ensure that the ecological contract works and construction mitigation procedures recommended in the EIA are carried out as specified and are effective. The construction and operational phase EM&A will be carried out as part of the site monitoring and audit programme.

6.2 ECOLOGY EM&A PROCEDURES

6.2.1.1 The design phase audit procedures are detailed in **Section 1.5.3 and Figure 1.1**. Ecological specifications for species translocation will be designed as part of the project detailed design phase. The specifications and designs will be reviewed as and when they are produced. The final ecological specifications and designs shall be signed off by the design auditor(s) using the appropriate proforma (see **Appendix B**).

6.2.1.2 The construction phase ecological audit is concerned with checking the effectiveness of the implementation of the ecology contract works, together with auditing the effectiveness of site mitigation. Operational phase EM&A will comprise the audit of the reestablishment of habitat areas and the on-going effectiveness of mitigation measures as appropriate. The operational phase EM&A shall be undertaken during the Contractor's one year maintenance period. The overall procedures for the ecological EM&A during construction and operation are shown in **Figures 1.2 and 6.1**.

6.3 DESIGN PHASE AUDIT

6.3.1.1 Ecological measures proposed by the EIA to mitigate the ecology impacts of the scheme will be incorporated into the detailed design of the project. In particular, ecology specifications will be produced for the elements detailed in **Table 6.1** below.

Table 6.1 Ecological Design Specifications

Number	Specification
1	Hoarding along the works boundary for protecting the pitcher plants and its surrounding habitat (not relevant to the current EM&A Programme)
2	Translocation specifications for corals
3	Pre, during and post construction dolphin monitoring.
4	Vessel speed limits and restrictions specification
5	Bored piling monitoring programme specification (not relevant to the current EM&A Programme)
6	Design of dredging and reclamation works acoustic decoupling methods (not relevant to the current EM&A Programme)
7	Specification for dolphin exclusion zone during dredging, reclamation, sheet and bored piling
8	Artificial reef deployment (not relevant to the current EM&A Programme)

6.3.1.2 The specifications should be issued to the EPD and AFCD and other relevant Authorities for approval before being implemented prior to construction.

6.3.1.3 Designs and specifications will be prepared during the detailed design stage by suitably qualified staff on the design team. The designs will be checked by a design auditor(s) to ensure that the measures are fully incorporated and that potential conflicts with the engineering are resolved prior to construction. In the event of a non conformity, the Event/Action plan detailed in **Table 6.2** below shall be followed by the relevant parties.

Table 6.2 Event / Action Plan for Design Phase

Action Level	Ecology Auditor	Project Engineer (PE)	Project Ecologist (PEC)
Non Conformity (with Design Standards and Specification)	<ul style="list-style-type: none"> - Identify Source - Inform PE and PEC - Discuss remedial actions with PE, and PEC - Verify remedial actions when complete 	<ul style="list-style-type: none"> - Notify PEC - Discuss remedial actions with PEC - Ensure remedial designs are fully incorporated 	<ul style="list-style-type: none"> - Amend designs - Discuss remedial actions with PE

6.4 BASELINE MONITORING

6.4.1 Background

6.4.1.1 Ecological baseline EM&A will consist of undertaking the following:

- Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme
- Audit of species translocation works (corals);
- Pre-construction dolphin monitoring; and
- Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme

6.4.2 *Baseline Walkover Survey*

6.4.2.1 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme

6.4.3 *Baseline Translocation Works*

- 6.4.3.1 In respect of translocation works, the ET will be required to audit the effectiveness of the implementation of the ecology translocation contract works, item 2 detailed in **Table 6.1** above. Prior to the translocation works, pre-construction surveys of corals were conducted at Pillar Point and the potential receptor site of Tai Mo To (**Figure 6.2**). An alternative receptor site at Yam Tsui Wan is proposed for the translocated coral from Pillar Point. Finding of the pre-construction survey are included in the Detailed Coral Translocation Methodology which was submitted to the EPD in accordance with *Condition 2.6* of the *EP-354/2009A*. The implementation of the specification for translocation of the corals should be undertaken prior to any major relevant construction works and thus, the EM&A for these will be undertaken early in the Contract. The audit will continue into the construction phase after the translocations have been completed.
- 6.4.3.2 A qualified ecologist(s), as part of the ET, will carry out the audit. The ecological contract works, detailed in **Table 6.1**, shall be audited with reference to the audit schedule detailed in **Table 6.3** below.

Table 6.3 *Audit Schedule for Ecological Contract Works*

Specification Number (Table 6.1)	Baseline Phase	Construction Phase
2	Audit compliance at least once per week during implementation which will be prior to the start of the main construction activities. After translocation is complete, carry out audit survey to determine if all corals have been moved.	Audit success of translocation once every 3 months after completion by assessing survival of transplanted species. Continue for a period of 12 months.

6.4.4 *Baseline Dolphin Monitoring*

- 6.4.4.1 Perhaps the most important ecological measure of all is to conduct surveys to monitor the density and behavior of the animals before, during, and after the period of the potential disturbance. This objective is to determine if the other mitigation measures have been effective in protecting the animals from disturbance and maintaining their habitat quality. In addition, it is necessary to monitor the effects of the construction works on the use of dolphin travelling corridors. While there is not expected to be a complete physical blockage of the travelling corridors, the works may have some impacts in terms of reducing dolphin use of these corridors. As data on this is scarce, dolphin monitoring is, also, required to monitor the use of the travel corridors and if the dolphins stop using the corridors, then it will be necessary to provide some remediation to deal with this, in the form of adaptive management.
- 6.4.4.2 In order for such monitoring to be effective, it needs to be divided into three phases: pre-disturbance (i.e., baseline phase), disturbance (i.e, construction phase), and post-disturbance (i.e., operational phase). Survey techniques must be held constant from phase to phase and survey equipment and personnel should ideally be the same as well.
- 6.4.4.3 Project-specific dolphin monitoring using line transect surveys combined with photo-identification studies, also, have the advantage of being able to provide evaluation of dolphin fine-scale habitat use patterns. This includes 1 km² per grid densities and grid-based patterns of feeding, socializing and calving, as well as individual ranging patterns, allowing the detection of any smaller-scale impacts and changes in core area use (see Hung 2008).
- 6.4.4.4 Considering that AFCD monitoring provides useful data, the monitoring programme should comprise undertaking surveys, 2 days per month for a period of 12 months during each phase. Notwithstanding, as 9 months of baseline surveys have been undertaken for the purposes of this EIA, a further 3 months only would be required for the pre-construction phase. In summary, the following monitoring would be required:
- Six, one-day survey events to be undertaken at a frequency of 2 per month over a period of 3 months before commencement of construction;
 - One-day survey events to be undertaken at a frequency of 2 per month for the duration of the marine works construction period; and
 - Forty-eight, one-day survey events to be undertaken at a frequency of 2 per month over a period of 24 months following cessation of the construction.

6.4.4.5 The period required for the monitoring is considered to be adequate to derive a reasonably large amount of data, thereby allowing any significant trends in dolphin distribution to be detected (Jefferson pers. comm.).

6.4.4.6 The monitoring should also be undertaken by a suitably qualified person (in biology) and should be independent of the construction contractor and should form part of the independent Environmental Team (ET). The IEC may audit the work of the ET if deemed necessary. Monitoring should be conducted following the methodology detailed below:

Vessel-based Observations

6.4.4.7 Line transect surveying techniques have now been standardized in Hong Kong Special Administrative Region Waters so that data from all surveys are directly comparable. The study area with line transects is presented in **Figure 6.3** which covers the Northeast Lantau (NEL) and Northwest Lantau (NWL). In order to provide a suitable long-term dataset for comparison, pre-, during and post-construction phase dolphin monitoring will employ an identical methodology and follow the same line transects as those in the EIA Report. Additional transect lines that are used in the AFCD long-term dolphin monitoring are also included, such that the monitoring data collected in this project is comparable to the long-term databases maintained by AFCD.

6.4.4.8 On each survey day, the survey vessel will depart from Tung Chung New Pier. Observation for incidental sighting will begin immediately on departure from the assigned pier and continue until the vessel reaches the survey area. The survey vessel shall have an open upper deck, allowing for observer eye heights of 4 to 5m above water level and relatively unobstructed forward visibility between 270° and 90°. When on-effort, the vessel shall travel along the survey lines at a speed of approximately 7 to 8 knots (13 to 15 km/hr). The direction of the survey shall be alternated on different days to avoid possible biases related to the timing of the survey coverage.

6.4.4.9 Vessel-based transect observations by a three-person team shall be conducted by searching the 180° swath in front of the survey vessel (270° to 90°). The area behind the vessel need not be searched, although dolphins observed in this area should be recorded as off-effort sightings. The primary observer will scan the entire search path (270° to 90°) continuously with Fujinon 7x50 marine binoculars or equivalent as the second member of the team, designated the data “recorder”, scans the same area with the naked eye and occasional binocular check. The third observer on the boat is required to rotate into the observation team after half an hour, thus relieving one of the initial team. Observers should rotate every half an hour. While on-effort, observers shall ignore potential sighting cues that could bias the sighting distance calibration (eg pair-trawl fishing vessels).

6.4.4.10 A critical consideration in the survey will be to ensure a strict timed quantification of “sighting effort” in order to maximise the comparative value of the field survey results. The time and position for the start and end of a period of intensive, uninterrupted effort, and the sighting conditions such as visibility

range and Beaufort scale associated with it shall be recorded. The collection of effort data allows comparisons within a single study as well as between studies. Strict recording of time and speed travelling along the assigned transect (“on-effort”) shall, therefore, be recorded. Time spent during any deviation from the transect will be recorded as “off-effort”.

- 6.4.4.11 During periods of poor weather, when visibility is hindered (e.g., below 1km) or when a Beaufort force 5 is reached, the survey should normally be postponed.
- 6.4.4.12 Sightings distant to 500m perpendicular distance and sightings of single dolphins that were hard to track should not be pursued (although those distant to 500m ahead of the vessel should be pursued). The initial sighting distance between the dolphin and the survey vessel and sighting angle shall be recorded in order to estimate the positions of the dolphins. These and other details of the sighting, including the exact location of the sighting and number of individuals should be agreed among the observation team and recorded immediately. Distances and angles shall be as accurate as possible.
- 6.4.4.13 A global positioning system shall be used during the surveys. A sighting record shall be filled out at the initial sighting with time, position, distance and angle data filled in immediately and verified between primary observer and recorder. All other information on sea state, weather conditions (Beaufort Scale), as well as notes on dolphin appearance, behaviour, and any other information shall also be completed.
- 6.4.4.14 A summary of equipment requirement is summarized in **Table 6.4** below.

Table 6.4 *Summary of Dolphin Monitoring Equipment Requirements*

Equipment	Type
Vessel for Monitoring	A monitoring boat which should have a flying bridge or upper deck with a relatively unobstructed forward visibility (270 ^o – 90 ^o) allowing for observer eye height of 4-5m above water
Observation	Fujinon 7x50 marine binoculars (or similar) with compass/reticule
Calibration	Leica Geovid laser range finder binnacles or equivalent
Navigation and Positioning	Global Positioning System Device (Magellen NAV 5000D or similar approved) (+ spare batteries)

- 6.4.4.15 The three-month vessel-based Baseline Dolphin Monitoring was conducted between 5 September and 7 November 2011. The monitoring results are presented in the *Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao*

Bridge Hong Kong Projects – Investigation ⁽¹⁾. The baseline data will be adopted for analysis in the current EM&A Programme.

6.4.5 Bored Piling Monitoring Programme

6.4.5.1 to 6.4.5.8 Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme

6.5 CONSTRUCTION AND OPERATIONAL PHASE EM&A

6.5.1 Background

6.5.1.1 During the construction and operational phases the ET will be required to undertake the following:

- continued audit of the translocation works as per the requirements in Table 6.3 above;
- audit of habitat protection measures as follows:
- ensure that work site boundaries are not breached and that damage does not occur to surrounding areas;
- provided and scheduled environmental briefing/training sessions for site staff to raise their awareness on environmental protection;
- ensure placement of equipment is within designated areas within the existing disturbed land;
- ensure construction activities are restricted to within the proposed works boundary;
- ensure spoil heaps are covered at all times;
- ensure that disturbed areas are reinstated immediately after completion of the works; and
- Not relevant to the Northern Connection Sub-sea Tunnel Section EM&A Programme
- ensure enhancement planting works undertaken.
- audit of acoustic decoupling for dredging and reclamation work and the vessel restrictions requirements, as specified by the specifications prepared during the design stage (**items 4 and 6 in Table 6.1 above**);

⁽¹⁾ Agreement No. CE 35/2011 (EP) Baseline Environmental Monitoring for Hong Kong-Zhuhai-Macao Bridge Hong Kong Projects-Investigation.
http://www.hzmbenpo.com/ep_docs/HKBCF_HY201002/503/Baseline_Report_Version_C.pdf

- implement any further recommendations, if any, of the bored piling monitoring;
- implementation of the dolphin exclusion zone during dredging, reclamation, sheet and piling works;
- audit the avoidance of peak CWD calving season in May and June for driving of metal caissons during bored piling works; and
- audit the pre-construction, construction and operational phase dolphin monitoring.

6.5.2 *Construction Ecological Audit*

- 6.5.2.1 A dolphin exclusion zone within a radius of 250m around the dredging, reclamation, sheet and bored piling works should be implemented and the area visually inspected for dolphins prior to commencement of the marine works. The principles of the exclusion zone are that, during daylight hours, the area should be visually inspected for dolphins prior to commencement of dredging, reclamation or sheet piling works. The sheet piling works will be restricted to 12 hours a day and visual inspection will be possible. However, it is possible that the other marine works for the TM-CLKL would continue for 16 hours per day. As such, as the visual exclusion zone relies on the visual detection of dolphins, it would not be suitable during evening or nighttime periods. Based upon this, an alternative method using Passive Acoustic Monitoring (PAM) would be required for any dredging and reclamation works undertaken outside daylight hours. PAM involves the use of hydrophones or cetacean detectors. The specification prepared during the detailed design should further specify the use of PAM.
- 6.5.2.2 The dolphin exclusion zone should be monitored by independent dolphin observers with an unobstructed, elevated view of the area. Piling should not begin until the observer certifies that the area is continuously clear of dolphins for a period of 30 minutes (thereby adequately spanning the approximate maximum dive time of the dolphins of 4 minutes). The observers must be suitably trained in biology and should be independent of the construction contractor and should form part of the independent Environmental Team (ET) to be employed by the Contractor. An Independent Environmental Checker (IEC) would be required to audit the work of the ET.
- 6.5.2.3 For the overall audit of habitat protection, acoustic decoupling, dolphin exclusion zone and the vessel restrictions requirements, in the event of non-compliance, the Event / Action plan detailed in **Table 6.5** below should be implemented.

Table 6.5 Event / Action Plan for General Ecology

Action Level	ET	IEC	SOR	Contractor
Non-conformity on one occasion	<ul style="list-style-type: none"> - Identify Source - Inform the IEC and the SOR - Discuss remedial actions with the IEC, the SOR and the Contractor - Monitor remedial actions until rectification has been completed 	<ul style="list-style-type: none"> - Check report - Check the Contractor's working method - Discuss with the ET and the Contractor on possible remedial measures - Advise the SOR on effectiveness of proposed remedial measures. - Check implementation of remedial measures. 	<ul style="list-style-type: none"> - Notify Contractor - Ensure remedial measures are properly implemented - Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the works in the case of a serious non- conformity until situation rectified. 	<ul style="list-style-type: none"> - Amend working methods - Rectify damage and undertake any necessary replacement
Repeated Non conformity	<ul style="list-style-type: none"> - Identify Source - Inform the IC(E) and the SOR - Increase monitoring frequency - Discuss remedial actions with the IC(E), the SOR and the Contractor - Monitor remedial actions until rectification has been completed - If exceedance stops, cease additional monitoring 	<ul style="list-style-type: none"> - Check monitoring report - Check the Contractor's working method - Discuss with the ES and the Contractor on possible remedial measures - Advise the SOR on effectiveness of proposed remedial measures - Supervise implementation of remedial measures 	<ul style="list-style-type: none"> - Notify the Contractor - Ensure remedial measures are properly implemented - Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the works in the case of a serious non- conformity until situation rectified. 	<ul style="list-style-type: none"> - Amend working methods - Rectify damage and undertake any necessary replacement

6.5.3 Construction and Operational Phase Dolphin Monitoring

6.5.3.1 The dolphin monitoring methodology is described in *Section 6.4* above and this should be continued both during construction and post construction (operational) phase based using the same transect, method and survey techniques, based upon the following frequency:

- one-day surveys to be undertaken at a frequency of 2 per month for the duration of the marine works construction; and
- forty-eight, one-day survey events to be undertaken at a frequency of 2 per month over a period of 24 months following cessation of the construction.

- 6.5.3.2 The data after each phase should be compared the pre-construction baseline findings. Any apparent differences in density among survey phases should be analysed for trends and the statistical power of the analysis to detect effects of the desired size should be tested. Comparison of the during and post construction dolphin monitoring with that of over the pre-construction dolphin monitoring will allow the assessment of the overall efficacy of the project-specific mitigation measures through the implementation of an Event and Action Plan detailed in the **Table 6.9b** below. Statistical procedures shall be used for data comparison. A range of applicable statistical procedures exist (e.g., t-test, ANOVA and ANCOVA, etc.) and the ET shall propose the procedure to be applied as part of the during and post-construction phase dolphin monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.
- 6.5.3.3 Should dolphin sighting numbers in the construction or post-construction phases be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity, recommendations for a further post-construction monitoring survey will be made. Data should then be re-assessed and the need for any further monitoring established. Comparison of the pre-construction dolphin monitoring with that of the during and post- construction dolphin monitoring will allow the assessment of the overall efficacy of the project-specific mitigation measures and an Event and Action Plan for the dolphin is provided in **Table 6.9b** below.
- 6.5.3.4 An action plan should be defined to indicate that should dolphin numbers be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity following the during and post-construction monitoring, recommendations for further monitoring and mitigation will be required. The Action and Limit level which will trigger the Event and Action Plan is proposed for the EM&A programme of the HKBCF. The Action and Limit Level and the Event and Action Plan of the HKBCF EM&A Programme will both be adopted for the current EM&A Programme given the same area of dolphin monitoring of the two programmes (ie Northeast Lantau (NEL) and Northwest Lantau (NWL)).

Table 6.9a Action and Limit Level for Dolphin Monitoring

	NEL	NWL
Action Level	(STG < 4.2) & (ANI < 15.5)	(STG < 6.9) & (ANI < 31.3)
Limit Level	[(STG < 2.4) & (ANI < 8.9)] AND [(STG < 3.9)& (ANI < 17.9)]	

Note:

- (1) AL will be trigger if either NEL or NWL fall below the criteria; LL will be triggered if both NEL and NWL fall below the criteria

Table 6.9b Event / Action Plan for During and Post Construction Dolphin Monitoring

EVENT	ACTION*			
	ET	IEC	SOR	Contractor
Action Level	<ol style="list-style-type: none"> 1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SOR and Contractor; 5. Check monitoring data. 6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and finding with the ET and the Contractor. 	<ol style="list-style-type: none"> 1. Discuss monitoring with the IEC and any other measures proposed by the ET; 2. If SOR is satisfied with the proposal of any other measures, SOR to signify the agreement in writing on the measures to be implemented. 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Discuss with the ET and the IEC and propose measures to the IEC and the SOR; 3. Implement the agreed measures.
Limit Level	<ol style="list-style-type: none"> 1. Repeat statistical data analysis to confirm findings; 2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences; 3. Identify source(s) of impact; 4. Inform the IEC, SOR and Contractor of findings; 5. Check monitoring data; 6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary. 7. If ET proves that the source of impact is caused by any of the construction activity by the works contract, ET to arrange a meeting to discuss with IEC, SOR and 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET and Contractor; 2. Discuss monitoring results and findings with the ET and the Contractor; 3. Attend the meeting to discuss with ET, SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 4. Review proposals for additional monitoring and any other 	<ol style="list-style-type: none"> 1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures. 2. If SOR is satisfied with the proposals for additional dolphin monitoring and/or any other mitigation measures submitted by ET and Contractor and verified by IEC, SOR to signify the agreement 	<ol style="list-style-type: none"> 1. Inform the SOR and confirm notification of the non-compliance in writing; 2. Attend the meeting to discuss with ET, IEC and SOR the necessity of additional dolphin monitoring and any other potential mitigation measures. 3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when

EVENT	ACTION*			
	ET	IEC	SOR	Contractor
	Contractor the necessity of additional dolphin monitoring and/or any other potential mitigation measures (e.g., consider to modify the perimeter silt curtain or consider to control/temporarily stop relevant construction activity etc.) and submit to IEC a proposal of additional dolphin monitoring and/or mitigation measures where necessary.	mitigation measures submitted by ET and Contractor and advise SOR of the results and findings accordingly. 5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise SOR the results and findings accordingly.	in writing on such proposals and any other mitigation measures. 3. Supervise the implementation of additional monitoring and/or any other mitigation measures.	necessary. 4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.

6.5.3.5 It should be noted that the current Northern Landfall Sub-sea Tunnel Section EM&A programme is exempted from carrying out the vessel-based line transect dolphin monitoring until the completion of the dolphin monitoring carried out under the HKBCF Reclamation Contract. Vessel-based line transect dolphin monitoring data from the impact monitoring of *Contract No. HY/2011/03 - HZMB HKLR - Section between Scenic Hill and HKBCF* ⁽¹⁾ will be adopted for the current EM&A programme.

6.6 MITIGATION AND ENHANCEMENT MEASURES

6.6.1.1 Ecological mitigation and enhancement measures recommended by the EIA are largely related to the protection of key floral and fauna species and are summarized below. In addition, measures recommended to minimise impacts on water quality will, also, reduce impacts on marine ecological resources. The ecological mitigation and enhancement measures to be implemented during the construction phase are as follows:

- use acoustic decoupling methods to minimise noise being transmitted through the dredging and reclamation barges;
- 250m dolphin exclusion zone during dredging, reclamation, sheet and bored

⁽¹⁾ Contract No. HY/2011/03 - HZMB HKLR - Section between Scenic Hill and HKBCF. Monthly EM&A Report. Data available online at http://www.hzmbenpo.com/php/list_cwd_year.php

piling works;

- avoidance of the peak calving season of May and June for installation of metal caisson during bored piling works;
- survey and translocation of corals as an enhancement measure;
- regularly check the work site boundaries to ensure that they are not breached and that damage does not occur to surrounding areas;
- provided environmental briefing/training sessions for site staff; and
- planting of approximately 33ha as an enhancement measure for vegetation loss.

6.6.1.2 The mitigation measures shall be audited at least once every week as part of the site audit programme. In the event of a non-compliance, the Event / Action plan detailed above shall be followed by the relevant parties.

6.6.1.3 In addition, in order to address the cumulative impacts from all the projects and compensate for the cumulative Chinese White Dolphin and fisheries habitat loss, the Government has made a firm commitment to seek to designate the Brothers Islands as a marine park for enhancing the CWD habitat in accordance with the statutory process stipulated in the Marine Parks Ordinance. The designation of the proposed marine park would proceed after the completion of these projects. A study will be conducted to confirm the details of the proposed marine park before the commencement of the statutory procedures as stipulated in the Marine Parks Ordinance. The Government's commitment to the marine park and its control and management in accordance with the Marine Parks Ordinance, as well as the Marine Parks and Marine Reserves Regulations, would significantly help conserve the CWD, and hence serves as an effective mitigation measure for the loss of CWD habitat arising from these projects. With this committed measures, the residual cumulative impacts to the CWD in terms of permanent habitat loss would be acceptable.

7 LANDSCAPE AND VISUAL ASSESSMENT

7.1 INTRODUCTION

7.1.1.1 The EIA has recommended landscape and visual mitigation measures to be undertaken during both the construction and operational phases of the project. This section outlines the monitoring and audit of these measures.

7.1.1.2 The sensitive receivers are shown in **Figures 7.1.1.1, 7.1.1.2, 7.2.1.1, 7.2.1.2, 7.3.1.1, 7.3.2.1.**

7.2 RELEVANT LEGISLATION

7.2.1.1 The following legislation, standards and guidelines are applicable to landscape and visual impact assessment associated with the construction and operation of the project:

- Environmental Impact Assessment Ordinance (Cap.499.S.16) and the Technical Memorandum on EIA Process (EIAO TM), particularly Annexes 10 and 18
- Environmental Impact Assessment Ordinance Guidance Note 8/2002
- ETWB No. 36/ 2004 - Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS)
- ETWB TCW No. 10/2005 - Planting on Footbridges and Flyovers
- ETWB TCW No. 2/2004 - Maintenance of Vegetation and Hard Landscape Features
- ETWB TCW No. 29/2004 - Registration of Old and Valuable Trees, and Guidelines for their Preservation
- ETWB TCW No. 3/2006 - Tree Preservation
- ETWB TCW No. 5/2005 on Protection of natural streams/rivers from adverse impacts arising from construction works
- Hong Kong International Airport Approved Plant Species List (Revision 3: June 2007)
- Hong Kong Planning Standards and Guidelines, particular Chapter 4, Chapter 8, Chapter 10 and Chapter 11
- HQ/GN/13 - Interim Guidelines for Tree Transplanting Works under Highways Department's Vegetation Maintenance Ambit
- HyDTC No. 3/2008 - Independent Vetting of Tree Works under the

Maintenance of Highways Department

- HyDTC No. 5/2000 on Control in the Use of Shotcrete (Sprayed Concrete) in Slope Works
- Protection of Endangered Species of Animals And Plants Ordinance (Cap 586)
- Study on Landscape Value Mapping of Hong Kong
- Town Planning Ordinance (Cap 131)
- WBTC No. 17/2000 on Improvement to the Appearance of Slopes
- WBTC No. 25/92 - Allocation of Space for Urban Street Trees
- WBTC No. 25/93 on Control of Visual Impact of Slopes
- WBTC No. 7/2002 - Tree Planting in Public Works

7.3 *METHODOLOGY AND CRITERIA*

- 7.3.1.1 The design, implementation and maintenance of landscape and visual mitigation measures should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures.
- 7.3.1.2 Site inspection and audit is necessary in the operation stage.

Table 7.1 Monitoring Programme

Stage	Monitoring Task	Monitoring Report	Form of Approval	Frequency
Design	Monitoring of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken during detailed design and tender stages, to ensure that they fulfil the intentions of the mitigation measures. Any changes to the design, including design changes on site should also be checked.	Report by SOR confirming that the design conforms to requirements of EP	Approved by Client	At Completion of Design Stage
Construction	Monitoring of the contractor's operations during the construction period.	Report on Contractor's compliance, by ET	Counter-signature of report by IEC	Weekly
Establishment Works	Monitoring of the planting works during the 24-month establishment period after completion of the construction works.	Report on Contractor's compliance, by ET	Counter-signature of report by IEC	3 months

Design Phase

- 7.3.1.3 The mitigation measures proposed within the EIA to mitigate the landscape and visual impacts of the scheme should be embodied into the detailed engineering design and landscape design drawings and contract documents. Detailed landscaping drawings and specification should be checked during detailed design stage and before tender stage by a Registered Landscape Architect to ensure that the measures are fully incorporated and that potential conflicts with civil engineering, geo-technical, structural, lighting, signage, drainage, underground utility and operational requirements are resolved prior to construction. Monitoring of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken when the designs are produced to ensure that they fulfil the intentions of mitigation measures.

Construction & Establishment Period

- 7.3.1.4 The implementation of landscape construction works and subsequent maintenance operations during the 12-month establishment period must be supervised by fully qualified Landscape Resident Site Staff (Registered Landscape Architect or Professional Member of the Hong Kong Institute of landscape Architects).

7.3.1.5 Measures to mitigate landscape and visual impacts during construction should be checked and monitored by a Registered Landscape Architect to ensure compliance with the intended aims of the mitigation measures.

7.3.1.6 The progress of the engineering works shall be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

7.4 ***BASELINE MONITORING***

7.4.1.1 A one off survey shall be conducted prior to commencement of any construction works. A photographic record of the site at the time of the contractor's possession of the site shall be prepared by the Contractor and approved by the SOR. The approved photographic Record shall be submitted to the Project proponent, ET, IEC and EPD for record.

7.5 ***EVENT AND ACTION PLAN***

7.5.1.1 Should non-compliance of the landscape and visual impacts occur, actions in accordance with the action plan stated in Table 7.2 should be carried out.

Table 7.2 Event and Action Plan for Landscape and Visual Impact

EVENT ACTION LEVEL	ACTION			
	ET	IEC	ER	CONTRACTOR
Design Check	<ul style="list-style-type: none"> Check final design conforms to the requirements of EP and prepare report. 	<ul style="list-style-type: none"> Check report. Recommend remedial design if necessary 	<ul style="list-style-type: none"> Undertake remedial design if necessary 	
Non-conformity on one occasion	<ul style="list-style-type: none"> Identify Source Inform IEC and ER Discuss remedial actions with IEC, ER and Contractor Monitor remedial actions until rectification has been completed 	<ul style="list-style-type: none"> Check report Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise ER on effectiveness of proposed remedial measures. Check implementation of remedial measures. 	<ul style="list-style-type: none"> Notify Contractor Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> Amend working methods Rectify damage and undertake any necessary replacement
Repeated Non-conformity	<ul style="list-style-type: none"> Identify Source Inform IEC and ER Increase monitoring frequency Discuss remedial actions with IEC, ER and Contractor Monitor remedial actions until rectification has been completed If non-conformity stops, cease additional monitoring 	<ul style="list-style-type: none"> Check monitoring report Check Contractor's working method Discuss with ET and Contractor on possible remedial measures Advise ER on effectiveness of proposed remedial measures Supervise implementation of remedial measures. 	<ul style="list-style-type: none"> Notify Contractor Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> Amend working methods Rectify damage and undertake any necessary replacement

7.6 MITIGATION MEASURES

7.6.1.1 The landscape and visual impact assessment of the EIA recommends a series on mitigation measures, as noted below:

Design Landscape and Visual Mitigation Measures

- The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2); and
- Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5).

Landscape and Visual Mitigation Measures during Construction Phase

- Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5);
- Control night-time lighting and glare by hooding all lights (CM6);
- Ensure no run-off into water body adjacent to the Project Area (CM7); and
- Avoidance of excessive height and bulk of buildings and structures (CM8).

Landscape and Visual Mitigation Measures during Operation Phase

- Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5); and
- Avoidance of excessive height and bulk of buildings and structures (OM6).

8 **WASTE MANAGEMENT AND CONTAMINATED LAND**

8.1 **WASTE ISSUES**

8.1.1 **Summary of Waste Arisings**

8.1.1.1 The Contractor is responsible for waste control within the construction site, removal of waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. Activities during the construction phase will result in the generation of a variety of wastes which can broadly be classified into distinct categories based on their nature and the options for their disposal. These include:

- Marine dredged sediment;
- Excavated construction and demolition (C&D) materials suitable for public fill, including the alluvium from the tunnel construction;
- Construction and demolition waste, including cleared vegetation, which is not suitable for public fill;
- Chemical waste;
- Sewage; and
- General refuse.

8.1.1.2 Marine dredged sediment represents the largest quantity of material to be generated by the project, although the use of both non-dredged and fully dredged methods for the construction of the southern and northern tunnel landfall reclamations have been considered in order to minimize the amounts of material generated where possible.

8.1.1.3 Not used.

8.1.1.4 According to findings of the Sediment Quality Report for the Northern Connection Sub-sea Tunnel Section ⁽¹⁾, the volumes of different types of sediment were estimated with their disposal methods recommended, as follows:

- 387,328 m³ of sediment is classified as Category L material which is considered suitable for Type 1 open sea disposal;
- 155,022 m³ of sediment is classified as Category M material passing the biological screening and is considered suitable for disposal at Type 1 dedicated sites; and

(1) AECOM (June 2013) Sediment Quality Report (for the Northern Landfall Contract). Prepared under Agreement No. CE 7/2011 (HY).

- 67,968 m³ of sediment is classified as Type 2 sediment requiring confined marine disposal.

8.1.1.5 The Construction and Demolition (C&D) materials generated from the TM-CLKL project will comprise the following:

- Alluvium and CDG from the submarine tunnel and deep sections of the marine viaduct bridge piers and building foundations;
- Excavation of reclamation materials for cut and cover tunnel, portal and ventilation building;
- Excavation materials from the land viaduct construction, slope cutting, utility diversions, site formation of the toll plaza and administration buildings formation; and
- Road and pavement demolition waste from the modification of the existing roads for new roads connections.

8.1.1.6 The estimated quantities of C&D materials/wastes generated from the *Contract No. HY/2012/08* are listed in **Table 8.1**.

Table 8.1 *Estimated quantities of C&D materials/wastes generated from Contract No. HY/2012/08*

Forecast C&D materials to be generate from Contract No. HY/2012/08	Imported	Generated	Reused in the Contract	Estimated Disposal Quantities
Imported sand (m ³)	520,000	0	0	0
Imported sorted public fill (m ³)	2,500,000	0	0	0
Imported Rock (m ³)	1,000,000	0	0	0
Site clearance waste (vegetation, refuse on land) (m ³)	0	1,000	0	1,000
General Waste: food and packaging waste/ office waste (m ³)	0	10,000	0	1,000
Plastics & Wood (kg)	0	Small amount	Small amount	Small amount
Chemical Waste (L)	0	0	0	5,000

8.1.1.7 Not used.

8.1.1.8 Not used.

8.1.2 *Mitigation Measures*

8.1.2.1 Based on the mitigation measures recommended in the EIA Report, the following measures, as summarized in the Environmental Mitigation Implementation

Schedule in Appendix A, shall be undertaken when handling waste material during construction phase:

- i) The requirements as stipulated in the ETWB TC(W) No.19/2005 Environmental Management on Construction Sites and the other relevant guidelines should be included in the Particular Specification for the Contractor as appropriate.
- ii) The TM-CLKL Contractor should be requested to submit an outline Waste Management Plan (WMP) prior to the commencement of construction work, in accordance with the ETWB TC(W) No.19/2005 so as to provide an overall framework of waste management and reduction. The WMP should include:
 - *Waste management policy;*
 - *Record of generated waste;*
 - *Waste reduction target;*
 - *Waste reduction programme;*
 - *Role and responsibility of waste management team;*
 - *Benefit of waste management;*
 - *Analysis of waste materials;*
 - *Reuse, recycling and disposal plans;*
 - *Transportation process of waste products; and*
 - *Monitoring and action plan.*
- iii) The waste management hierarchy below should be strictly followed. This hierarchy should be adopted to evaluate the waste management options in order to maximise the extent of waste reduction and cost reduction. The records of quantities of waste generated, recycled and disposed (locations) should be properly documented.
- iv) A trip-ticket system should be established in accordance with ETWB(W) 31/2004 and Waste Disposal (Charges for Disposal of Construction Waste) Regulation to monitor the disposal of public fill and solid wastes at public filling facilities and landfills, and to control fly-tipping. A trip- ticket system would be included as one of the contractual requirements for the Contractor to strictly implement. The Supervising Officer would also regularly audit the effectiveness of the system.
- v) A recording system for the amount of waste generated, recycled and disposed (locations) should be established. The future Contractor should

also provide proper training to workers regarding the appropriate concepts of site cleanliness and waste management procedures, e.g. waste reduction, reuse and recycling all the time.

- vi) The CEDD should be timely notified of the estimated spoil volumes to be generated and the Public Fill Committee should be notified and agreement sort on the disposal of surplus inert C&D materials e.g. good quality rock during detailed design of the TM-CLKL project. Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and to ensure acceptability at public filling areas or reclamation sites.
- vii) The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.
- viii) Inert C&D materials from slopes and road pavement will be reused for construction of the raised platform for the toll plaza.
- ix) C&D materials generated by construction of cut slopes along NLH at North Lantau shall be reused in reclamation works where possible.
- x) The surplus surcharge should be transferred to a fill bank.
- xi) TMB generated alluvium and CDG material should be treated at a slurry treatment plant prior to transfer to a fill bank.
- xii) Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible.
- xiii) The site and surroundings shall be kept tidy and litter free.
- xiv) No waste shall be burnt on site.
- xv) Make provisions in contract documents to allow and promote the use of recycled aggregates where appropriate.
- xvi) Prohibit the Contractor to dispose of C&D materials at any sensitive locations e.g. natural habitat,, etc. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.
- xvii) Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off.
- xviii) Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.
- xix) Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.

- xx) Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.
- xxi) Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork or plastic facing for construction works should also be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should be carefully planned in order to avoid over-ordering and wastage.
- xxii) The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.
- xxiii) All falsework will be steel instead of wood.
- xxiv) Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows:
 - Suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed;
 - Having a capacity of <450L unless the specifications have been approved by the EPD; and
 - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations.
 - Clearly labelled and used solely for the storage of chemical wastes;
 - Enclosed with at least 3 sides;
 - Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest;
 - Adequate ventilation;
 - Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and
 - Incompatible materials are adequately separated.

- xxv) Waste oils, chemicals or solvents shall not be disposed of to drain;
- xxvi) Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them. Night soil should be regularly collected by licensed collectors.
- xxvii) General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.
- xxviii) All waste containers shall be in a secure area on hardstanding;
- xxix) Aluminum cans are usually collected and recovered from the waste stream by individual collectors if they are segregated and easily accessible. Separately labelled bins for their deposition should be provided as far as practicable.
- xxx) Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminum cans, plastic bottles, etc should be provided on-site.
- xxxi) Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.

8.1.3 ***Waste Disposal Recommendations***

8.1.3.1 The recommended disposal sites for the different types of waste are detailed in **Table 8.2** below:

Table 8.2 Recommended Waste Disposal Sites

Type of Waste	Disposal Site
Marine Dredged Mud	Category L – as capping materials at ESC or SB CMPs M _p and M _f – to ESC or SB CMPs ⁽¹⁾
Imported sand	N/A
Imported sorted public fill	Tuen Mun Area 38 Fill Bank
Imported Rock	N/A
Site clearance waste (vegetation, refuse on land)	Northwest New Territories (NWNT) refuse transfer stations/ West New Territories Landfill (WENT)
General Waste: food and packaging waste/ office waste	Northwest New Territories (NWNT) refuse transfer stations/ West New Territories Landfill (WENT)
Plastics & Wood	Northwest New Territories (NWNT) refuse transfer stations/ West New Territories Landfill (WENT)
Chemical Waste	To be handled by Registered Contractor on the approved list

Note: (1) Subject to DASO application

8.2 CONTAMINATED LAND

8.2.1.1 The results of the contaminated land assessment did not reveal any contamination hotspots that might be affected by the proposed TM-CLKL works and as such no mitigation measures in the form of contaminated land remediation is required. Therefore, no EM&A activities for the construction nor operational phases have been recommended as no significant impacts are predicted.

8.3 WASTE EM&A REQUIREMENTS

8.3.1.1 EM&A requirements are required for waste management during the construction phase only and the effective management of waste arisings during the construction phase will be monitored through the site audit programme. The aims of the waste audit are:

- to ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
- to encourage the reuse and recycling of material.

8.3.1.2 The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licence/permits for waste disposal. The Environmental Team (ET) shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licences including:

- Chemical Waste Permits/licenses under the Waste Disposal Ordinance

(Cap 354);

- Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
- Marine Dumping Permit under the Dumping at Sea Ordinance (Cap 466); and
- Effluent Discharge Licence under the Water Pollution Control Ordinance.

8.3.1.3 The Contractor shall refer to the relevant booklets issued by the DEP when applying for the licence/permit and the Environmental Team (ET) (see Section 1) shall refer to these booklets for auditing purposes.

8.3.1.4 During the site inspections and the document review procedures as mentioned in Chapter 10 of this Manual, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong. In addition to the site inspections, the ET shall review the documentation procedures prepared by the Waste Coordinator once a week to ensure proper records are being maintained and procedures undertaken in accordance with the Waste Management Plan.

8.3.1.5 The Contractor's waste management practices should be audited with reference to the checklist detailed in **Table 8.3** below:

Table 8.3 Waste Management Checklist

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
All necessary waste disposal permits or licences have been obtained	Before the commencement of demolition works	Once	Apply for the necessary permits/ licences prior to disposal of the waste. The ET shall ensure that corrective action has been taken.
Only licensed waste haulier are used for waste collection.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non- compliance. The SOR shall instruct the Contractor to use a licensed waste haulier. The Contractor shall temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action shall be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed are properly kept. For demolition material/waste, the number of loads for each day shall be recorded (quantity of waste can then be estimated based on average truck load. Should landfill charging be implemented, the receipts of the charge could be used for estimating the quantity).	Throughout the works	Weekly	The Contractor shall estimate the missing data based on previous records and the activities carried out. The ET shall audit the results and forward to the SOR and IEC for approval.
Wastes are removed from site in a timely manner. General refuse is collected on a daily basis.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non- compliance. The SOR shall instruct the Contractor to remove waste accordingly.
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non- compliance. The SOR shall instruct the Contractor to clean the storage area and/or cover the waste.
Different types of waste are segregated in different containers or skip to enhance recycling of material and proper disposal of waste.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non- compliance. The SOR shall instruct the Contractor to provide separate skips/ containers. The Contractor shall ensure the workers place the waste in the appropriate containers.

Chemical wastes are stored, handled and disposed of in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes, published by the EPD.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non-compliance. The SOR shall instruct the Contractor to rectify the problems immediately. Warning shall be given to the Contractor if corrective actions are not taken within 24 hrs and the Waste Control Group of the EPD shall be identified.
Demolition material/waste in dump trucks are properly covered before leaving the site.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non-compliance. The SOR shall instruct the Contractor to comply. The Contractor shall prevent trucks shall leaving the site until the waste are properly covered.
Wastes are disposal of at licensed sites.	Throughout the works	Weekly	The ET shall inform the SOR and IEC of the non-compliance. The SOR shall warn the Contractor and instruct the Contractor to ensure the wastes are disposed of at the licensed sites. Should it involve chemical waste, the Waste Control Group of EPD shall be notified.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, SOR – Supervising Officer's Representative

9 *CULTURAL HERITAGE*

9.1 *INTRODUCTION*

- 9.1.1.1 Cultural heritage resources are not identified within the works area of TM-CLKL Northern Connection Sub-sea Tunnel Section. As such, EM&A requirements for cultural heritage are not relevant to the Northern Connection Sub-sea Tunnel Section.

10 LANDFILL GAS HAZARD ASSESSMENT

10.1 INTRODUCTION

10.1.1.1 The landfill gas hazard assessment undertaken in the EIA identified the hazards that are likely to be generated from the Pillar Point Valley (PPV) Landfill, during the construction and operation phases of this Project and evaluate the associated risk. The EIA Report recommended that some precautionary measures are required to protect the proposed TM-CLKL toll plaza from the landfill gas risk due to the PPV Landfill. As such, the EM&A requirements for landfill gas hazard are not relevant for the current Northern Connection Sub-sea Tunnel Section EM&A Programme.

11 SITE ENVIRONMENTAL AUDIT

11.1 SITE INSPECTIONS

- 11.1.1.1 Site inspections provide a direct means to assess and ensure the Contractor's environmental protection and pollution control measures are in compliance with the contract specifications. Site inspections shall be undertaken routinely by the Environmental Team (ET) (see Section 1) to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the EIA.
- 11.1.1.2 The ET is responsible for the formulation of an environmental site inspection, deficiency and remedial action reporting system and for carrying out the site inspection works. In consultation with the Independent Environmental Checker (IEC), the ET shall prepare a procedure for the site inspection, deficiency and remedial action reporting requirements and submit this to the Contractor for agreement and to the Supervising Officer's Representative (SOR) for approval within 21 days of commencement to the construction contract.
- 11.1.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities.
- 11.1.1.4 The ET shall make reference to the following information while conducting the inspections:
- i) the EIA recommendations on environmental protection and pollution control mitigation measures as stated in the EIA report;
 - ii) work progress and programme;
 - iii) individual works methodology proposals;
 - iv) the contract specifications on environmental protection;
 - v) the relevant environmental protection and pollution control laws;
 - vi) previous site inspection results; and
 - vii) environmental monitoring data.
- 11.1.1.5 The Contractor shall update the ET with all relevant information on the construction works prior to carrying out the site inspections. The site inspection results and associated recommendations on improvements to the environmental protection and pollution control works shall be submitted, in a site inspection proforma (see Appendix B), by the ET to the IEC, the SOR and the Contractor within 24 hours for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame, as stipulated in the environmental

site inspection, deficiency and remedial action reporting system to report on any remedial measures subsequent to site inspections.

- 11.1.1.6 Ad hoc site inspections shall also be carried out by the ET and IEC if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint (an example of the complaint log is provided in Appendix B) or as part of the investigation work as specified in the Action Plan for environmental monitoring and audit.

11.2 COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS

- 11.2.1.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which the construction activities shall comply.
- 11.2.1.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the SOR for approval shall be sent to the ET for vetting to see whether sufficient environmental protection and pollution control measures have been included.
- 11.2.1.3 The ET shall also review the progress and programme of the works to check that relevant environmental laws have not been violated and that any foreseeable potential for violating the laws can be prevented.
- 11.2.1.4 The Contractor shall regularly copy relevant documents to the ET so that the checking work can be carried out. The documents shall include at minimum the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws and all valid licence/permit. The site diaries shall also be available for the ET's inspection upon request.
- 11.2.1.5 After reviewing the document, the ET shall advise the IEC, the SOR and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. The ET shall also advise the IEC, the Contractor and the SOR on the current status on licence/permit applications and any environmental protection and pollution control preparation works that may not be suitable for the works programme or may result in potential violation of environmental protection and pollution control requirements.
- 11.2.1.6 Upon receipt of the advice, the Contractor shall undertake immediate action to remedy the situation. The ET, IEC and the SOR shall follow up to ensure that appropriate action has been taken by the Contractor in order that the environmental protection and pollution control requirements are fulfilled.

11.3 ENVIRONMENTAL COMPLAINTS

- 11.3.1.1 Complaints shall be referred to the ET for carrying out complaint investigation procedures. The ET shall prepare a flow chart of the complaint response

procedures that addresses, complaint receiving channels, responsible parties/contacts for information, the investigation process, procedures for the implementation of mitigation/remedial action, guidelines for communication and public relation with the complainant etc. The flow chart should be agreed by all parties and issued to the Contractor, SOR and IEC for reference.

11.3.1.2 The ET shall undertake the following procedures upon receipt of a complaint:

- i) log complaint and date of receipt into the complaint database and inform the IEC immediately;
- ii) investigate the complaint and discuss with the Contractor to determine its validity and to assess whether the source of the problem is due to works activities;
- iii) if a complaint is considered valid by the SOR or EPD and due to the works, the ET shall identify mitigation measures in consultation with the IEC;
- iv) if mitigation measures are required, the ET shall advise the Contractor accordingly;
- v) review the Contractor's response on the identified mitigation measures and the updated situation;
- vi) if the complaint is transferred from EPD, an interim report shall be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- vii) (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
- viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and
- ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

11.3.1.3 During the complaint investigation work, the Contractor and SOR shall cooperate with the ET in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation by the ET, in consultation with the IEC, the Contractor shall promptly carry out the mitigation measures. The ET and SOR shall approve the proposed mitigation measures and check that the measures have been carried out by the Contractor.

11.4 *CHOICE OF CONSTRUCTION METHOD*

- 11.4.1.1 At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the project. It is the responsibility of the ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma as shown in Appendix B to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

12 REPORTING

12.1 GENERAL

- 12.1.1.1 The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the Supervising Officer's Representative (SOR). The reports are required to be prepared by the Environmental Team (ET).

12.2 DOCUMENTATION

- 12.2.1.1 All documentation is required to be filed in a traceable and systematically manner. Site documentation, including monitoring field records, laboratory analysis records, meeting minutes, correspondences etc.(some examples are provided in Appendi~ B) shall be cross-referenced by the ET and be ready for inspection upon request. All EM&A results and findings shall be documented in the respective construction and operational phase EM&A reports prepared by the ET and endorsed by the Independent Environmental Checker (IEC) prior to dissemination to the Contractor, the SOR and EPD. All reports including details of water quality monitoring, ecology, landscape and visual and archaeological EM&A shall also be issued to the AFCD and the AMO as appropriate.
- 12.2.1.2 All documentation shall be in paper form and/or electronic (in an agreed format) upon request. All documents and data shall be kept for at least one year after the completion of the operational phase EM&A works. All submissions (reports, data and correspondences etc.) shall be liable to free use for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.

12.3 DESIGN AUDIT REPORT

- 12.3.1.1 The Design Audit Report shall provide the means for the Consultant undertaking the detailed design of the project to certify that environmental design elements and specifications have been completed in accordance with the EIA requirements. The Consultant shall include in the report a signed off proforma (see Appendi~ B) to confirm that there are no outstanding environmental measures, identified as requiring design phase audit, that require further action. The Design Audit Report and specifications shall be prepared by the Consultants and issued to EPD, the AFCD and the PlanD, as appropriate, prior to the commencement of the tendering period.

12.4 BASELINE MONITORING REPORTS

- 12.4.1.1 In respect of the construction phase EM&A works, the ET shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of

completion of baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the following: the Contractor, the IEC, the SOR, EPD, the AFCD and the AMO as appropriate. The ET shall liaise with the relevant parties on the exact number of copies required.

12.4.1.2 The baseline monitoring reports for both the construction and operational phases

12.4.1.2 The baseline monitoring reports for both the construction and operational phases shall include at least the following:

- i) Up to half a page executive summary.
- ii) Background information.
- iii) Drawings showing locations of the baseline monitoring stations.
- iv) An updated construction programme with milestones of environmental protection/mitigation activities annotated.
- v) Monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - QA/QC results and detection limits.
- vi) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
- vii) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data.
- viii) Revisions for inclusion in the EM&A Manual.
- (ix) Comments and conclusions.

12.5 EM&A REPORTS

- 12.5.1.1 The results and findings of all construction phase EM&A work required in this Manual shall be recorded in the EM&A Reports prepared by the ET on a monthly basis and endorsed by the IEC. The EM&A Reports shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due one month and 10 days after construction commences.
- 12.5.1.2 A maximum of 4 copies of each EM&A Report shall be submitted to each of the following parties: the Contractor, the IEC, the SOR, EPD, the AFCD, the AMO and the PlanD, as appropriate. Before submission of the first EM&A Report, the ET shall liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium.
- 12.5.1.3 Not used.
- 12.5.1.4 The ET shall review the monitoring programme every 6 months or on an as needed basis in order to cater for any changes in the surrounding environment and nature of works in progress and shall document all observations in the monthly/bi- monthly reports.

12.6 FIRST EM&A REPORT

- 12.6.1.1 The first EM&A report for both the construction and operational phases shall include at least the following:
- i) 1-2 pages executive summary, comprising:
 - breaches of AL levels;
 - complaint Log;
 - notifications of any summons and successful prosecutions;
 - reporting Changes; and
 - future key issues.
 - ii) Basic Project information including a synopsis of the Project organisation (including key personnel, contact names and telephone numbers), a drawing of the Project area showing the environmentally sensitive receivers and the locations of monitoring and control stations, programme, management structure and the work undertaken during the month.
 - iii) Environmental Status, comprising:
 - works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used); and

- drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- iv) A brief summary of EM&A requirements including:
- all monitoring parameters;
 - environmental quality performance limits (Action and Limit levels);
 - Event-Action Plans;
 - environmental mitigation measures, as recommended in the Project EIA study final report; and
 - environmental requirements in contract documents.
- v) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule.
- vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration; and
 - QA/QC results and detection limits.
- vii) Graphical plots of trends of monitored parameters at the representative monitoring stations annotated against the following:
- major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
 - QA/QC results and detection limits.
- viii) Advice on the solid and liquid waste management status.
- ix) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).

- x) A review of the reasons for and the implications of noncompliance including a review of pollution sources and working procedures.
- xi) A description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance.
- xii) A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints.
- xiii) A summary of notifications of summons, successful prosecutions for breaches of environmental protection/pollution control legislation and actions to rectify such breaches.
- xiv) An account of the future key issues as assessed from the works programme and work method statements.
- xv) Advice on the solid and liquid waste management status.
- xvi) Comments, recommendations and conclusions for the monitoring period.
- xvii) Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarizing the EM&A of the period.

12.7 SUBSEQUENT EM&A REPORTS

12.7.1.1 The subsequent EM&A reports prepared by the ES for both the construction and operational phases shall include the following:

- i) Title page.
- ii) Executive summary (1-2 pages), including:
 - breaches of all Action and Limit levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- iii) Contents page.
- iv) Environmental status, comprising:

- drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - summary of non-compliance with the environmental quality performance limits; and
 - summary of complaints.
- v) Environmental issues and actions, comprising:
- review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
 - description of the actions taken in the event of noncompliance and deficiency reporting;
 - recommendations (should be specific and target the appropriate party for action); and
 - implementation status of the mitigatory measures and the corresponding effectiveness of the measures.
- vi) Future key issues.
- vii) Appendices, including:
- action and limit levels;
 - graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following: major activities being carried out on site during the period; weather conditions during the period and any other factors which might affect the monitoring results;
 - monitoring schedule for the present and next reporting period;
 - cumulative complaints statistics; and
 - details of complaints, outstanding issues and deficiencies.

12.8 *QUARTERLY EM&A SUMMARY REPORTS*

12.8.1.1 The ET shall submit Quarterly EM&A Summary Reports for the construction phase EM&A works only. These reports should be around 5 pages (including about three pages of text and tables and two pages of figures) and shall contain at minimum the following information:

- i) Up to half a page executive summary.
- ii) Basic Project information including a synopsis of the Project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter.

- iii) A brief summary of EM&A requirements including:
 - monitoring parameters;
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures, as recommended in the Project EIA study final report.
- iv) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule.
- v) Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- vi) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - the major activities being carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results.
- vii) Advice on the solid and liquid waste management status.
- viii) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- ix) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures.
- x) An assessment of the construction impacts on suspended solids, including but not limited to, a comparison of the difference between the quarterly mean and the 1.3 times the ambient mean value, the latter being defined as a 30% increase of the baseline data or EPD data, using appropriate statistical procedures. Suggestions of appropriate mitigation measures shall be made if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 ambient mean value ($p < 0.05$).
- xi) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance.

- xii) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- xiii) Comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter.
- xiv) Proponents' contacts and any hotline telephone number for the public to make enquiries.

12.9 ANNUAL/FINAL EM&A REVIEW REPORTS

12.9.1.1 An annual EM&A report should be prepared by the ET at the end of each construction year during the course of the project. A final EM&A report should be prepared by the ET at the end of both the construction and operational phases. The annual/final EM&A reports should contain at least the following information:

- i) Executive Summary (1-2 pages).
- ii) Drawings showing the project area any environmental sensitive receivers and the locations of the monitoring and control stations.
- iii) Basic project information including a synopsis of the project organization, contacts for key management staff and a synopsis of work undertaken during the course of the project or past twelve months.
- iv) A brief summary of EM&A requirements including:
 - environmental mitigation measures as recommended in the project EIA study final report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit Levels);
 - all monitoring parameters; and
 - Event-Action Plans.
- v) A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report and summarised in the updated implementation schedule.
- vi) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the projects including the post-project monitoring (or the past twelve months for annual reports) for all monitoring stations annotated against the following:

- the major activities being carried out on site during the period;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - the return of ambient environmental conditions in comparison with baseline data.
- vii) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate.
- ix) A description of the actions taken in the event of non-compliance.
- x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- xi) A summary record of notifications of summonses and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches investigation, follow-up actions taken and results.
- xii) A comparison of the EM&A data with the EIA predictions with annotations and explanations for any discrepancies, including a review of the validity of EIA predictions and identification of shortcomings in the EIA recommendations.
- xiii) A review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness, including cost effectiveness;
- xiv) A review of the success of the EM&A programme, including a review of the effectiveness and efficiency of the mitigation measures, and recommendations for any improvements in the EM&A programme.
- xv) A clear cut statement on the environmental acceptability of the project with reference to specific impact hypotheses and a conclusion to state the return to ambient and/or the predicted scenario as the EIA findings.

12.10 DATA KEEPING

- 12.10.1.1 The site documents such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the EM&A Reports for submission. However, the documents shall be kept by the ET and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be

recorded in magnetic media, and the software copy shall be available upon request. All the documents and data shall be kept for at least one year after the completion of the operational phase EM&A works.

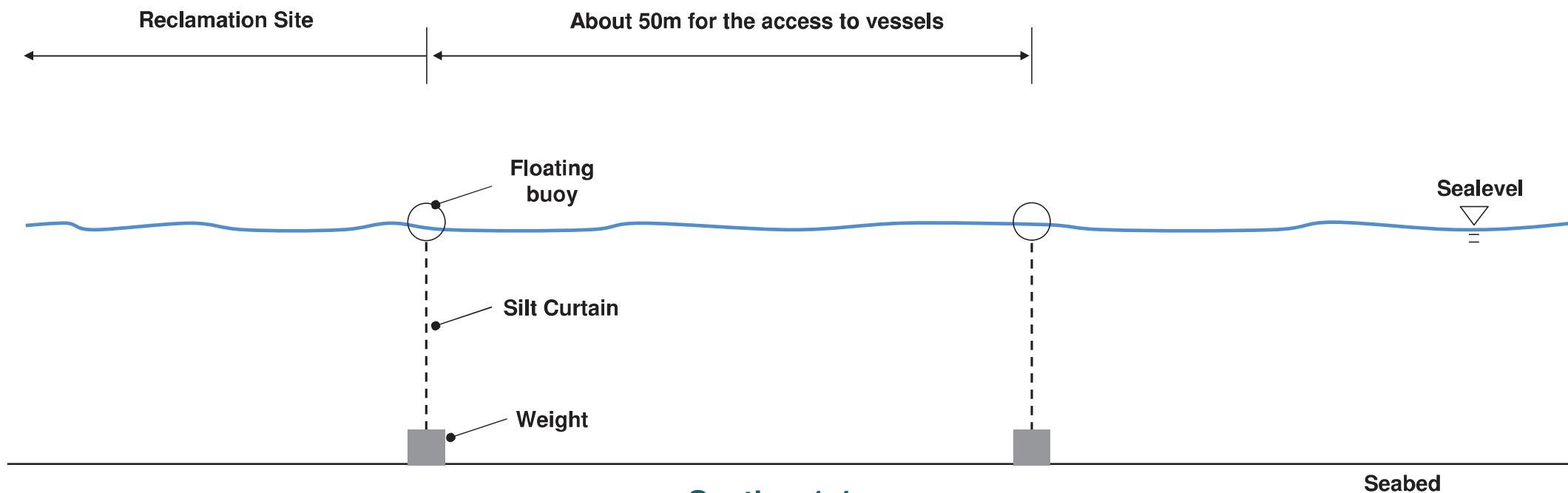
12.11 *INTERIM NOTIFICATIONS OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES*

- 12.11.1.1 With reference to Event/Action Plans, when the environmental quality limits are exceeded, the ET shall immediately notify the Contractor, the SOR, EPD and the AFCD as appropriate. The notification shall be followed up with advice to each party on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Figure 12.1**.

Annex A

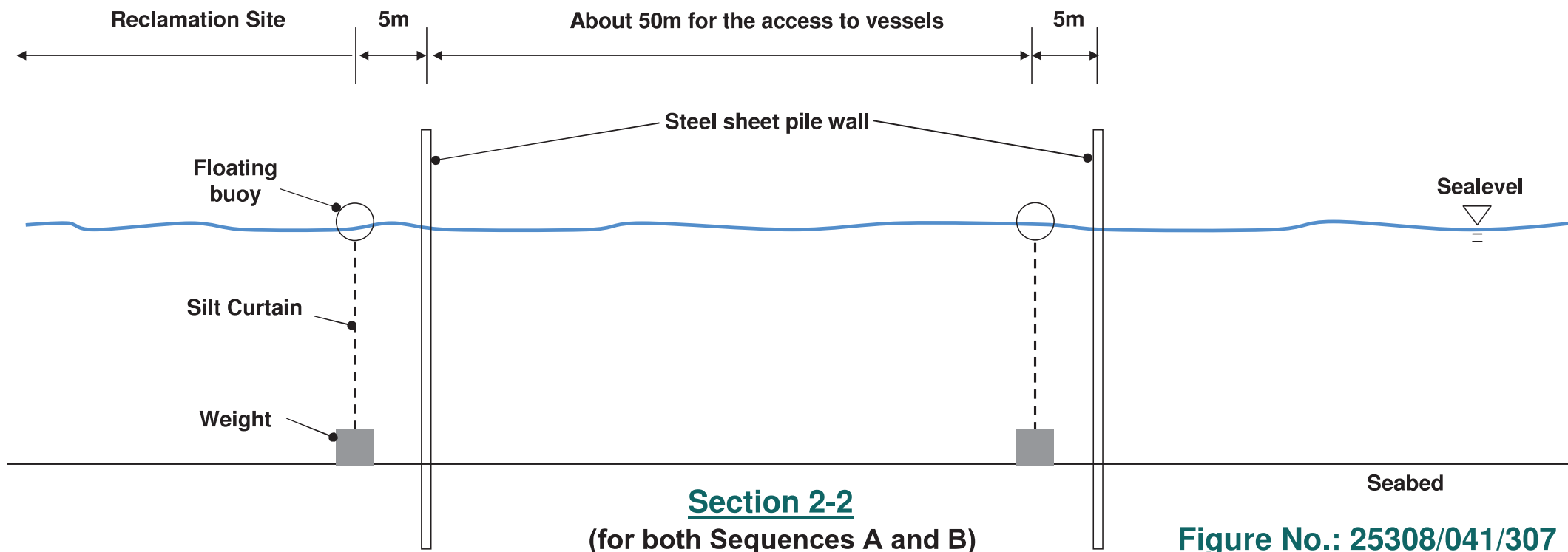
Silt Curtain Arrangements

(Adopted from: CINOTECH (2011) Agreement No.
CE35/2011 EP Baseline Environmental Monitoring for
Hong Kong-Zhuhai-Macao Bridge
Tuen Mun-Chep Lap Kok Link – Investigation.
Updated EM&A Manual for Tuen Mun-Chek Lap Kok
Link)



Section 1-1

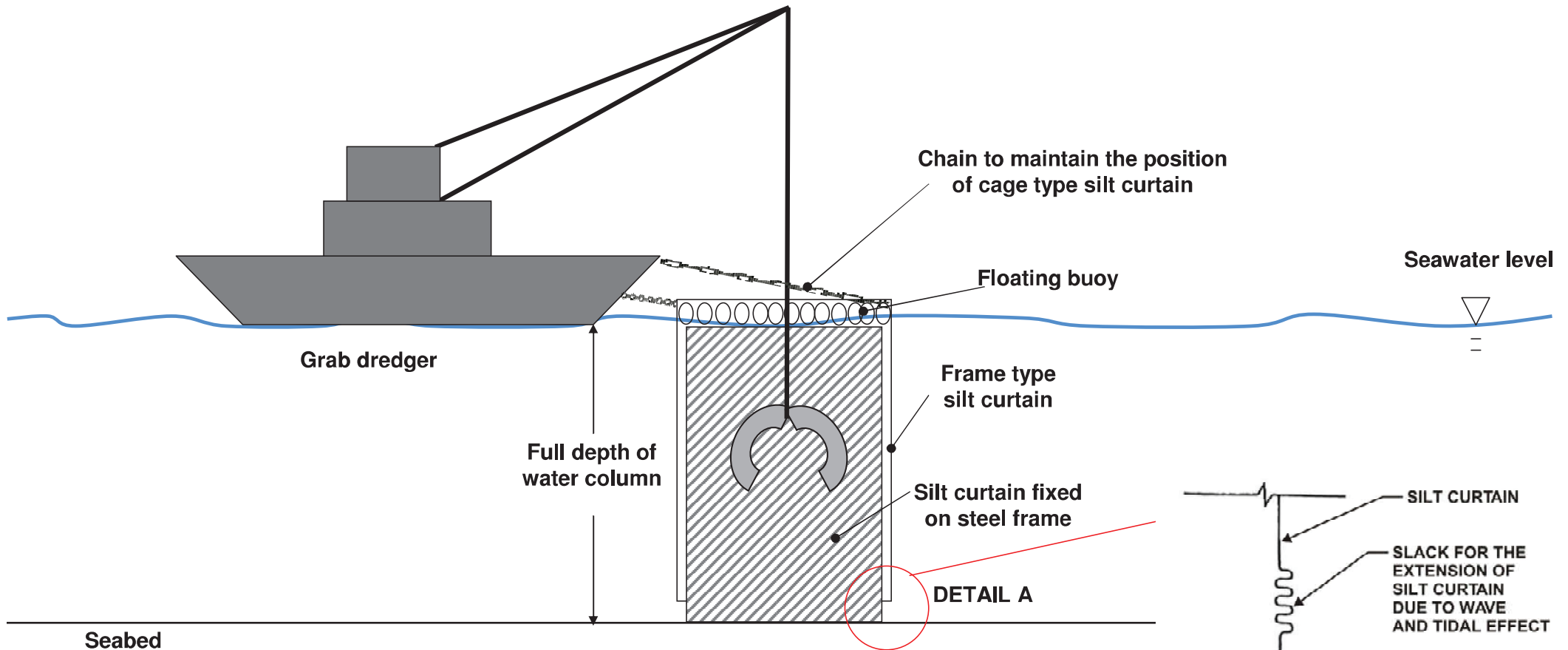
(for both Sequences A and B)



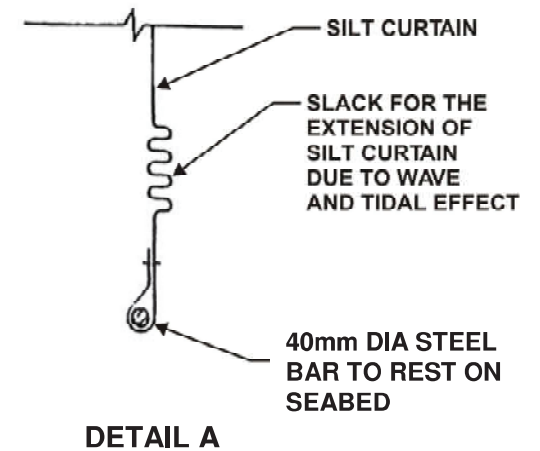
Section 2-2

(for both Sequences A and B)

Figure No.: 25308/041/307



Additional Cage Type Silt Curtain for Grab Dredgers
 (for general application)



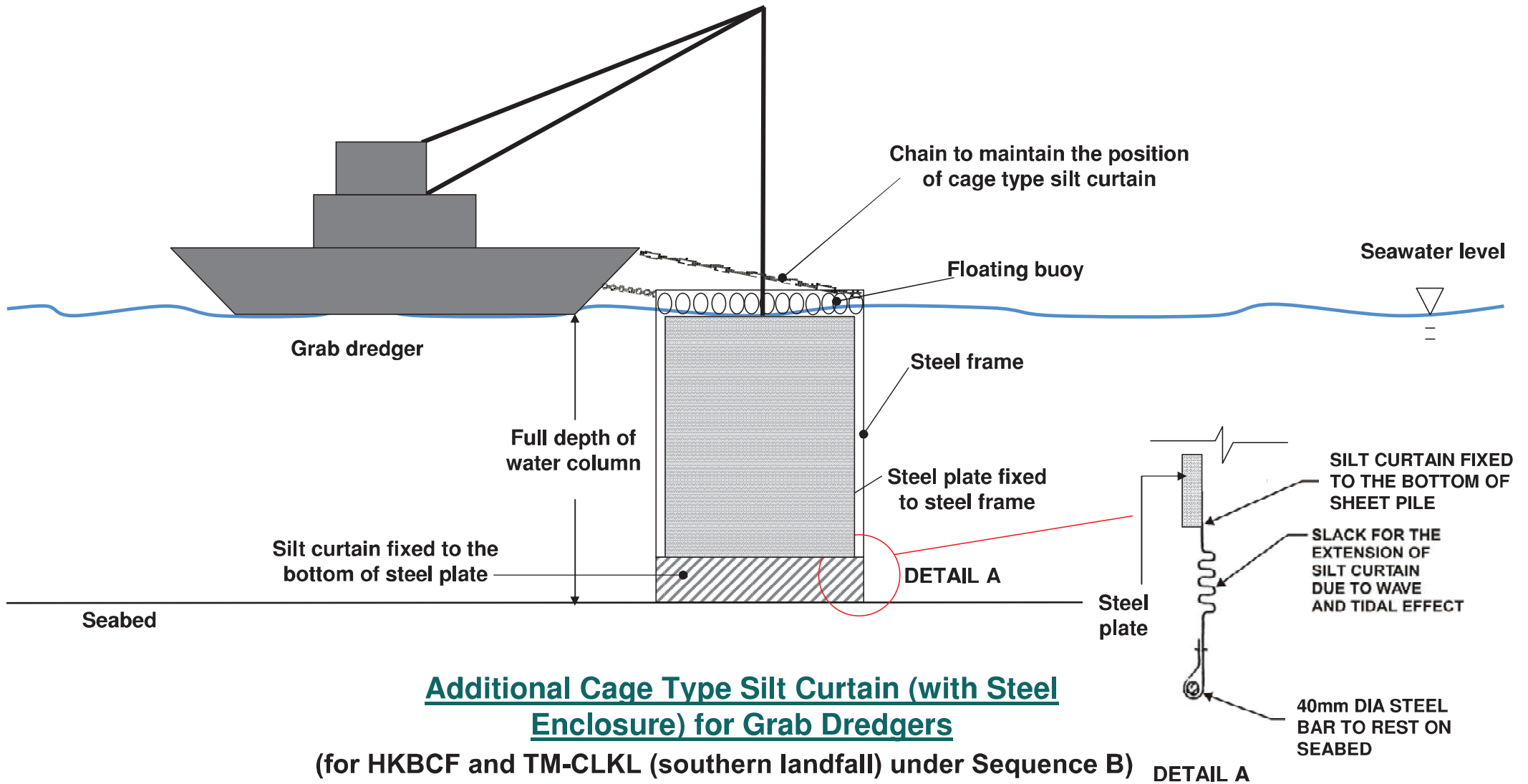
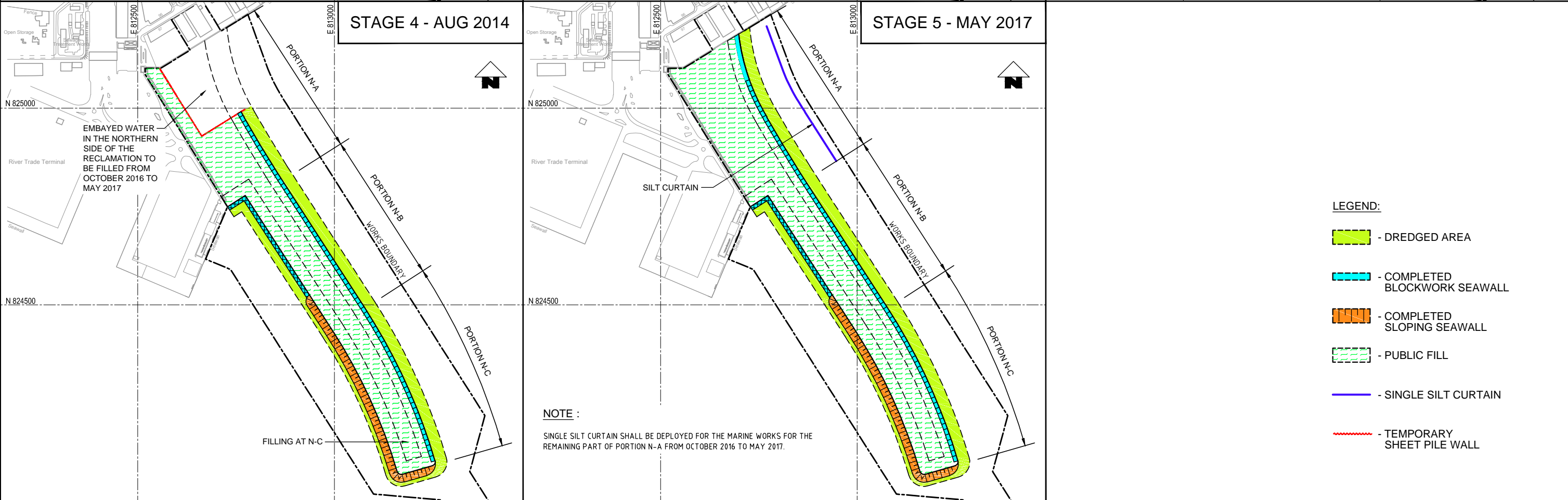
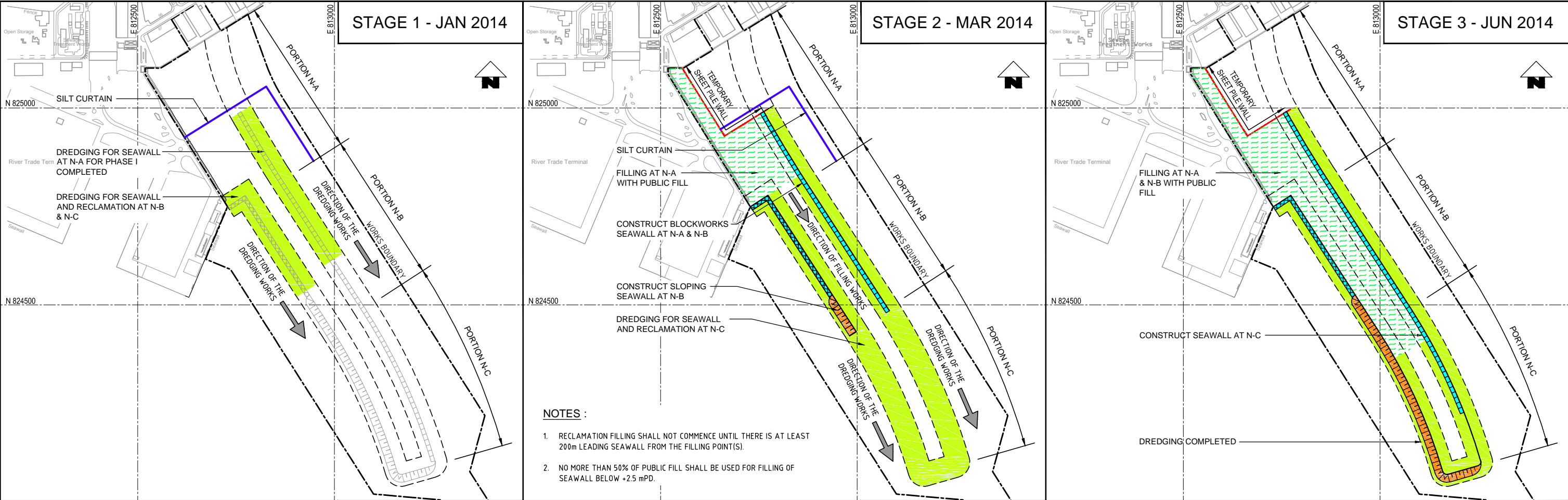







Figure No.: 25308/041/308a

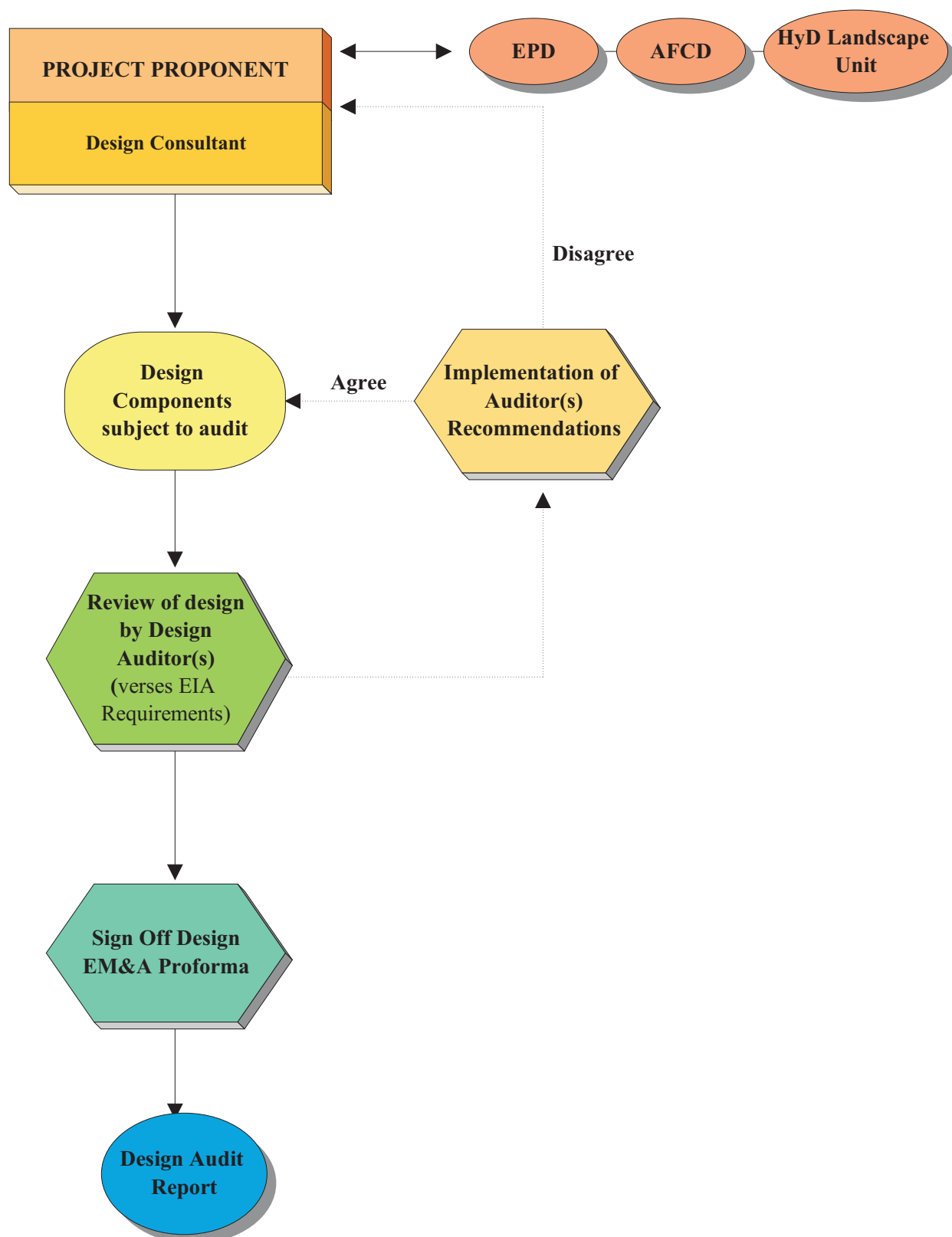


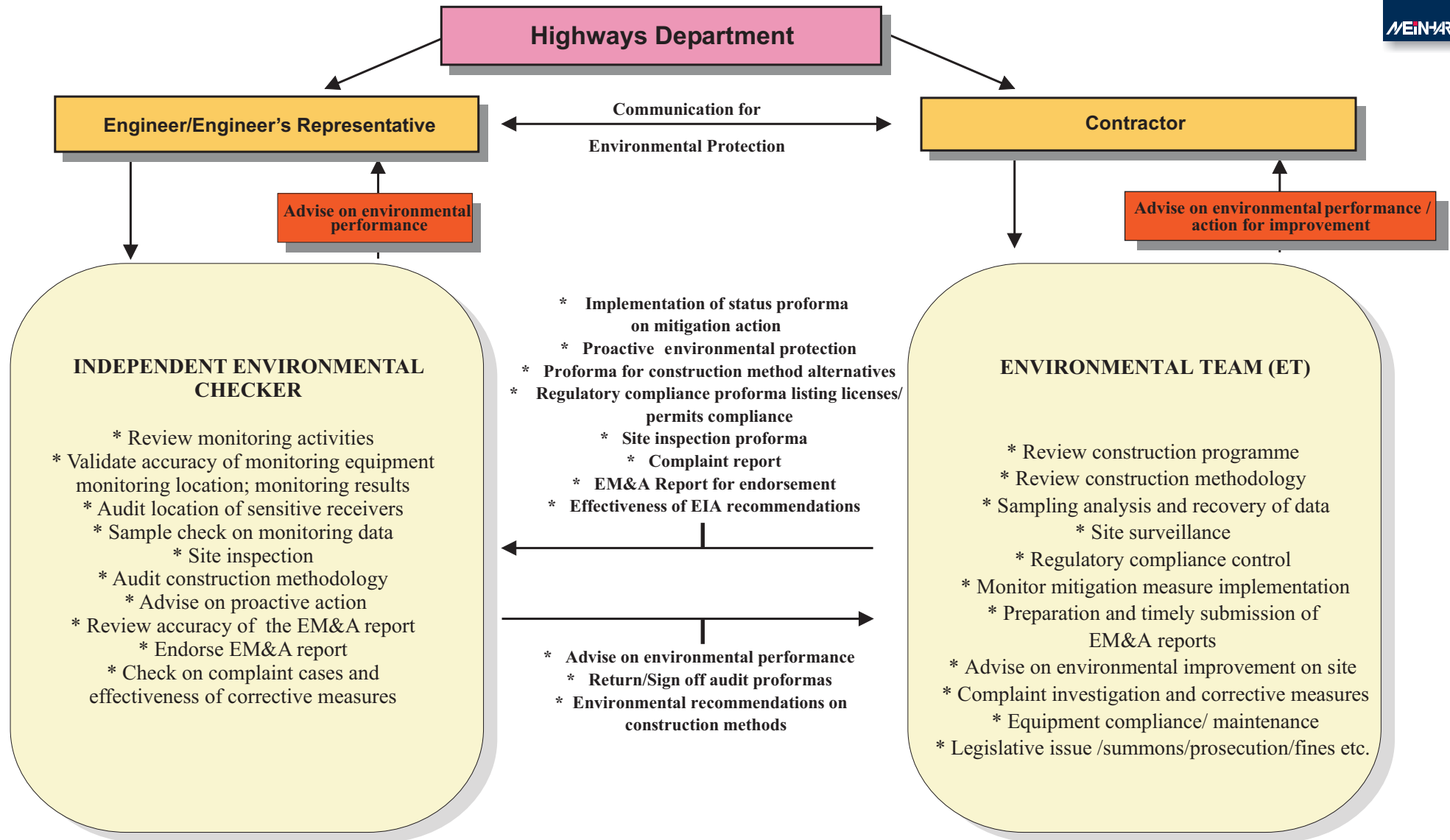
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			Drawn By KC										Scale 1:10000 @ A3	
C	FURTHER ESS COMMENTS ADDED	24SEP13	PKV	Approved By SPo						Drawing Title Figure 1		CADD Ref. TMCLKL8-DBJ-NTH-DWG-00132-DFT-C		
B	ESS COMMENTS ADDED	23SEP13	PKV	SPo								Issue Status DFT (DRAFT)		
A	FIRST ISSUE	09SEP13	MHo	Date 09SEP2013								Revision C		
Rev.	Description	Date	Checked											

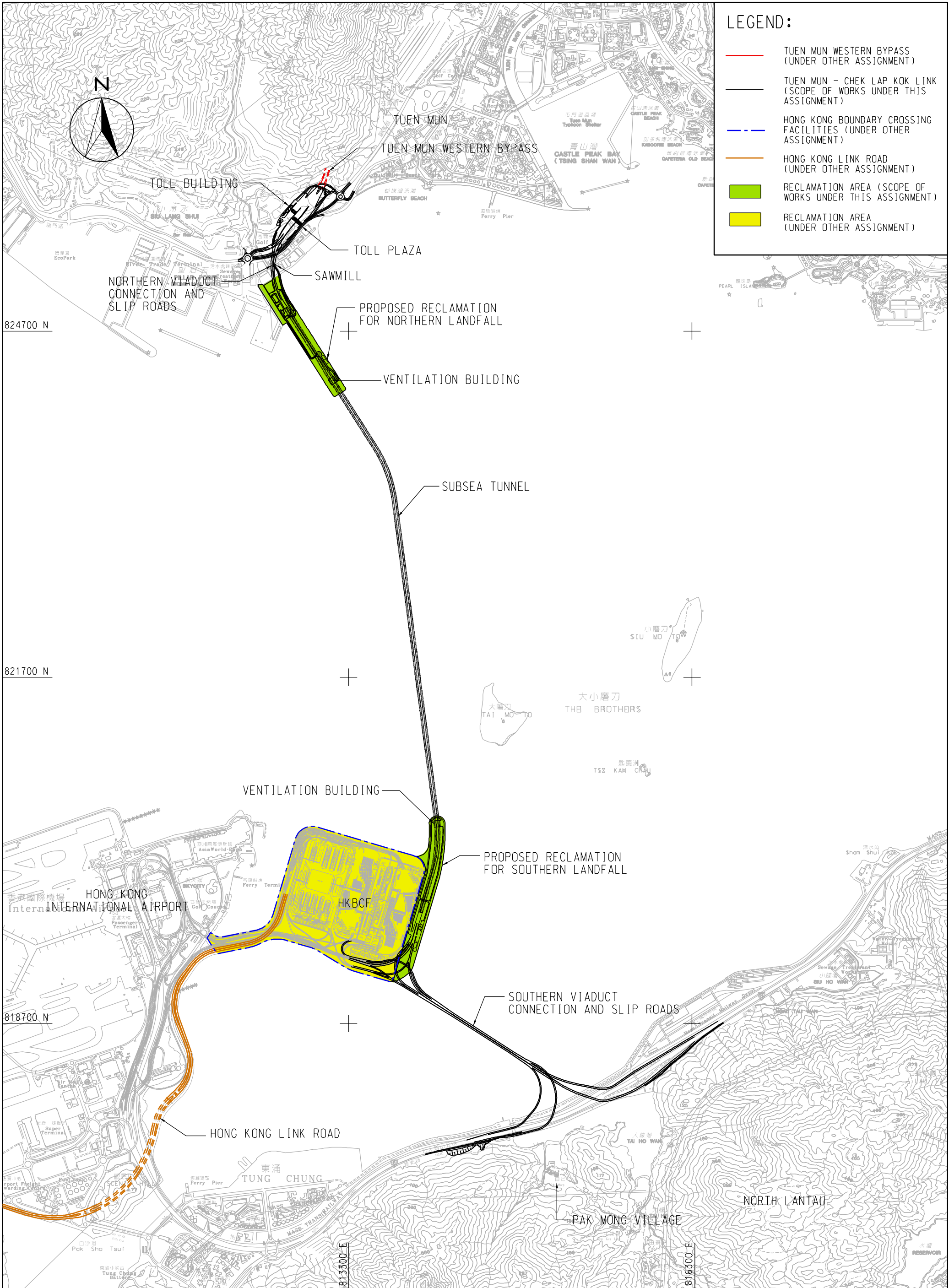
Annex B

Figures

(Adopted from: CINOTECH (2011) Agreement No.
CE35/2011 EP Baseline Environmental Monitoring for
Hong Kong-Zhuhai-Macao Bridge
Tuen Mun-Chep Lap Kok Link – Investigation.
Updated EM&A Manual for Tuen Mun-Chek Lap Kok
Link)







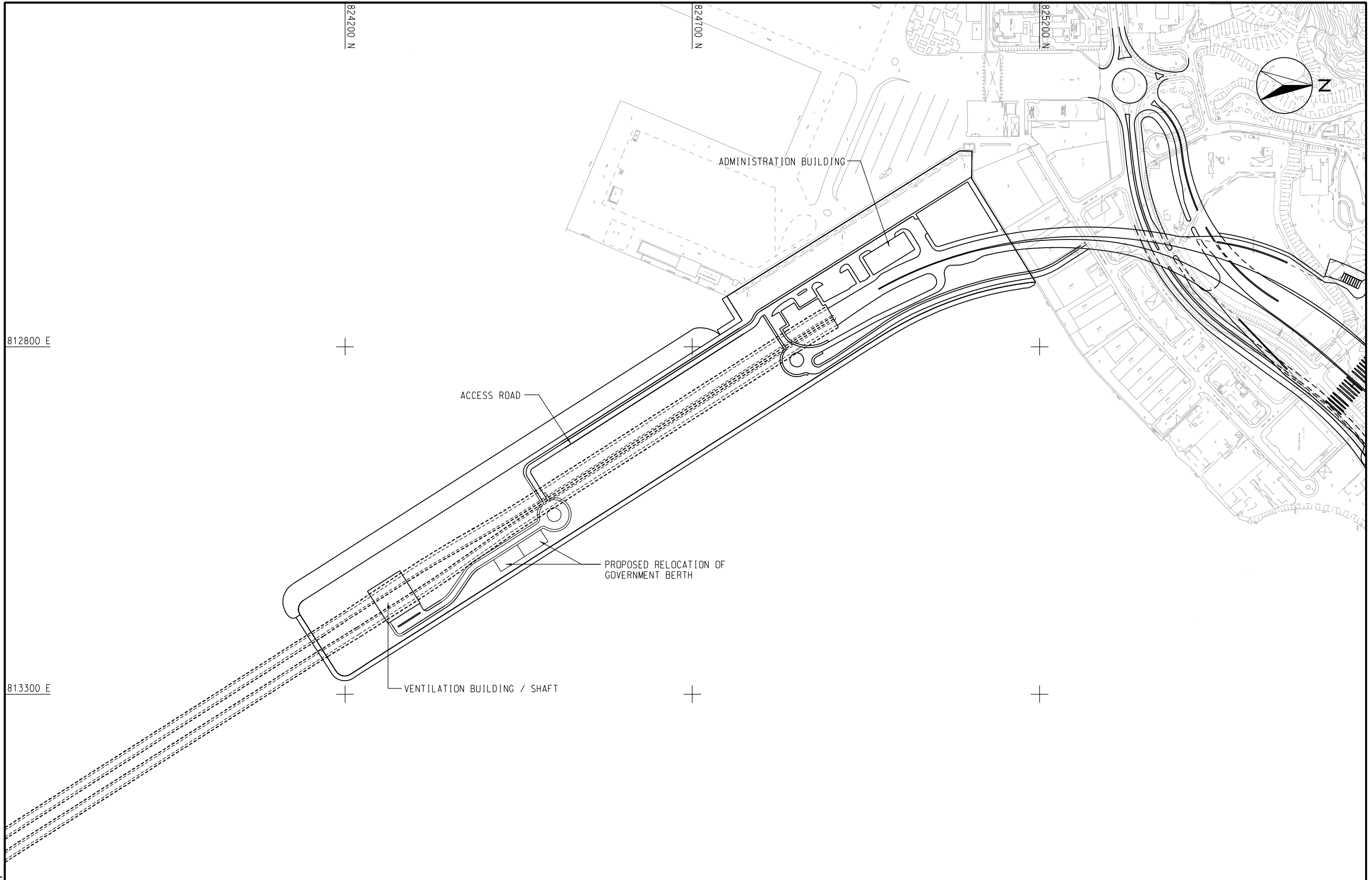
LEGEND:

- TUEN MUN WESTERN BYPASS (UNDER OTHER ASSIGNMENT)
- TUEN MUN - CHEK LAP KOK LINK (SCOPE OF WORKS UNDER THIS ASSIGNMENT)
- HONG KONG BOUNDARY CROSSING FACILITIES (UNDER OTHER ASSIGNMENT)
- HONG KONG LINK ROAD (UNDER OTHER ASSIGNMENT)
- RECLAMATION AREA (SCOPE OF WORKS UNDER THIS ASSIGNMENT)
- RECLAMATION AREA (UNDER OTHER ASSIGNMENT)

AECOM

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
GENERAL LAYOUT OF TM-CLKL

SCALE	A3 1:30000	DATE	JUL. 2009
CHECK	--	DRAWN	WYP
JOB No.	60044963	DRAWING No.	Fig 2.1
		REV	A

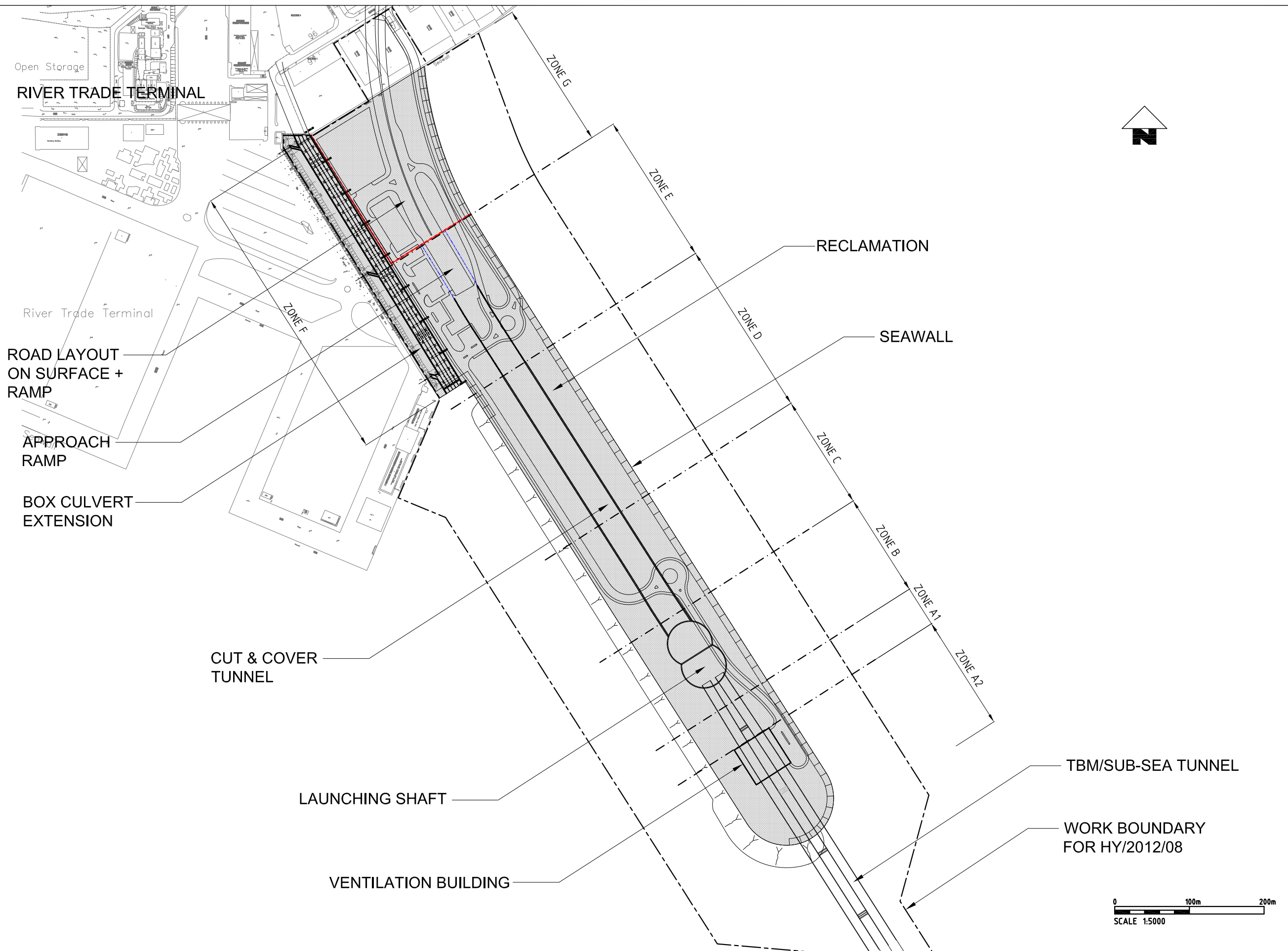


Plotting By 2008-7-22
Plot Scale \$ScalesShort\$

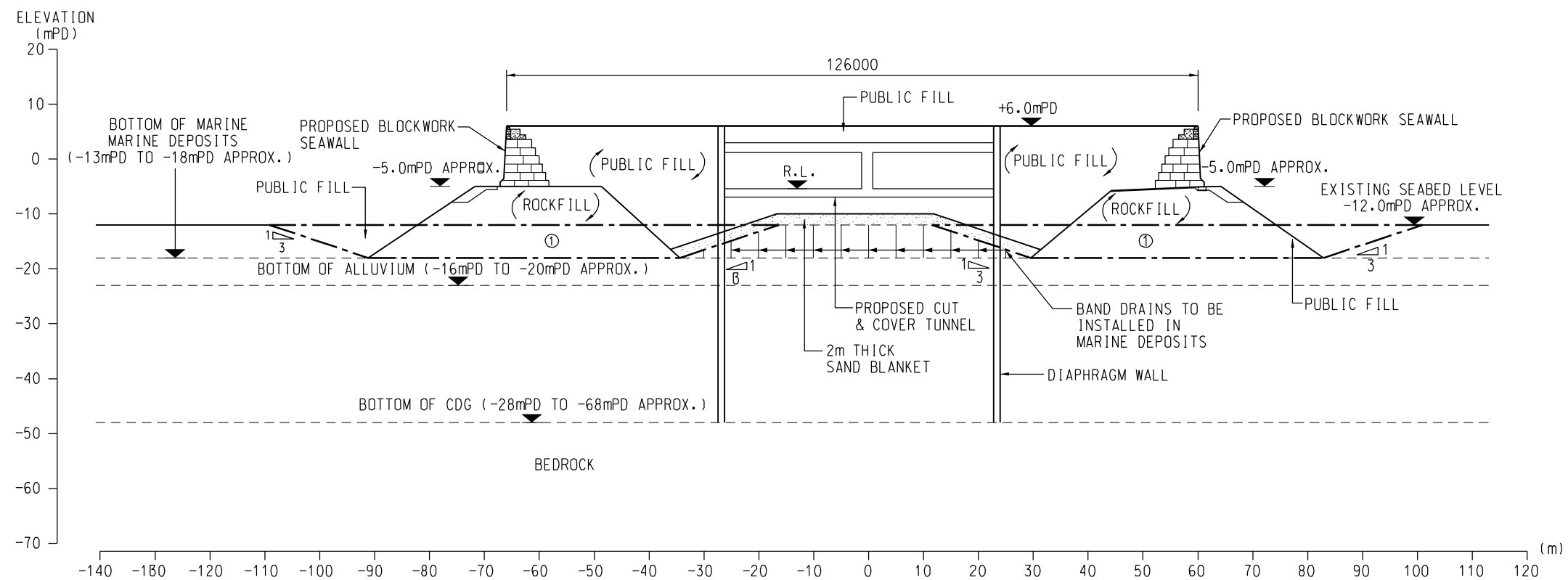
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AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
LAYOUT PLAN OF NORTHERN LANDFALL

SCALE	A3 1:5000	DATE	JUN. 2009
CHECK	--	DRAWN	GXH
JOB No.	60044963	DRAWING No.	Fig 2.2a
		REV	--



				Designed By PKV	<div><div><div><div>香港實業 Dragages Hong Kong</div><div>A member of the Bouygues Construction group</div></div><div><div><div>BOUYGUES TRAVAUX PUBLICS</div></div><div><div><div>路政署 HIGHWAYS DEPARTMENT</div></div></div></div></div></div>	Client	Contractor's Designer	Project	Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section		Drawing no. TMCLKL8-DBJ-NTH-DWG-00138
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				Approved By SPo		pp			CADD Ref. TMCLKL8-DBJ-NTH-DWG-00138-DFT-A		
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A	FIRST ISSUE	10SEP13	PKV								
Rev.	Description	Date	Checked								

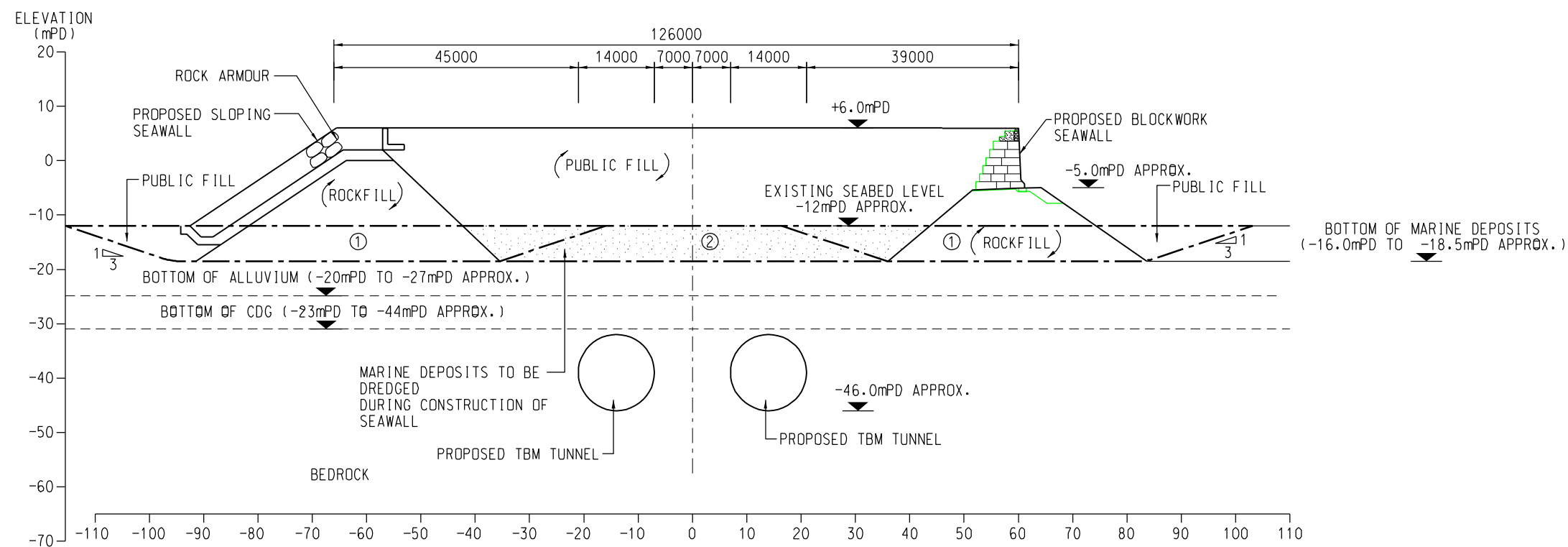


LEGEND:			
		EXTENT OF MARINE DEPOSITS TO BE DREDGED	
①		DREDGING DURING CONSTRUCTION OF SEAWALL	

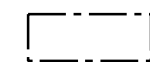
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AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
NORTHERN LANDFALL - SECTION B - B

SCALE	A3 1:1000	DATE	JUN. 2009
CHECK	--	DRAWN	LCG
JOB No.	60044963	DRAWING No.	Fig 2.3b
		REV	--



LEGEND:



EXTENT OF MARINE DEPOSITS TO BE DREDGED

①

DREDGING DURING CONSTRUCTION OF SEAWALL AT RECLAMATION SIDE EDGES

②

DREDGING DURING CONSTRUCTION OF SEAWALL AT RECLAMATION FRONT EDGE



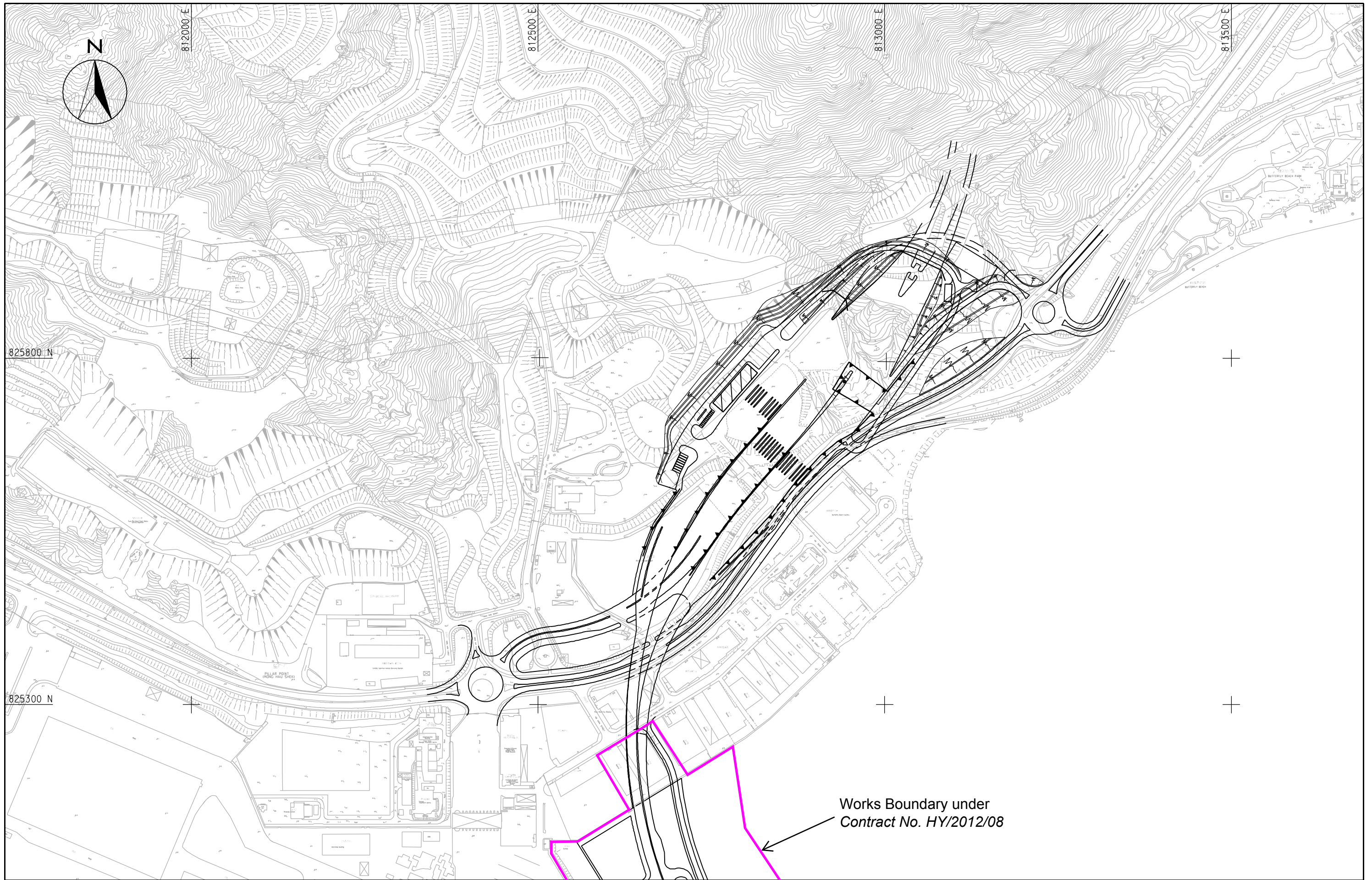
SAND FILL

AECOM

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

NORTHERN LANDFALL - SECTION D - D

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		REV	--

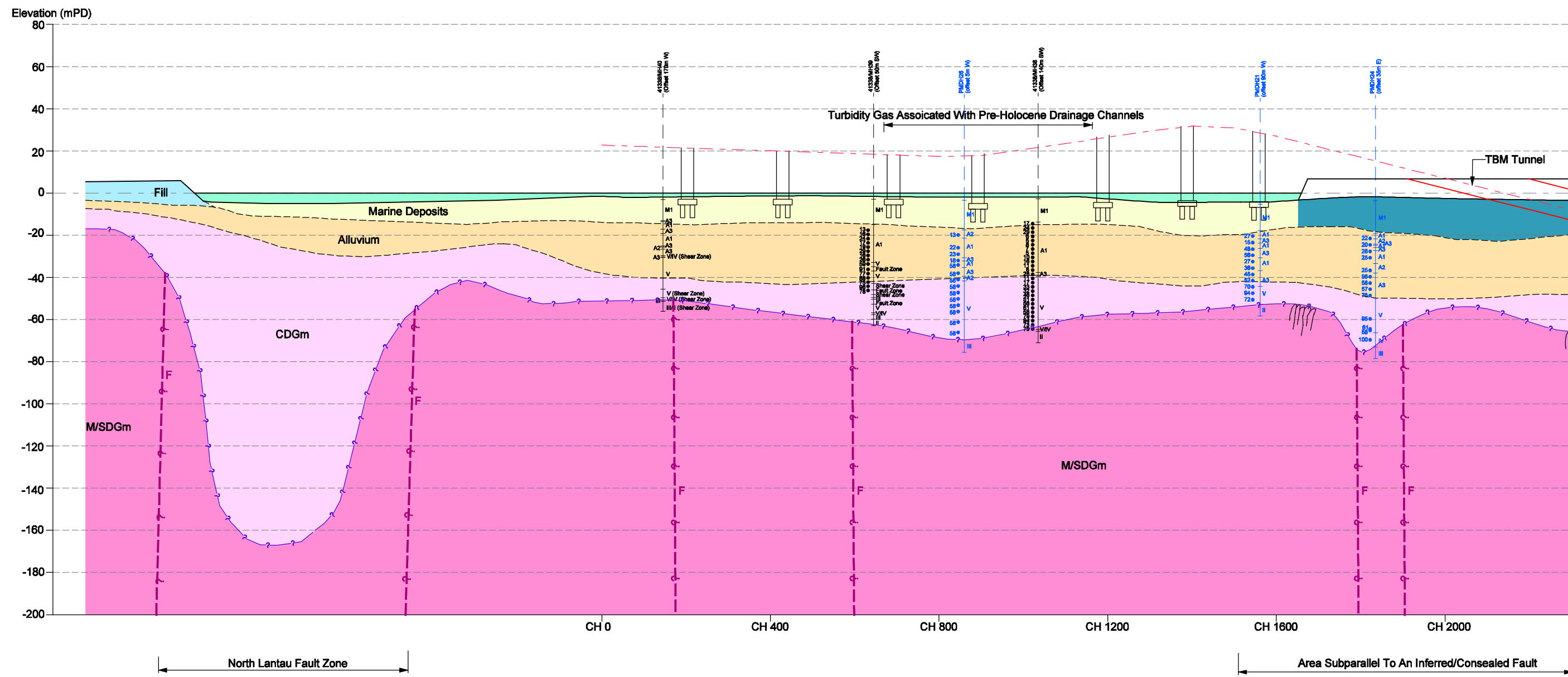


AECOM

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

NORTHERN VIADUCT CONNECTION, SLIP ROADS AND TOLL PLAZA

SCALE	A3 1:5000	DATE	JUL. 2009
CHECK	--	DRAWN	YHS
JOB No.	60044963	DRAWING No.	Fig 2.4a
		REV	--

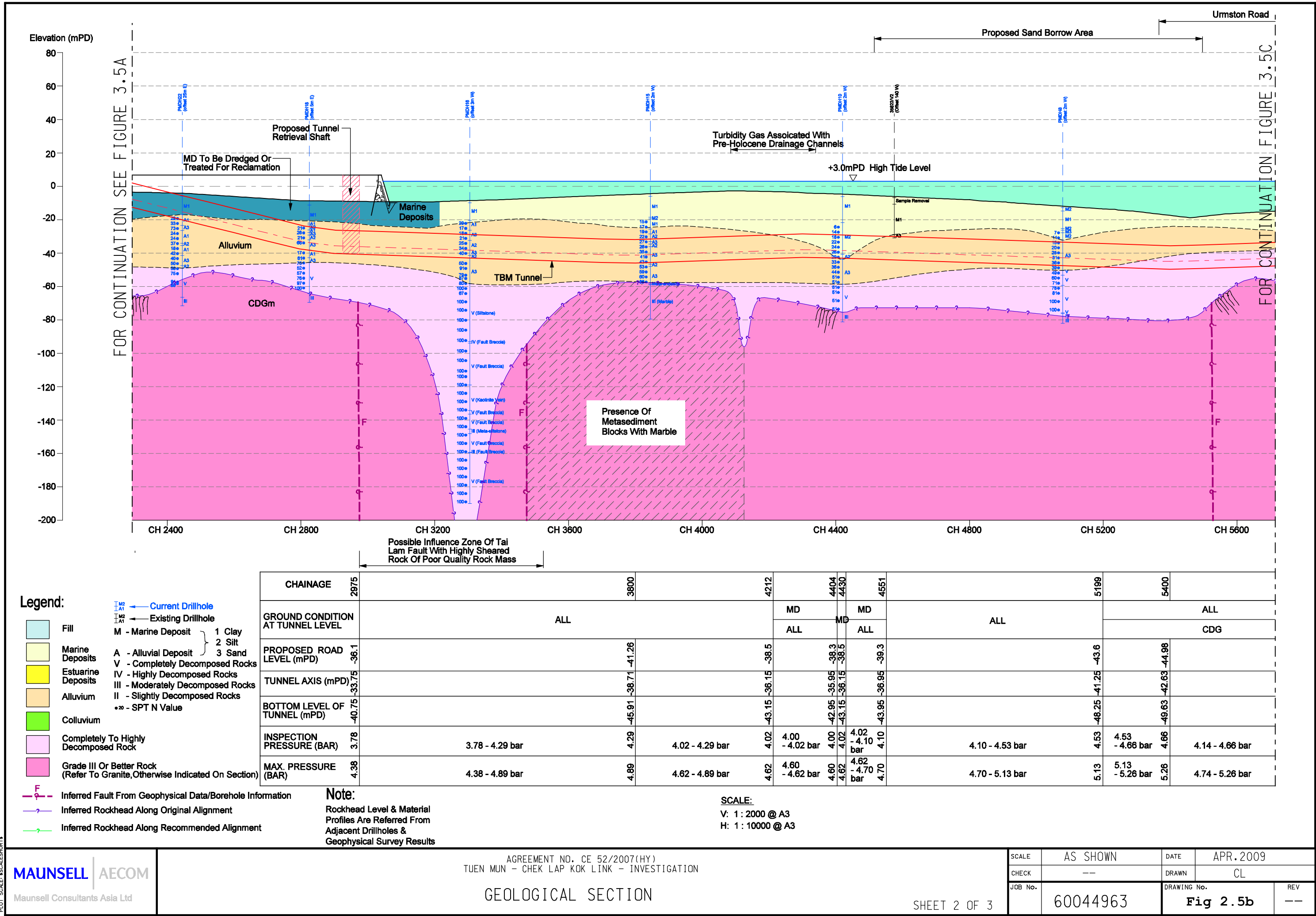


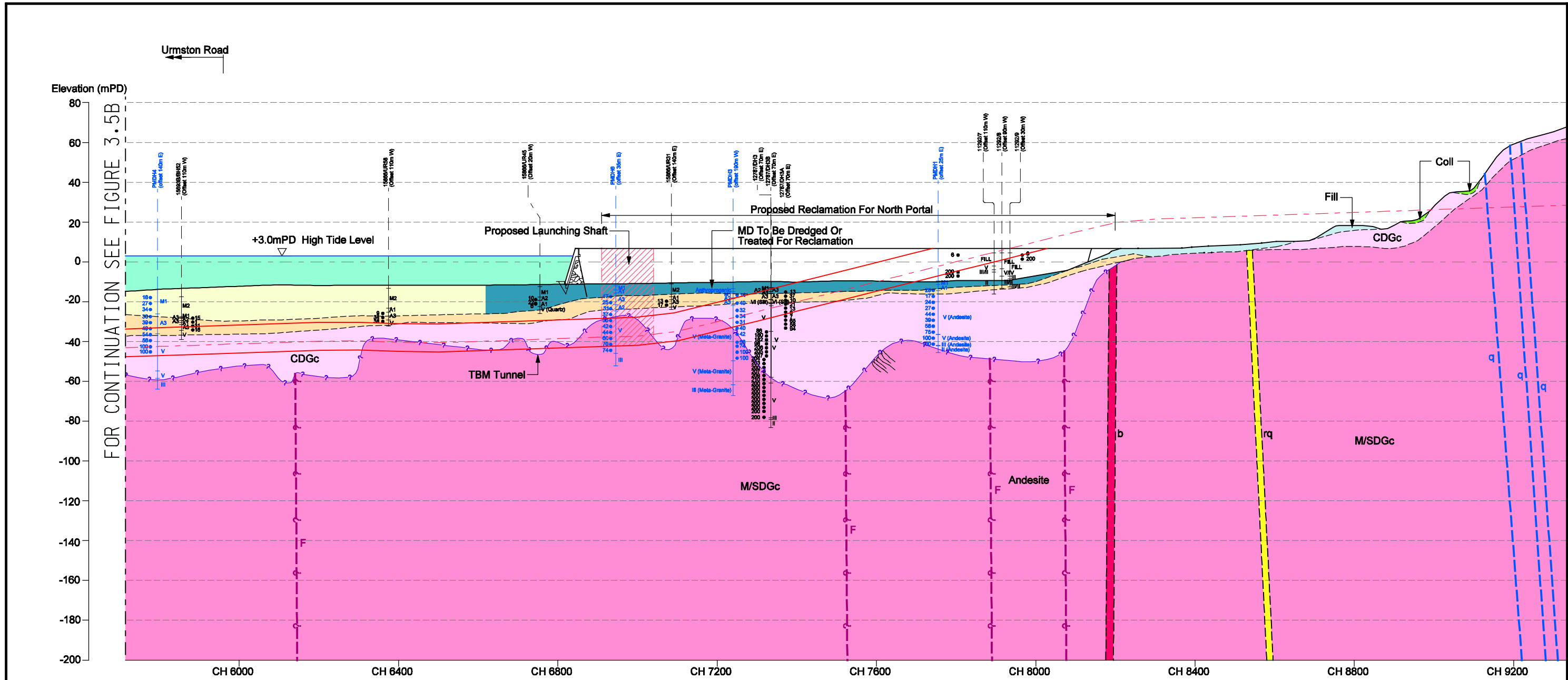
FOR CONTINUATION SEE FIGURE 3.5B

- Legend:**
- Fill
 - Marine Deposits
 - Estuarine Deposits
 - Alluvium
 - Colluvium
 - Completely To Highly Decomposed Rock
 - Grade III Or Better Rock (Refer To Granite, Otherwise Indicated On Section)
 - Inferred Fault From Geophysical Data/Borehole Information
 - Inferred Rockhead Along Original Alignment
 - Inferred Rockhead Along Recommended Alignment
- Note:**
Rockhead Level & Material Profiles Are Referred From Adjacent Drillholes & Geophysical Survey Results
- Legend:**
- Current Drillhole
 - Existing Drillhole
 - M - Marine Deposit
 - 1 Clay
 - 2 Silt
 - 3 Sand
 - A - Alluvial Deposit
 - V - Completely Decomposed Rocks
 - IV - Highly Decomposed Rocks
 - III - Moderately Decomposed Rocks
 - II - Slightly Decomposed Rocks
 - - SPT N Value

SCALE:
V: 1 : 2000 @ A3
H: 1 : 10000 @ A3

SCALE	AS SHOWN	DATE	APR. 2009
CHECK	---	DRAWN	CL
JOB No.	60044963	DRAWING No.	Fig 2.5a
		REV	---





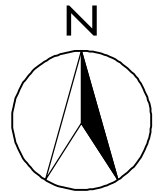
SCALE:
V: 1 : 2000 @ A3
H: 1 : 10000 @ A3

Legend:

- Fill
 - Marine Deposits
 - Estuarine Deposits
 - Alluvium
 - Colluvium
 - Completely To Highly Decomposed Rock
 - Grade III Or Better Rock (Refer To Granite, Otherwise Indicated On Section)
 - Inferred Fault From Geophysical Data/Borehole Information
 - Inferred Rockhead Along Original Alignment
 - Inferred Rockhead Along Recommended Alignment
- Current Drillhole
 - Existing Drillhole
 - M - Marine Deposit
 - A - Alluvial Deposit
 - V - Completely Decomposed Rocks
 - IV - Highly Decomposed Rocks
 - III - Moderately Decomposed Rocks
 - II - Slightly Decomposed Rocks
 - 20 - SPT N Value
 - 1 Clay
 - 2 Silt
 - 3 Sand

Note:
Rockhead Level & Material Profiles Are Referred From Adjacent Drillholes & Geophysical Survey Results

CHAINAGE		6309		6500		6796		6910
GROUND CONDITION AT TUNNEL LEVEL	ALL				ALL			CDG
	CDG				CDG			M/SDG
PROPOSED ROAD LEVEL (mPD)		-39.7		-40.58		-38.7		-37.8
TUNNEL AXIS (mPD)		-37.35		-38.23		-36.35		-35.45
BOTTOM LEVEL OF TUNNEL (mPD)		-44.35		-45.23		-43.35		-42.45
INSPECTION PRESSURE (BAR)	4.14 - 4.66 bar	4.14	4.14 - 4.22 bar	4.22	4.04 - 4.22 bar	4.04	3.95 - 4.04 bar	3.95
MAX. PRESSURE (BAR)	4.74 - 5.26 bar	4.74	4.74 - 4.82 bar	4.82	4.64 - 4.82 bar	4.64	4.55 - 4.64 bar	4.55



831700 N

811200 E

815200 E

819200 E

827700 N

INSET A

INSET A

PILLAR POINT VALLEY LAND FILL

PILLAR POINT VALLEY LAND FILL

CASTLE PEAK BAY
(TSING SHAN WAN)

WA19
WA18

WA19
WA18

LEGEND:





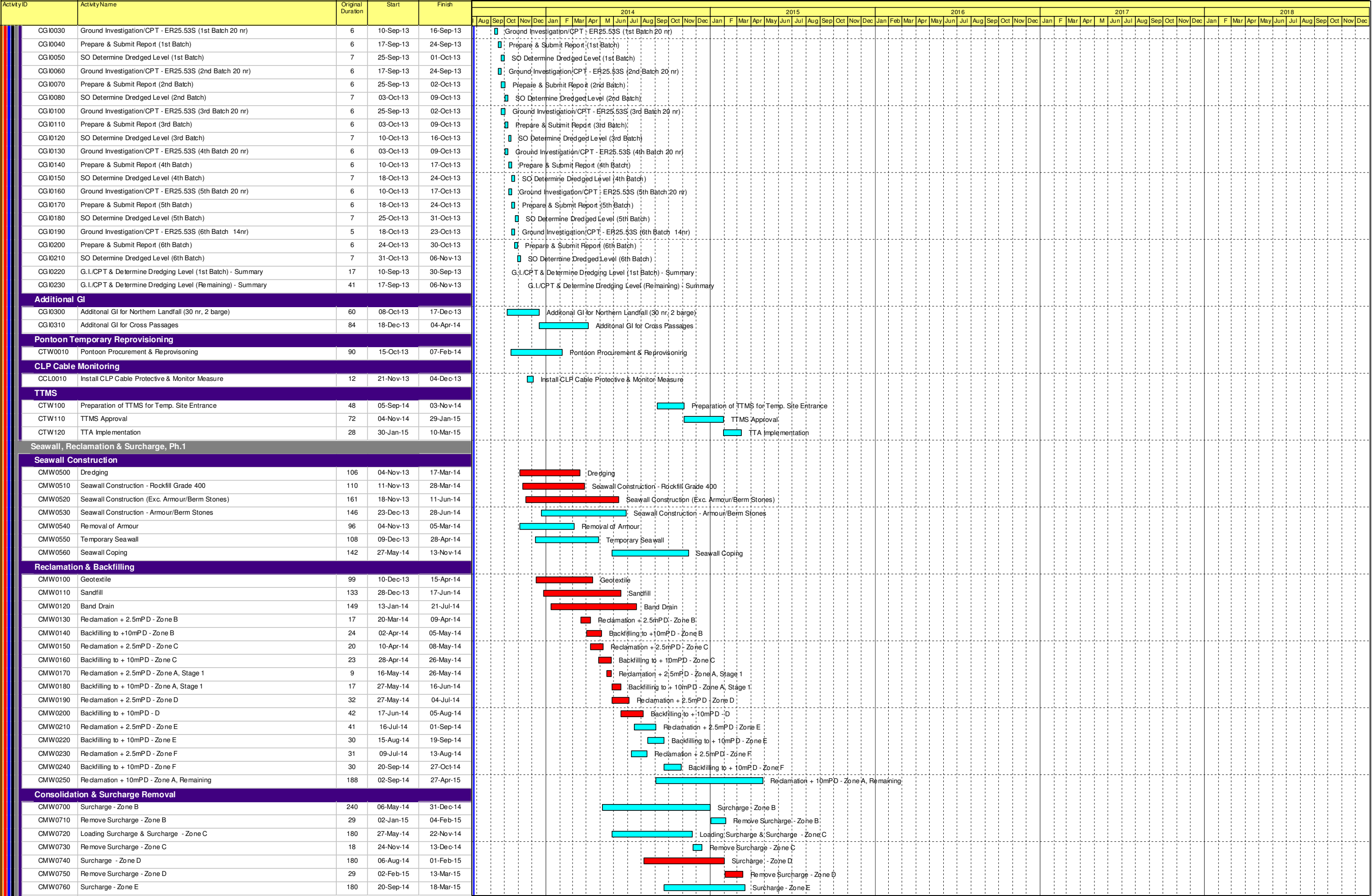
PROPOSED WORKS AREA

AECOM

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
PROPOSED WORKS AREAS FOR TMCLKL (TUEN MUN SIDE)

SCALE	A3 1:40000	DATE	JUN. 2009
CHECK	--	DRAWN	YMZ
JOB No.	60044963	DRAWING No.	Fig 2.8a
		REV	--

Page 1 of 6	<div> <div>Non Critical Activity</div> <div>Critical Activity</div> <div>Milestone</div> </div>	HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section Initial Works Programme - Construction	<div> <div>  <p>香港寶嘉 Dragages HongKong</p> <p><small>A member of the Bouygues Construction group</small></p> <p>Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營</p> </div> <div>  </div> <div> <table border="1"> <thead> <tr> <th>Date</th> <th>Revision</th> <th>Checked</th> <th>Approved</th> </tr> </thead> <tbody> <tr> <td>12-Aug-13</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <div>Figure 2.9a</div> </div> </div>	Date	Revision	Checked	Approved	12-Aug-13			
Date	Revision	Checked	Approved								
12-Aug-13											



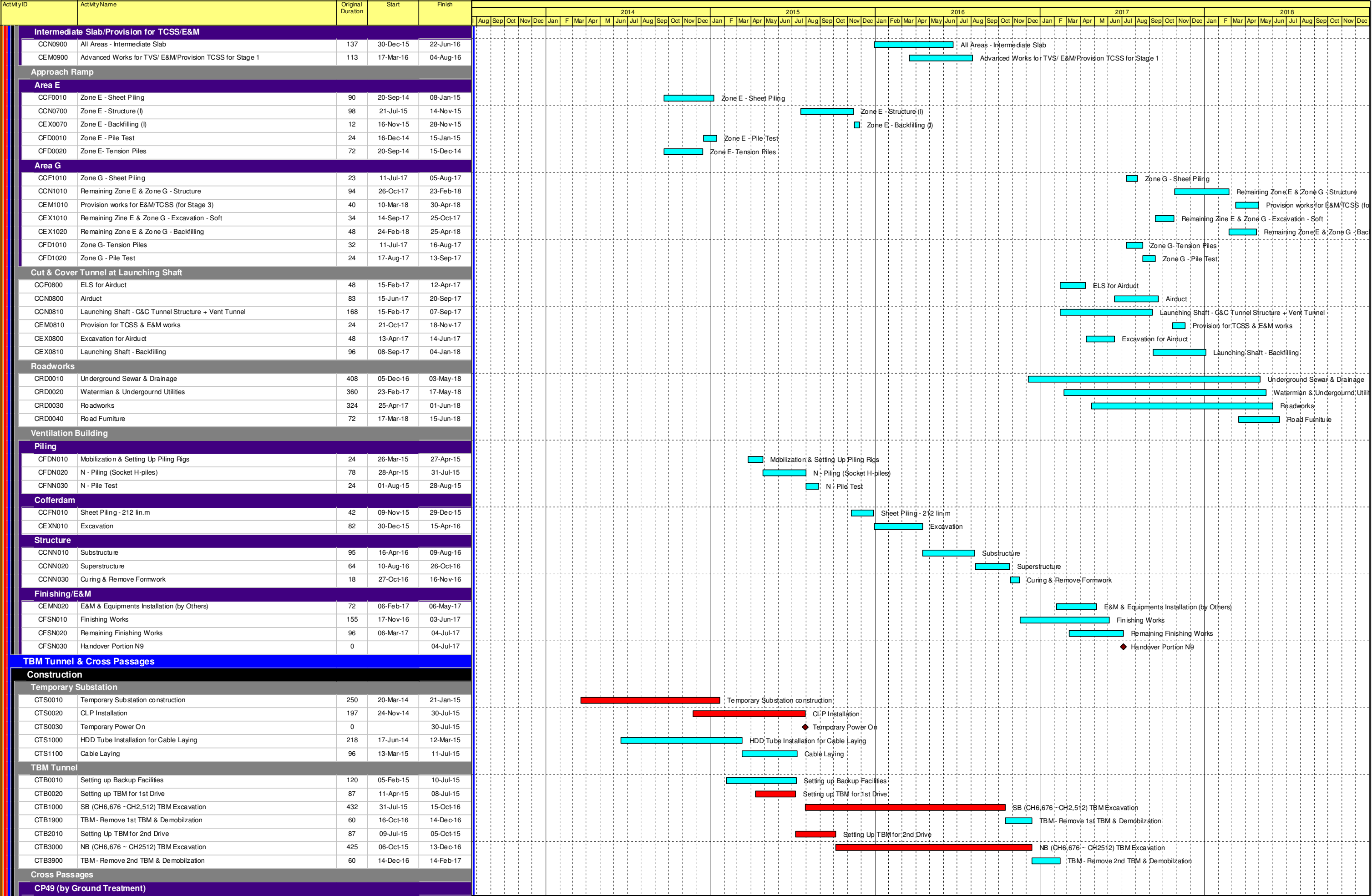
Page 3 of 6

Legend:
 Non Critical Activity
 Critical Activity
 Milestone

HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section



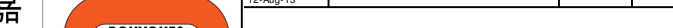
Initial Works Programme - Construction

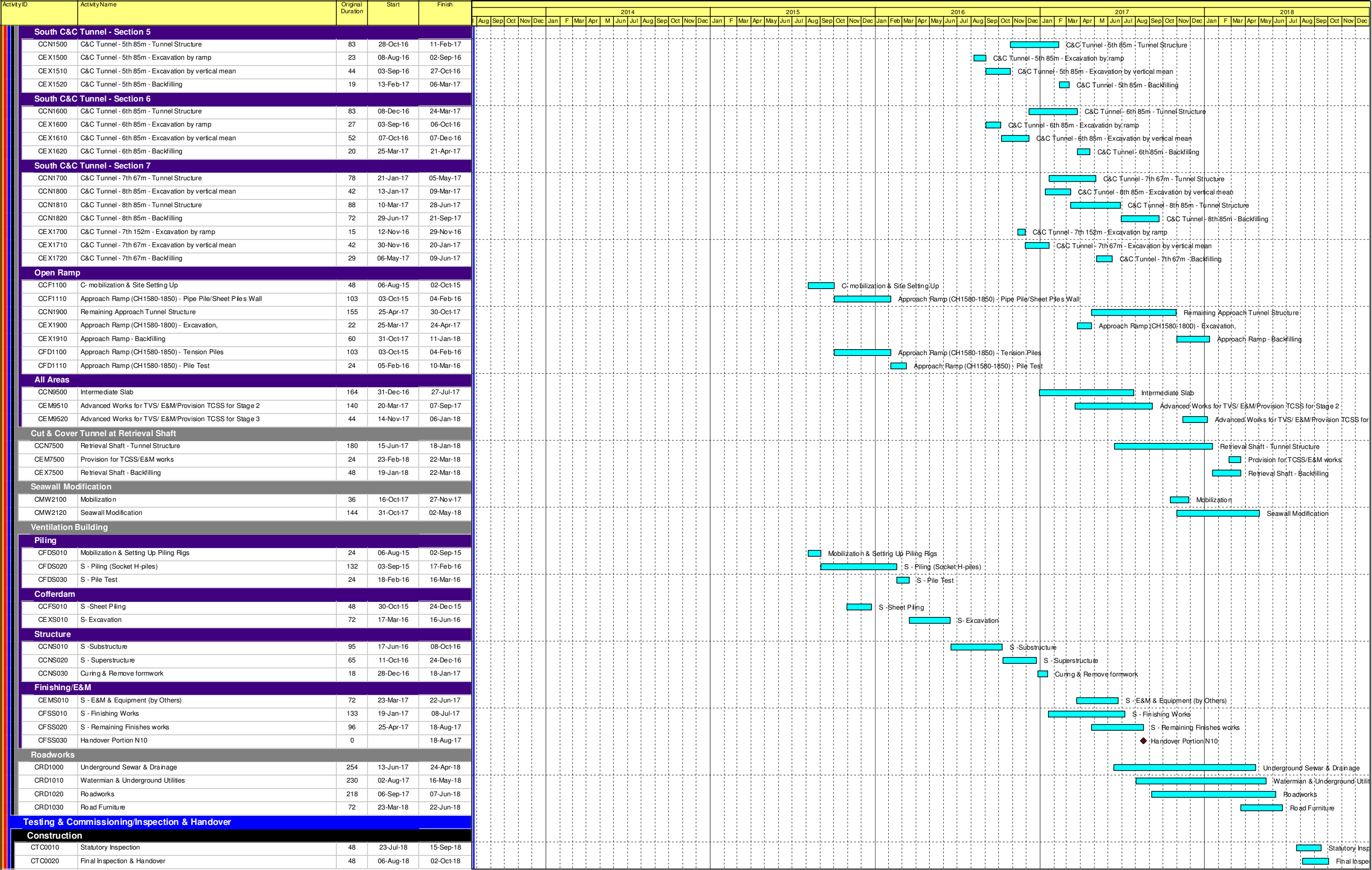
Figure 2.9a



Date	Revision	Checked	Approved
12-Aug-13			

Figure 2.9a

Page 5 of 6	<div> <div> <div></div> <div>Non Critical Activity</div> </div> <div> <div></div> <div>Critical Activity</div> </div> <div> <div></div> <div>Milestone</div> </div> </div>	HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section Initial Works Programme - Construction	<div> <div>  <div> 香港寶嘉 Dragages Hong Kong </div> </div> <div>  <div> BOUYGUES TRAVAUX PUBLICS </div> </div> </div> <div> <div> <div>Date</div> <div>12-Aug-13</div> </div> <div> <div>Revised on</div> <div></div> </div> <div> <div>Checked</div> <div></div> </div> <div> <div>Approved</div> <div></div> </div> </div> <div>  </div>
-------------	--	--	---



Date	Revision	Checked	Approved
12-Aug-13			

Figure 2.9a

Figure 3.1**Data Sheet for TSP Monitoring**

Monitoring Location:	
Details of Location:	
Sampler Identification:	
Date & Time of Sampling:	
Elapsed-time	Start (min.)
Meter Reading	Stop (min.)
Total Sampling Time (min.):	
Weather Conditions:	
Site Conditions:	
Initial Flow Rate, Qsi	Pi (mmHg):
	Ti (°C):
	Hi (in.):
	Qsi (Std. m ³):
Final Flow Rate, Qsf	Pf (mmHg):
	Tf (°C):
	Hf (in.):
	Qsf (Std. m ³):
Average Flow Rate (Std. m ³):	
Total Volume (Std. m ³):	
Filter Identification No.:	
Initial Wt. of Filter (g):	
Final Wt. of Filter (g):	
Measured TSP Level (g/m ³):	

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :		_____	_____
Laboratory Staff :		_____	_____
Checked by :	_____	_____	_____

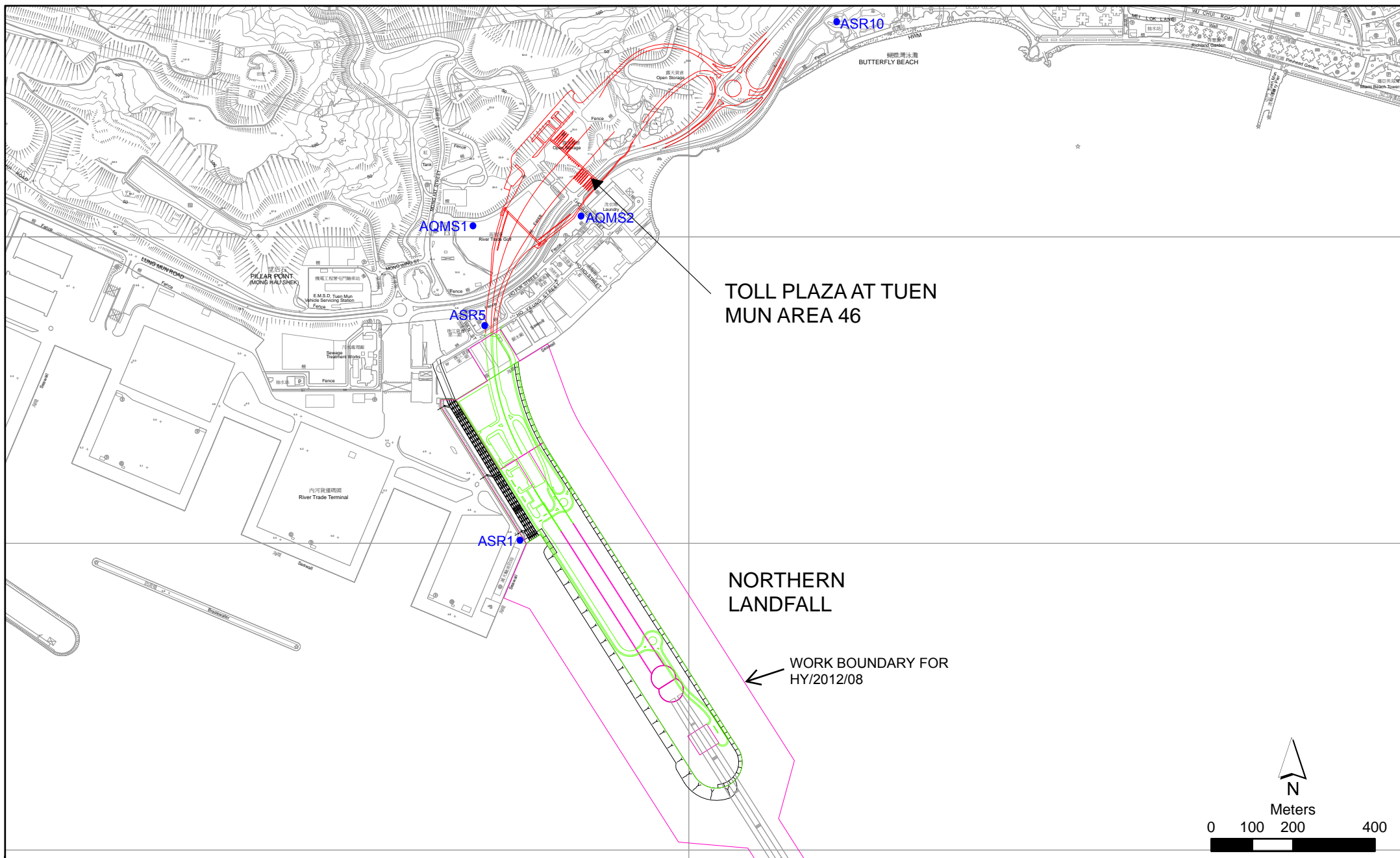


Figure 3.2a

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

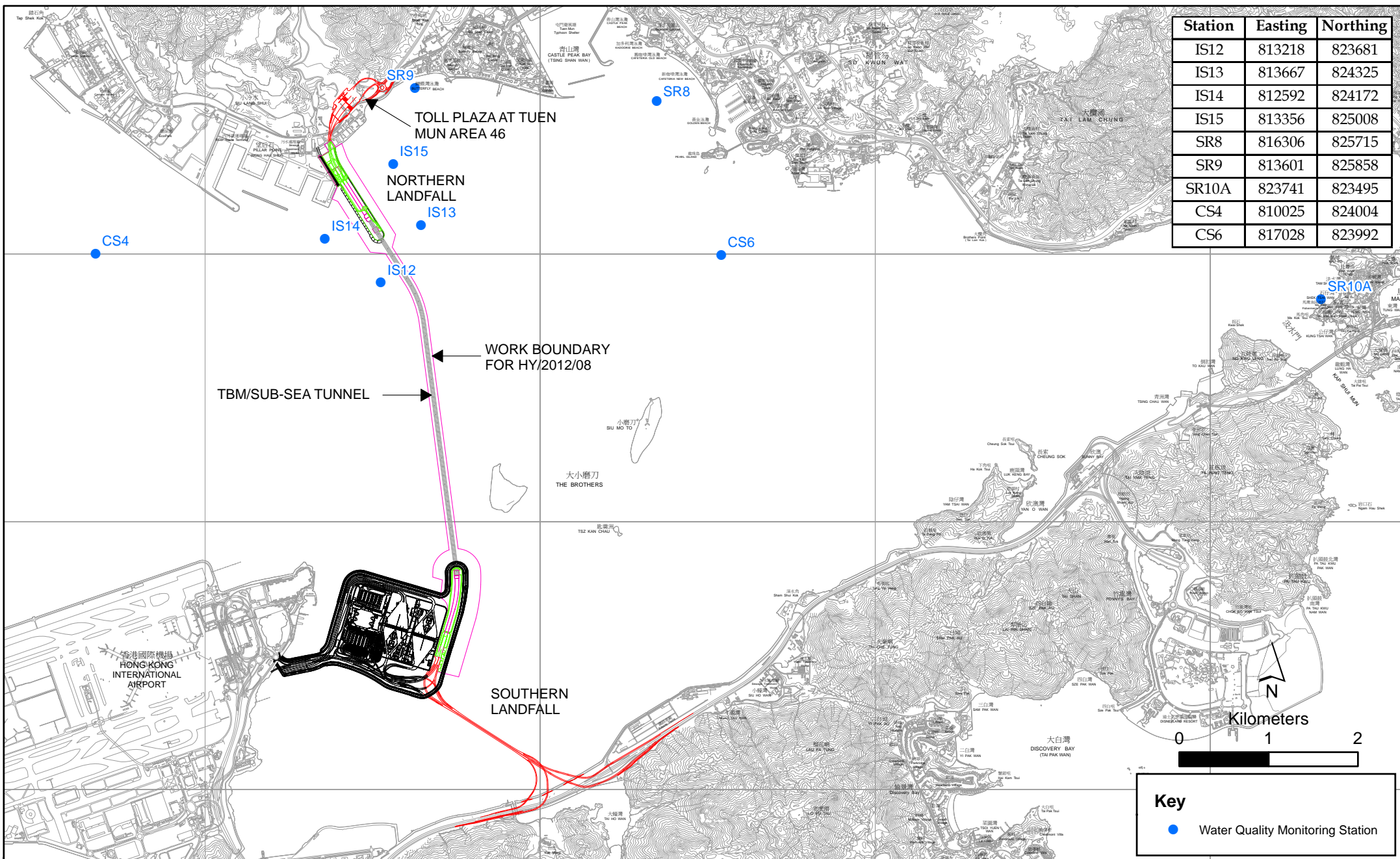


Figure 3.2b

Water Quality Monitoring Station

Figure 4.1 Noise Monitoring Field Record Sheet

Monitoring Location:	
Description of Location:	
Date of Monitoring:	
Measurement Start Time (hh:mm):	
Measurement Time Length (min.):	
Noise Meter Model/Identification:	
Calibrator Model/Identification:	
Measurement Results	L ₉₀ (dB(A)):
	L ₁₀ (dB(A)):
	Leq (dB(A)):
Major Construction Noise Source(s) During Monitoring:	
Other Noise Source(s) During Monitoring:	
Remarks:	

Name & Designation

Signature

Date

Recorded By : _____

Checked By : _____





				Designed By PKV	<div><div><div><div>香港實業 Dragages Hong Kong</div><div>A member of the Bouygues Construction group</div></div><div><div><div>BOUYGUES TRAVAUX PUBLICS</div></div></div></div><div>Dragages - Bouygues Joint Venture 實業 - 布依格聯營</div></div>	Client <div><div><div>路政署 HIGHWAYS DEPARTMENT</div></div></div>	Contractor's Designer <div><div><div>Ove Arup & Partners Hong Kong Limited</div></div></div>	Project Contract No. HY/2012/08 Tuen Mun - Chek Lap Kok Link - Northern Connection Sub-Sea Tunnel Section	Drawing no. TMCLKL8-DBJ-NTH-DWG-00138	
				Drawn By DAI				Scale 1:5000 @ A3		
				Approved By SPo				CADD Ref. TMCLKL8-DBJ-NTH-DWG-00138-DFT-A		
				Date 10SEP2013				Issue Status DFT (DRAFT)	Revision A	
A	FIRST ISSUE	10SEP13	PKV							
Rev.	Description	Date	Checked							

Figure 5.4 Water Quality Monitoring Data Record Sheet

Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		Surface	Middle	Bottom
Current Speed (predominant) (m/s)				
Current Direction (predominant)				
Salinity				
Temperature ($^{\circ}\text{C}$)				
DO Saturation (%)				
DO (mg/L)				
Turbidity (NTU)				
SS Sample Identification				
SS (mg/L)				
Observed Construction Activities	<100m from location			
	>100m from location			
Other Observations				

Name & Designation

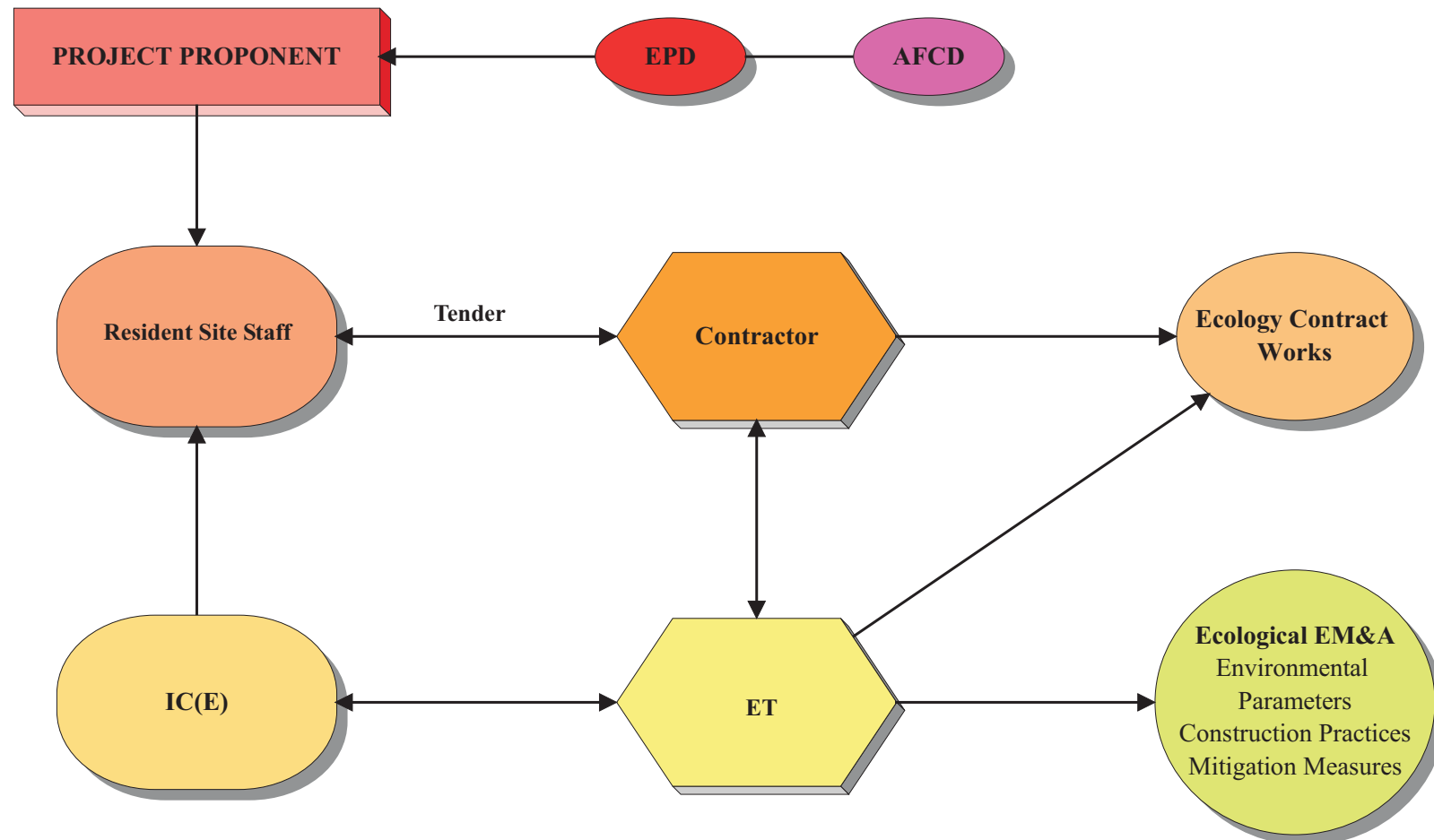
Signature

Date

Recorded By :

Checked By :

Note: The SS results are to be filled in once they are available from the laboratory



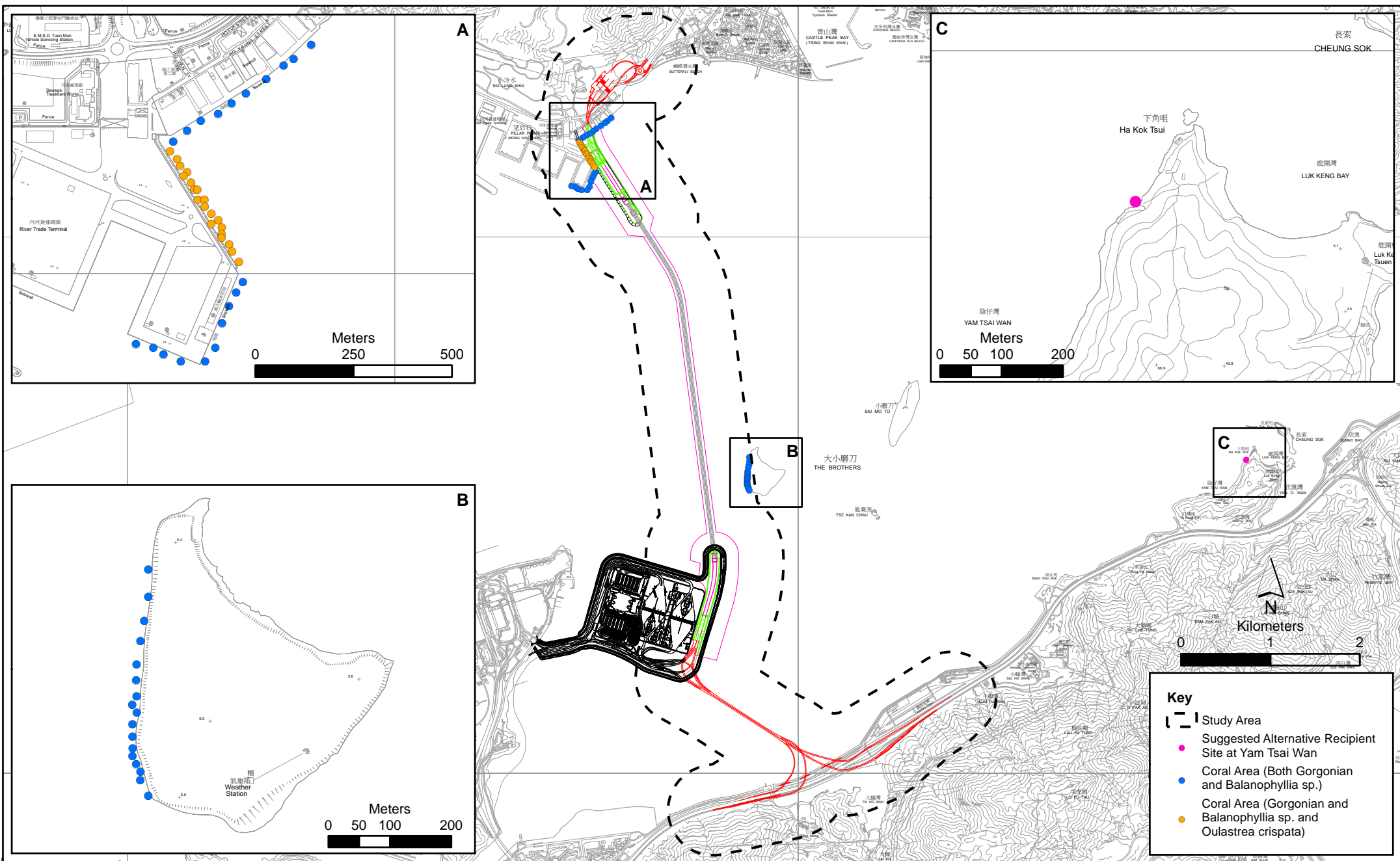


Figure 6.2

Locations of Coral Colonies identified at Pillar Point and Tai Mo To and Location of Alternative Receptor Site

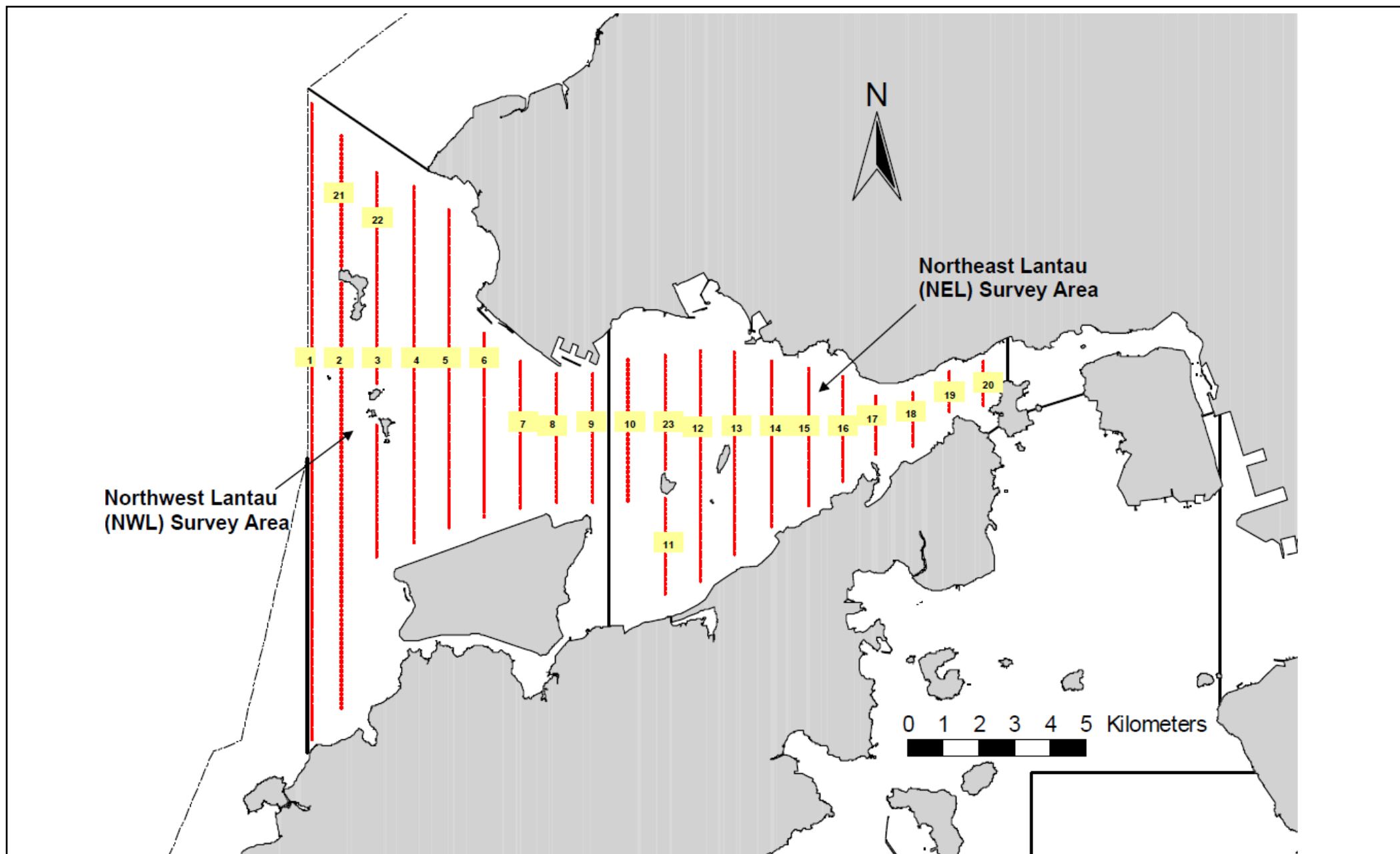


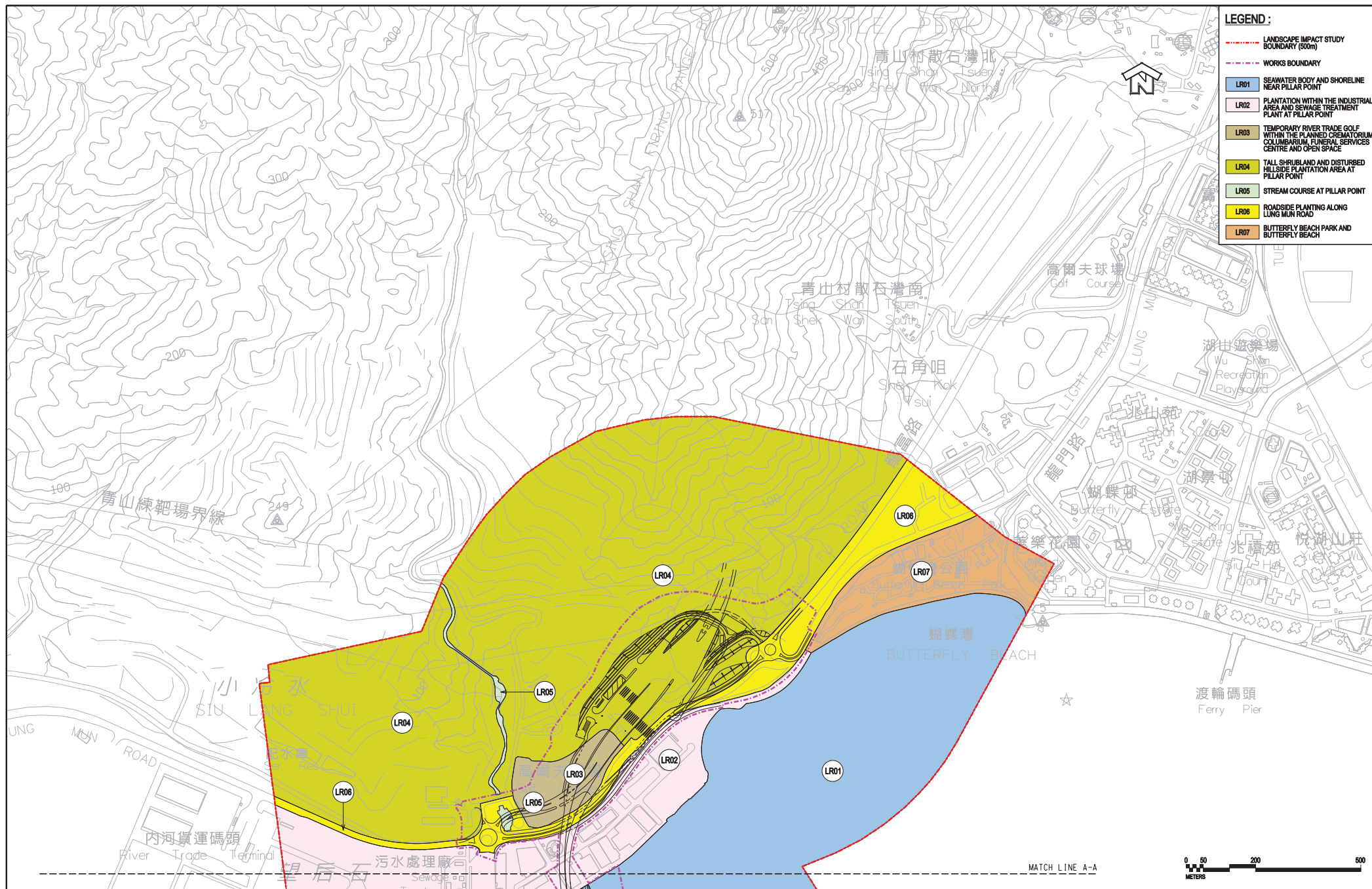
Figure 6.3

Layout of Transect Lines of Dolphin Monitoring in Northwest and Northeast Lantau Areas.

DATE: 06/03/2013

Environmental
Resources
Management





- LEGEND:**
- LANDSCAPE IMPACT STUDY BOUNDARY (500m)
 - WORKS BOUNDARY
 - LR01 SEAWATER BODY AND SHORELINE NEAR PILLAR POINT
 - LR02 PLANTATION WITHIN THE INDUSTRIAL AREA AND SEWAGE TREATMENT PLANT AT PILLAR POINT
 - LR03 TEMPORARY RIVER TRADE GOLF WITHIN THE PLANNED CREMATORIUM, COLUMBARIUM, FUNERAL SERVICES CENTRE AND OPEN SPACE
 - LR04 TALL SHRUBLAND AND DISTURBED HILLSIDE PLANTATION AREA AT PILLAR POINT
 - LR05 STREAM COURSE AT PILLAR POINT
 - LR06 ROADSIDE PLANTING ALONG LUNG MUN ROAD
 - LR07 BUTTERFLY BEACH PARK AND BUTTERFLY BEACH

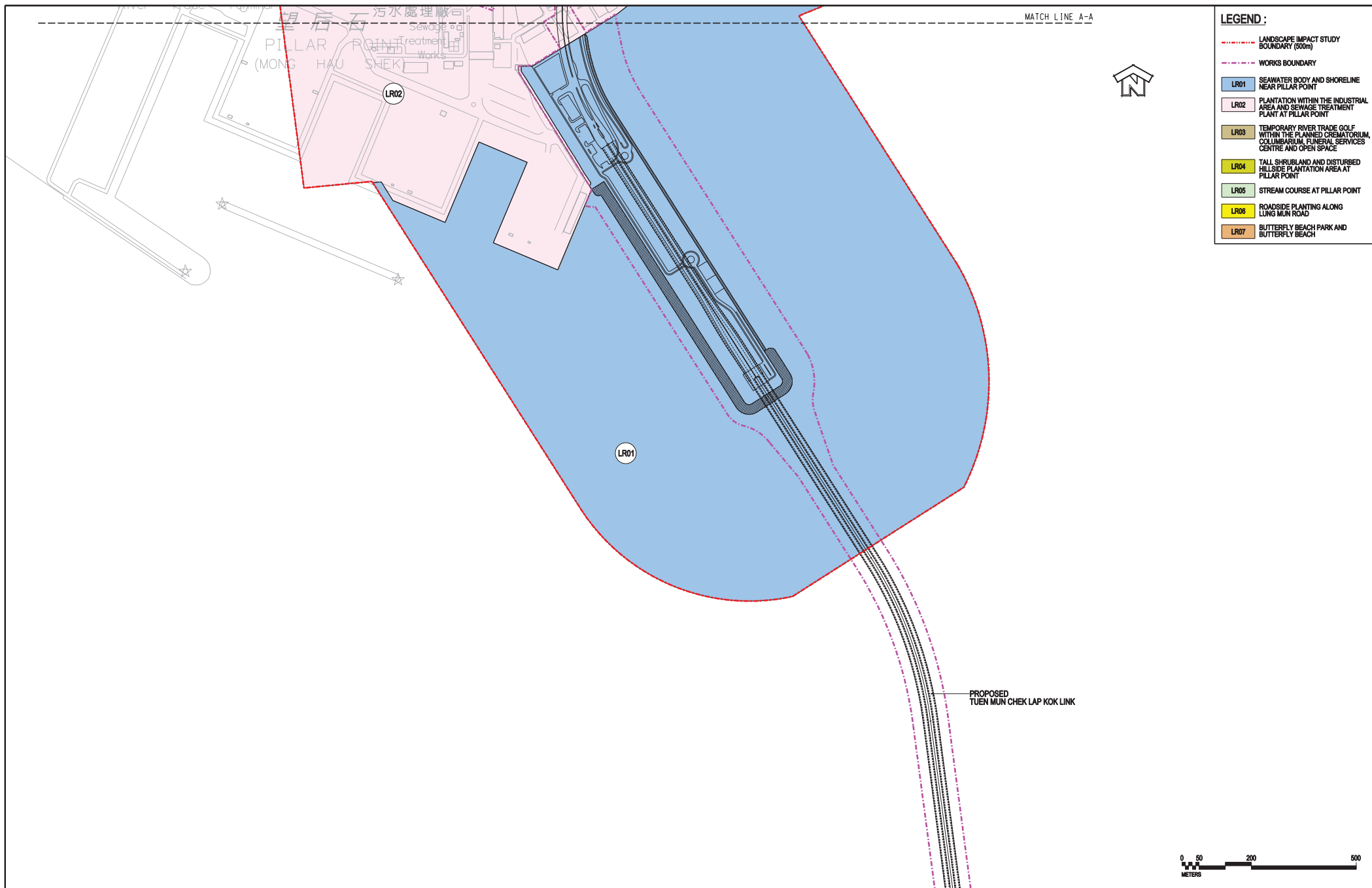
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AECOM

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
**BASELINE LANDSCAPE RESOURCES WITH
 DEVELOPMENT PROPOSAL OVERLAID**

SHEET 1 OF 5

SCALE	1:10000	DATE	MAY 2009
CHECK	E.L.	DRAWN	F.L.
JOB No.	60044963	DRAWING No.	FIGURE 7.1.1.1
		REV	-



LEGEND:	
- - - - -	LANDSCAPE IMPACT STUDY BOUNDARY (500m)
- - - - -	WORKS BOUNDARY
 	LR01 SEAWATER BODY AND SHORELINE NEAR PILLAR POINT
 	LR02 PLANTATION WITHIN THE INDUSTRIAL AREA AND SEWAGE TREATMENT PLANT AT PILLAR POINT
 	LR03 TEMPORARY RIVER TRADE GOLF WITHIN THE PLANNED CREMATORIUM, COLUMBARIUM, FUNERAL SERVICES CENTRE AND OPEN SPACE
 	LR04 TALL SHRUBLAND AND DISTURBED HILLSIDE PLANTATION AREA AT PILLAR POINT
 	LR05 STREAM COURSE AT PILLAR POINT
 	LR06 ROADSIDE PLANTING ALONG LUNG MUN ROAD
 	LR07 BUTTERFLY BEACH PARK AND BUTTERFLY BEACH

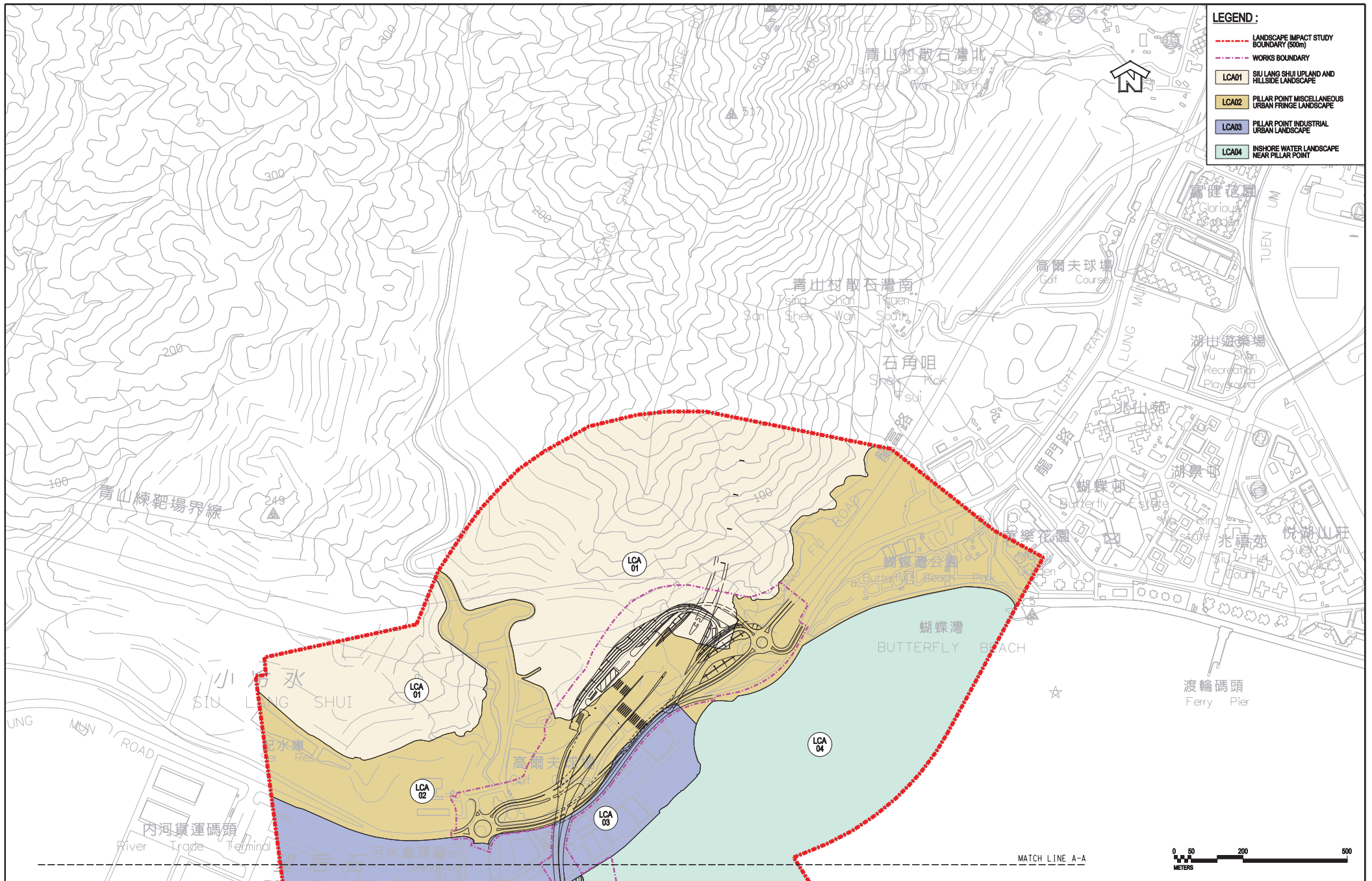
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AECOM

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
**BASELINE LANDSCAPE RESOURCES WITH
 DEVELOPMENT PROPOSAL OVERLAID**

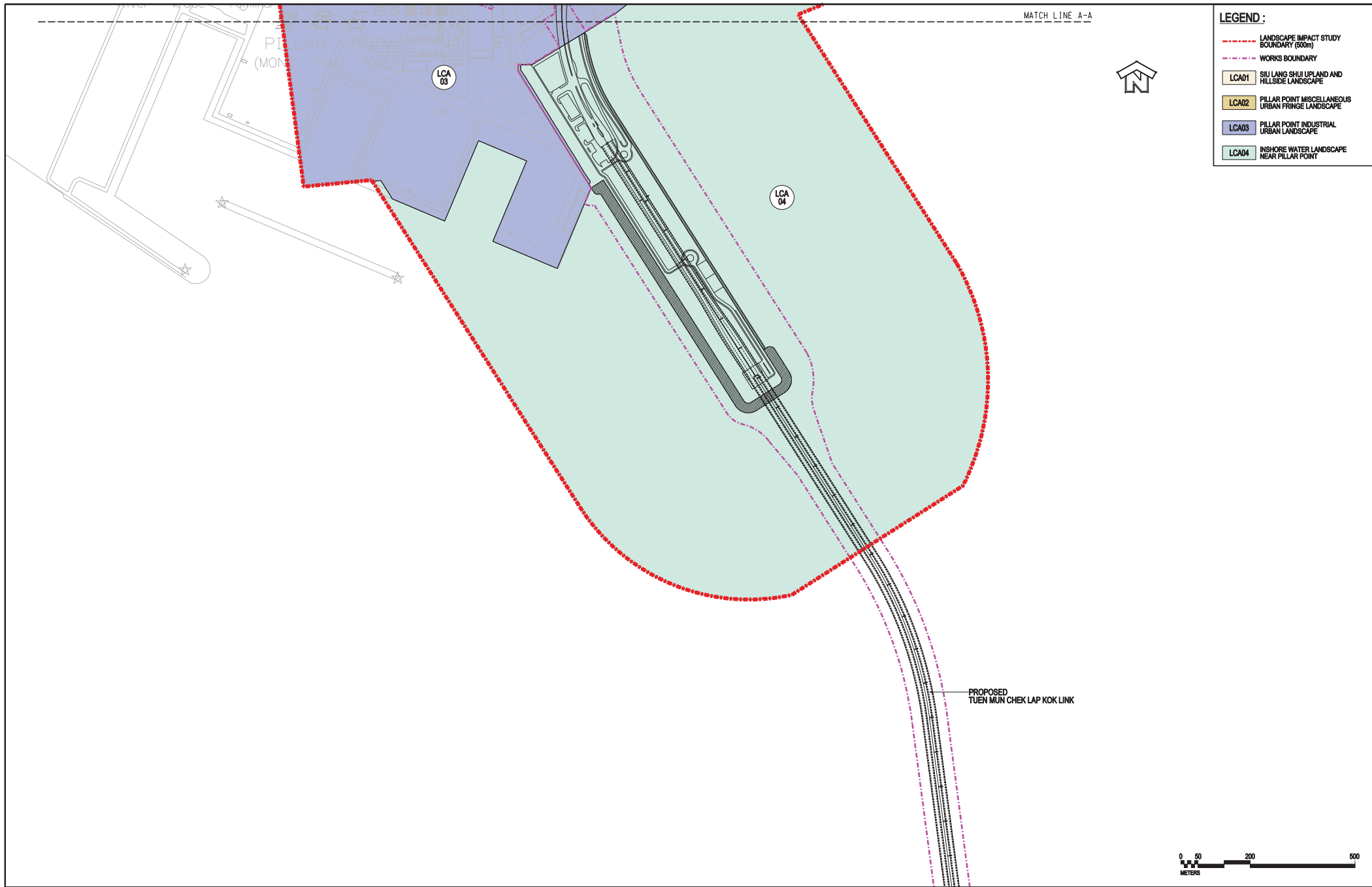
SHEET 2 OF 5

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CHECK	E.L.	DRAWN	F.L.
JOB No.	60044963	DRAWING No.	FIGURE 7.1.1.2
		REV	-



LEGEND:

- LANDSCAPE IMPACT STUDY BOUNDARY (500m)
- WORKS BOUNDARY
- LCA01 SIU LANG SHUI UPLAND AND HILLSIDE LANDSCAPE
- LCA02 PILLAR POINT MISCELLANEOUS URBAN FRINGE LANDSCAPE
- LCA03 PILLAR POINT INDUSTRIAL URBAN LANDSCAPE
- LCA04 INSHORE WATER LANDSCAPE NEAR PILLAR POINT



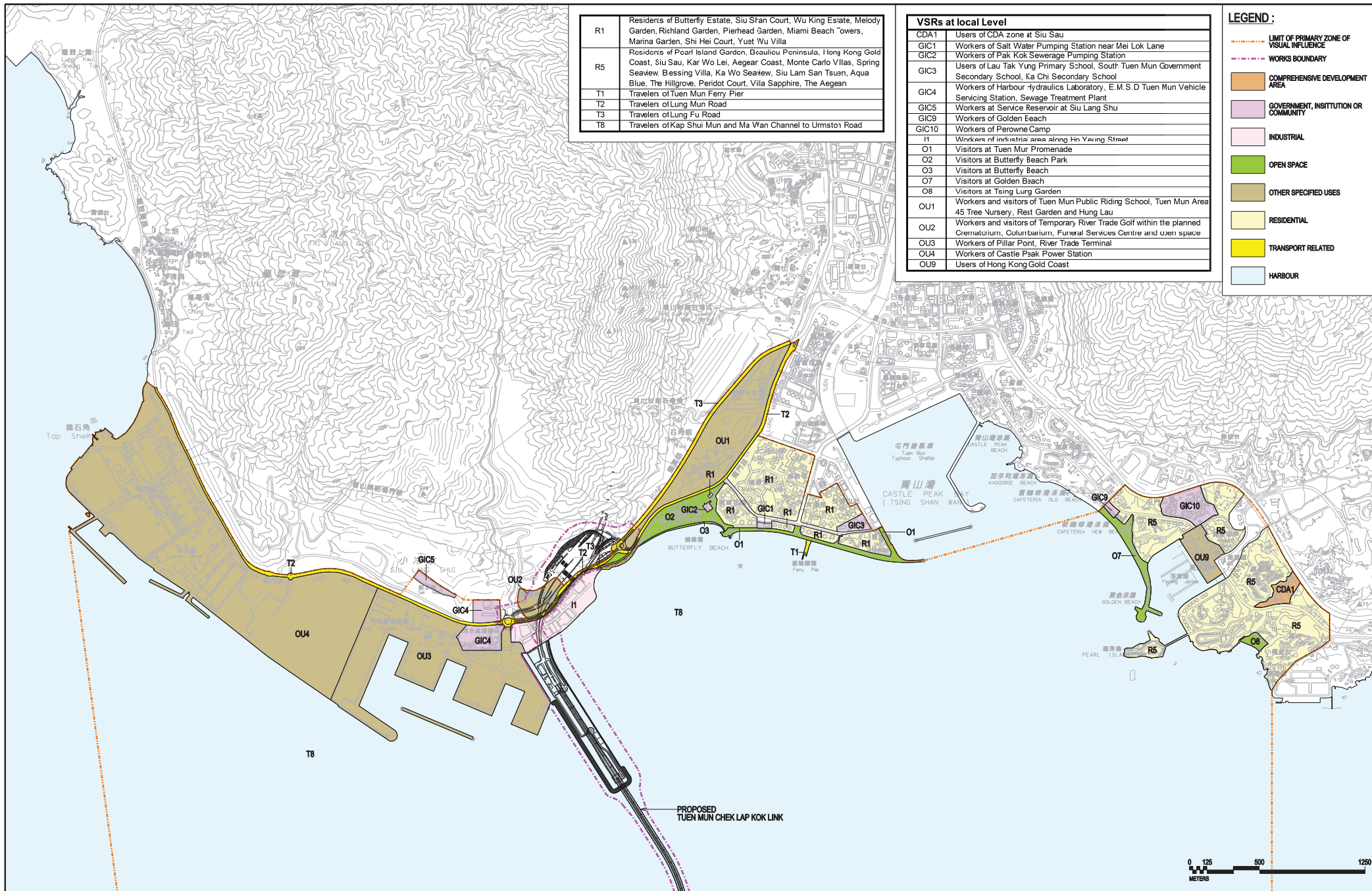
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- WORKS BOUNDARY
- LCA01 SIUNG SHUI UPLAND AND HILLSIDE LANDSCAPE
- LCA02 PILLAR POINT MISCELLANEOUS URBAN FRINGE LANDSCAPE
- LCA03 PILLAR POINT INDUSTRIAL URBAN LANDSCAPE
- LCA04 INSHORE WATER LANDSCAPE NEAR PILLAR POINT



PROPOSED
TUEN MUN CHEK LAP KOK LINK

	AGREEMENT NO. CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION				SCALE	1:10000	DATE	MAY 2009
	BASELINE LANDSCAPE CHARACTER AREAS WITH DEVELOPMENT PROPOSAL OVERLAID				CHECK	E.L.	DRAWN	F.L.
					JOB No.	60044963	DRAWING No.	FIGURE 7.2.1.2
					SHEET 2 OF 5		REV	-



VSRs at Strategic Level (S1)

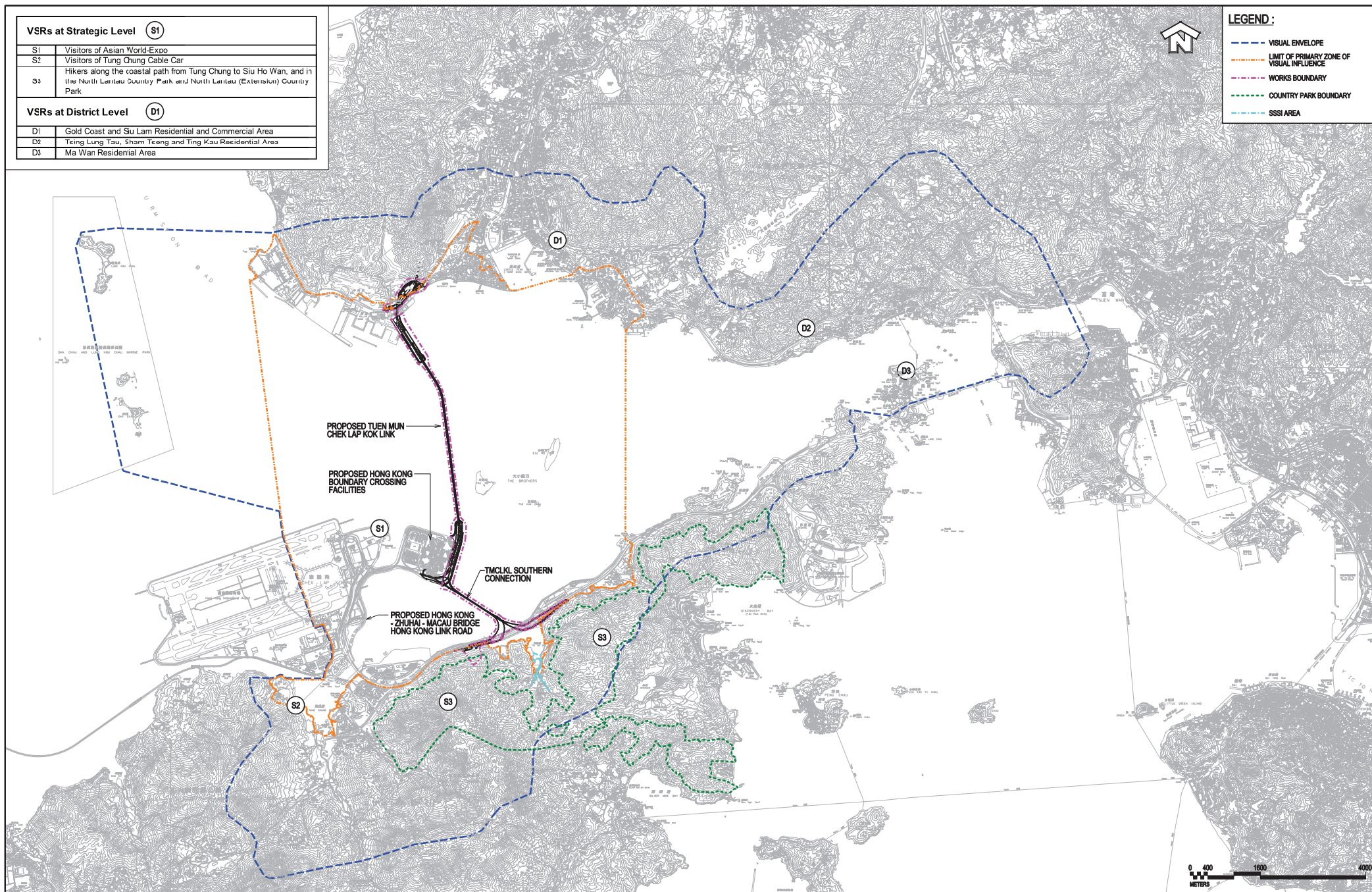
S1	Visitors of Asian World-Expo
S2	Visitors of Tung Chung Cable Car
S3	Hikers along the coastal path from Tung Chung to Siu Ho Wan, and in the North Lantau Country Park and North Lantau (Extension) Country Park

VSRs at District Level (D1)

D1	Gold Coast and Su Lam Residential and Commercial Area
D2	Ting Lung Tau, Sham Tseng and Ting Kau Residential Area
D3	Ma Wan Residential Area

LEGEND :

---	VISUAL ENVELOPE
---	LIMIT OF PRIMARY ZONE OF VISUAL INFLUENCE
---	WORKS BOUNDARY
---	COUNTRY PARK BOUNDARY
---	SSSI AREA



Plotting: Bui 21/7/2009
 Plot: SCALE: 1:5000

AECOM

AGREEMENT NO. CE 52/2007(HY)
 TUN MUN - CHEK LAP KOK LINK - INVESTIGATION
BASELINE KEY VSRs AND VIEWPOINTS AT STRATEGIC AND DISTRICT LEVEL WITH DEVELOPMENT PROPOSAL OVERLAID

SCALE	1:80000	DATE	MAY 2009
CHECK	E.L.	DRAWN	F.L.
JOB No.	60044963	DRAWING No.	FIGURE 7.3.2.1
		REV	--

Figure 12.1 Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Location Plan

Prepared by : _____

Designation : _____

Signature : _____

Date : _____

--

Annex C

Summary of Notification of Changes in Construction Sequence

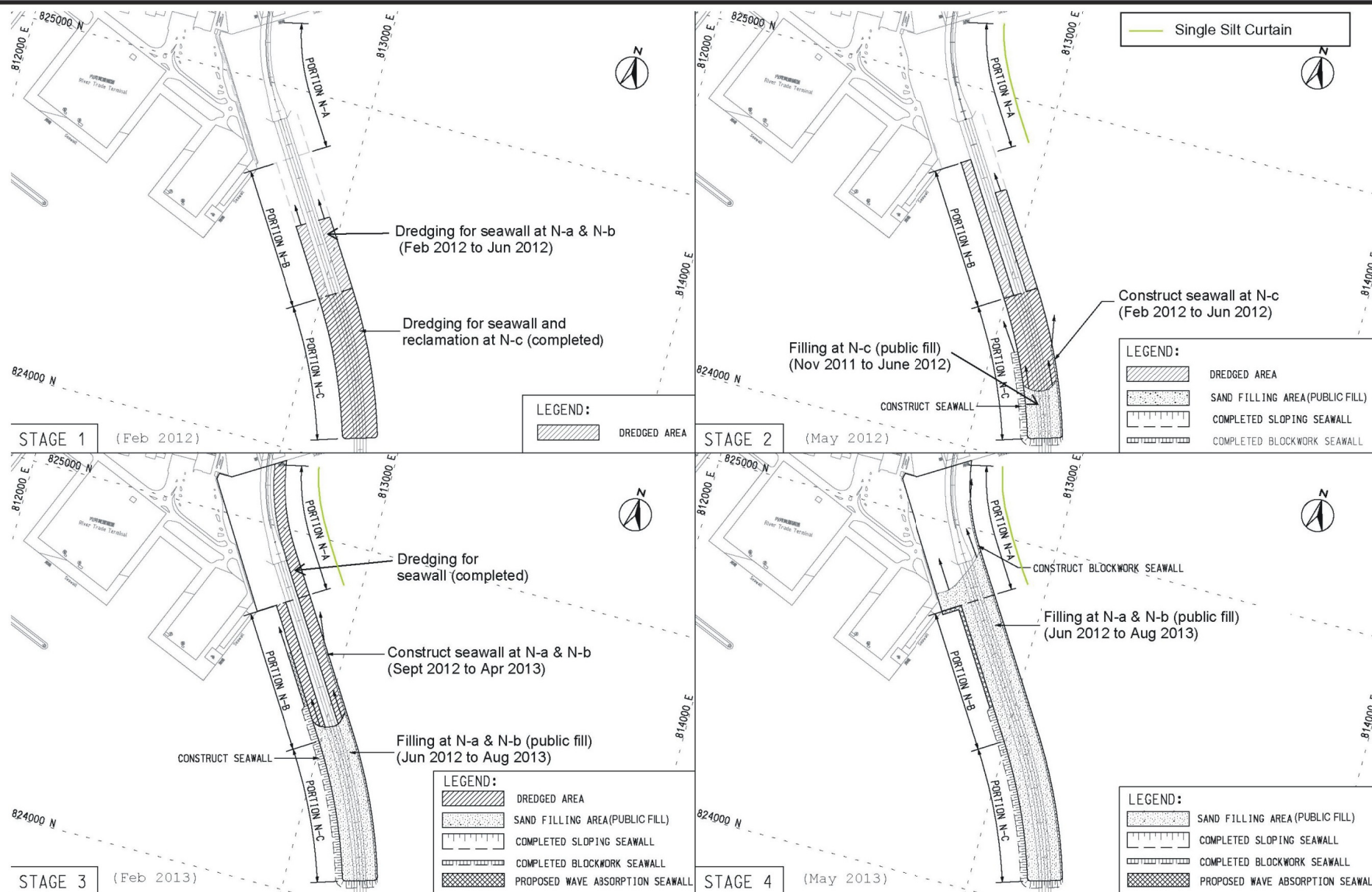
1. ORIGINAL CONSTRUCTION SEQUENCE PRESENTED IN THE APPROVED EIA REPORT

The original construction sequence of the northern landfall reclamation of the Project is illustrated in *Figure 3* of the EP-354/2009A and is attached to this Notification ("the original sequence"). Descriptions of the construction sequence are also provided in *Section 3.2* of the approved EIA Report and are briefly summarised below.

Accordingly to the approved EIA Report, reclamation is required at the northern landfall for the construction of the Project in order to provide a land area for construction of the launching shaft for the tunnel boring machine (TBM) and ultimately, protection to the tunnel structure when constructed. The reclamation size is approximately 16.5 ha of land area when calculated to the cope line or 21.1 ha for the footprint area to the bottom of the seawall where it intersects the seabed.

It is assumed in the approved EIA Report that the construction of Portion N-c, the portion of reclamation adjacent to the TBM launching shaft, is critical to the overall programme as the TBM is planned to be launched from the northern reclamation southward (please refer to *Figure 3* of the EP-354/2009A). As such, land is required to be formed earlier for the construction and operation of the launching shaft, as well as for the stockpile of tunnel lining segments, a slurry treatment plant to treat the extracted alluvium arising from the tunnel construction so that it would then be suitable as public fill and other operations. In the approved EIA Report and the EP condition, it is thus assumed that reclamation will commence at Portion N-c, followed by reclamation at Portions N-b and N-a.

It should be noted that the rationale of adopting the original sequence is entirely based on construction programme consideration rather than any environmental implications.



Project Title: Tuen Mun - Chek Lap Kok Link
 工程項目名稱：屯門至赤鱗角連接路

Construction Sequence of Northern Landfall
 北接點施工程序

(Plan originated from Figure 9a of Appendix D6a of Approved EIA Report reference no.: AEIAR-146/2009)
 (圖則源自已批准的環境影響評估報告編號AEIAR-146/2009 附件D6a 圖 9a)

Environmental Protection Department
 環境保護署



Environmental Permit No.: EP-354/2009/A
 環境許可證編號：EP-354/2009/A

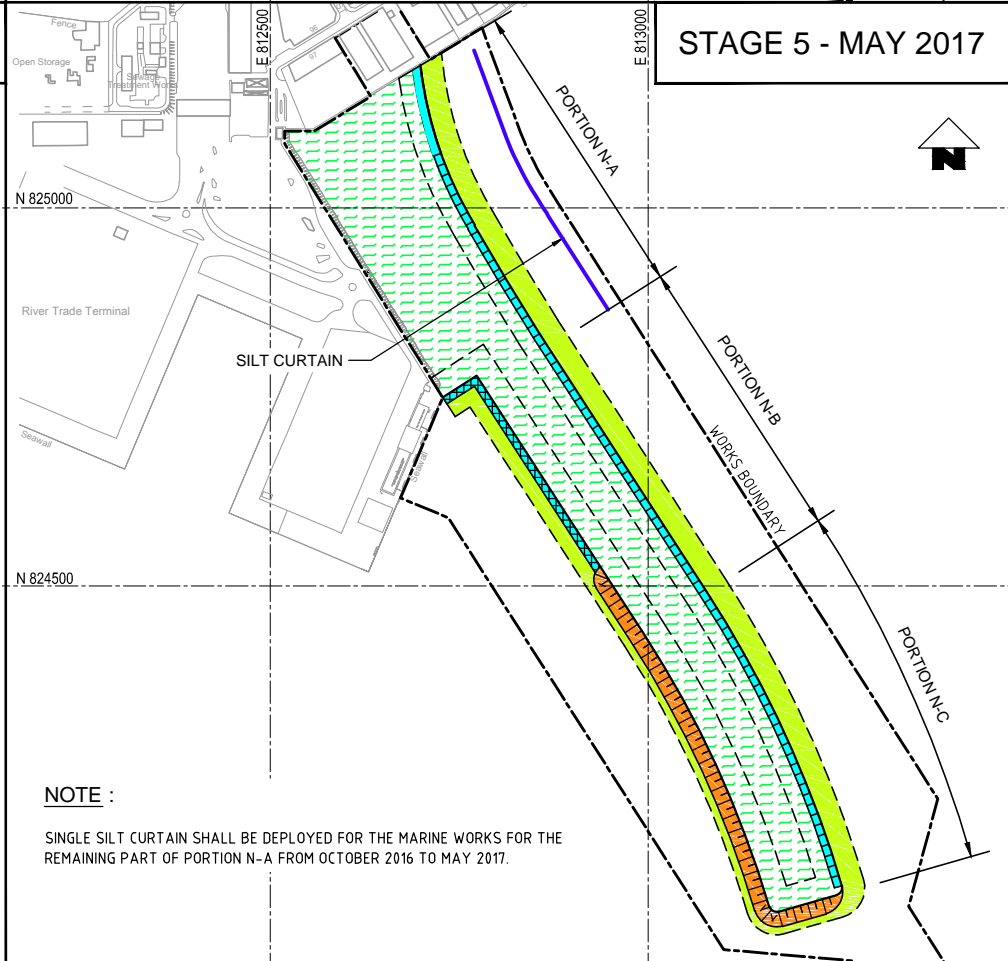
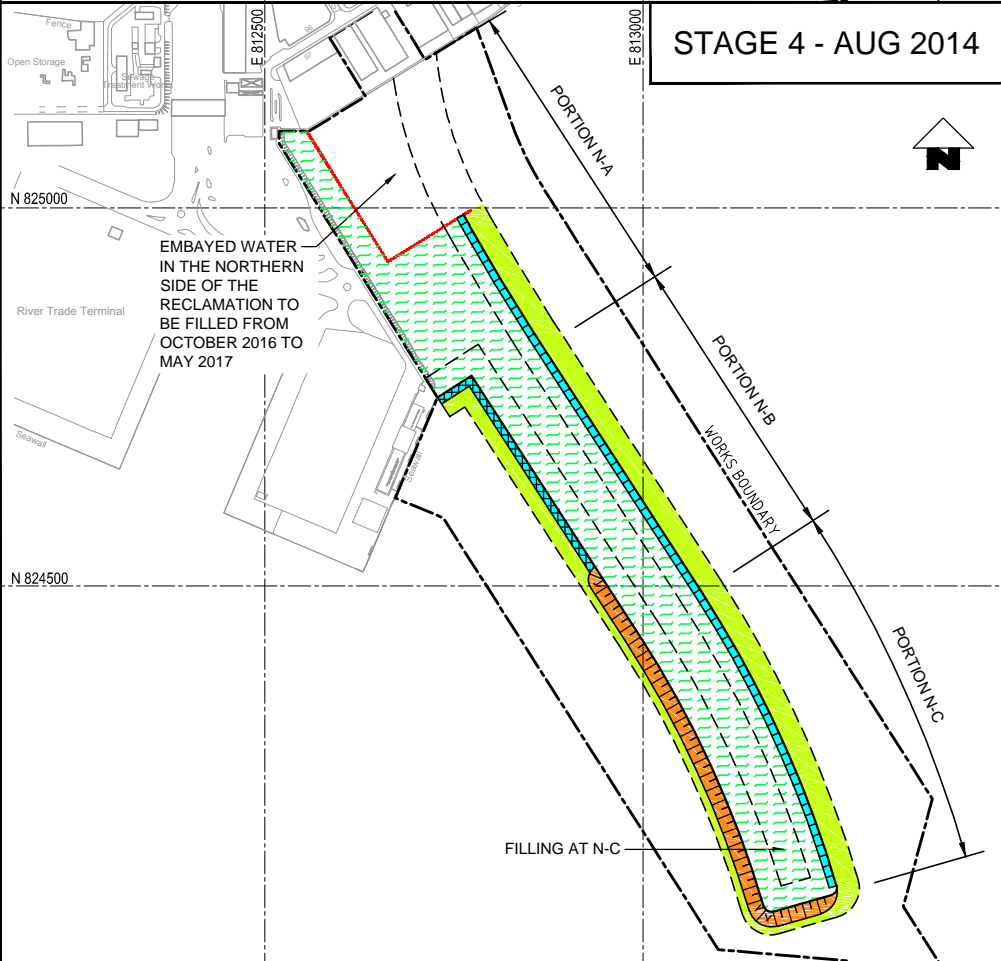
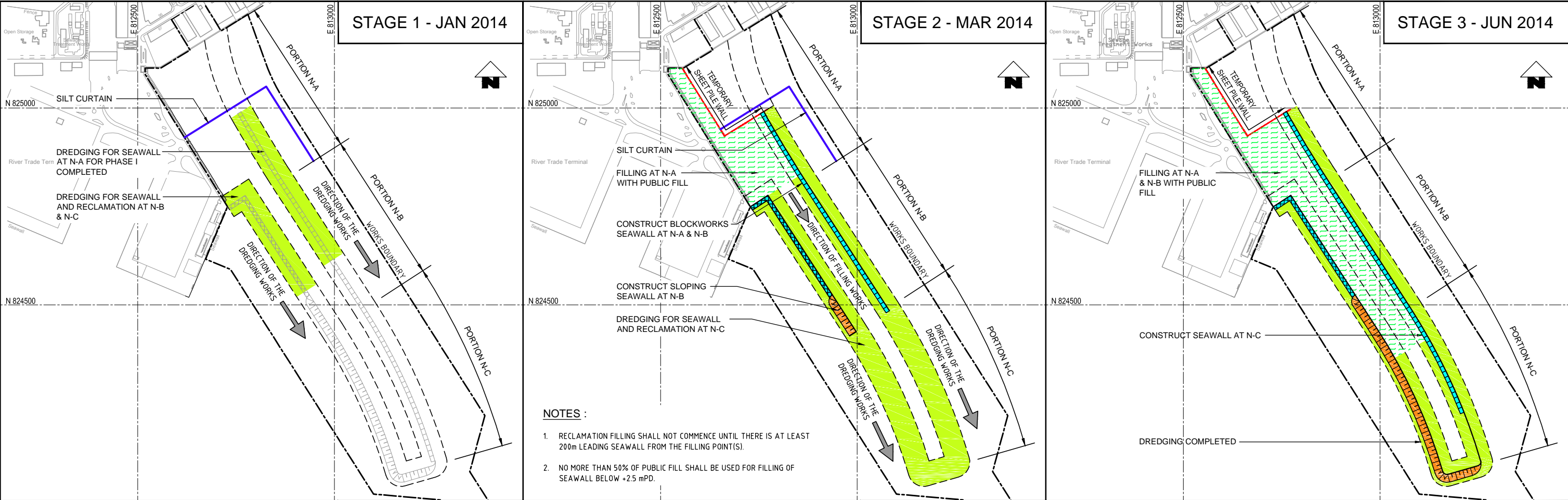
Figure 3
 圖 3

During the detailed design phase of the Contract, the latest development of the tunnels' design requires Portion N-a of the reclamation to be ready first in order to reduce the construction risks. The latest construction sequence is presented in *Figure 1*. Under the latest sequence, it is proposed to commence reclamation at Portion N-a, followed by reclamation at Portions N-b and N-c, which is a reverse of the original sequence of the EIA Report and EP-354/2009A.

By adopting the latest construction sequence, it is expected that the construction risks of the northern landfall could be reduced through the following ways:

- This change of construction sequence will ensure that the reclamation works will always be connected to the shore, avoiding the construction of the reclamation to start with the formation of an island offshore;
- Working from the shore towards the sea will improve the access to the works area (effectively providing a land access) while minimizing the construction risks associated with the strong currents in the works area;
- The access to the works area between the two constructed seawalls (slopping seawall on the western side and vertical seawall on the eastern side) will be done from the open end of the reclamation with reduced impact on the local marine traffic; and
- The works will start in the shallower waters, allowing a better learning process in more protected environment.

Except for the change in the sequence of construction, the construction method (ie plant requirements, duration, method and extent of dredging, filling and seawall construction etc), layout, alignment, scale and design of the Project will be the same between the original and latest construction sequence. In addition, mitigation measures recommended in the EP, approved EIA Report and Environmental Monitoring and Audit Manual of the Project for the original sequence will also be adopted for the construction of the latest sequence. It should, however, be noted that the arrangement of the single silt curtain at Portion N-a will be changed due to concern of marine access to the piers along the northern coast of the Northern Landfall during Stage 1 and Stage 2 of works (*Figure 1*).



NOTES :

1. RECLAMATION FILLING SHALL NOT COMMENCE UNTIL THERE IS AT LEAST 200m LEADING SEAWALL FROM THE FILLING POINT(S).
2. NO MORE THAN 50% OF PUBLIC FILL SHALL BE USED FOR FILLING OF SEAWALL BELOW +2.5 mPD.

NOTE :

SINGLE SILT CURTAIN SHALL BE DEPLOYED FOR THE MARINE WORKS FOR THE REMAINING PART OF PORTION N-A FROM OCTOBER 2016 TO MAY 2017.

LEGEND:

- DREDGED AREA
- COMPLETED BLOCKWORK SEAWALL
- COMPLETED SLOPING SEAWALL
- PUBLIC FILL
- SINGLE SILT CURTAIN
- TEMPORARY SHEET PILE WALL

Rev.	Description	Date	Checked
C	FURTHER ESS COMMENTS ADDED	24SEP13	PKV
B	ESS COMMENTS ADDED	23SEP13	PKV
A	FIRST ISSUE	09SEP13	MHo

Designed By	AAm
Drawn By	KC
Approved By	SPo
Date	09SEP2013

Main Contractor

DRAGAGES 香港寶嘉
A member of the Bouygues Construction group

BOUYGUES 布魯格
Dragages - Bouygues Joint Venture 寶嘉 - 布魯格聯營

Client

HIGHWAYS DEPARTMENT

Contractor's Designer

ARUP Ove Arup & Partners
Hong Kong Limited

Project

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link -
Northern Connection Sub-Sea Tunnel Section

Drawing Title

Figure 1.1
Latest Construction Sequence

Drawing no.	TMCLKL8-DBJ-NTH-DWG-00132
Scale	1:10000 @ A3
CADD Ref.	TMCLKL8-DBJ-NTH-DWG-00132-DFT-C
Issue Status	DFT (DRAFT)
Revision	C

3. **ASSESSMENT OF THE LATEST CONSTRUCTION SEQUENCE AGAINST
EIAO-TM ITEM 6**

Considering the definitions stipulated under *Items 6.1-2* of the *EIAO-TM*, the proposed latest sequence is evaluated against *Item 6.1* to justify whether there will be any material changes to the designated project and against *Item 6.2* to assess any material changes to the environmental impacts of the Project as presented in the approved EIA report. If no material change is identified, the proposed sequence should be considered as conforming to the information and requirements contained in the EIA Report. Results of the evaluation are summarized in *Table 3.1*

Table 3.1 Summary of Evaluation Results against Item 6 of the EIAO-TM

Item	Requirements	Major Findings	Material Change?
6.1 (a)	A change to physical alignment, layout or design of the project causing an environmental impact likely to affect existing or planned community, ecologically important areas or sites of cultural heritage	Under the latest sequence, the physical alignment, layout and design of the northern landfall is the same as that presented for the original sequence in the approved EIA Report and the EP-354/2009A.	No
6.1 (b)	A physical change resulting in an increase in the extent of reclamation or dredging affecting water flow or quality likely to affect ecologically important areas, or disrupting sites of cultural heritage	<p>Under the latest sequence, the extent of reclamation and dredging are the same as the original sequence assumed in the approved EIA Report and EP-354/2009A, which are presented as follows:</p> <ul style="list-style-type: none"> • Reclamation size of about 16.5 ha of land area when calculated to the cope line or 21.1 ha for the footprint area to the bottom of the seawall where it intersects the seabed. • Dredging for the construction of the seawall of all portions and for the reclamation area of Portion N-c. Extent of dredging will remain the same since the footprint of seawall and reclamation will be the same between the latest and original sequence (please refer to <i>Figure 3</i> of the EP-354/2009A and <i>Figure 1</i>). 	No
6.1 (c)	An increase in pollution emissions or discharges or waste generation likely to violate guidelines or criteria in this technical memorandum without mitigation measures in place	Emission (eg dust emission) and discharges (eg dispersal of suspended sediment due to dredging and filling works, construction site runoff) due to the latest sequence are expected to be no greater than those predicted in approved EIA report since the construction method, plant requirements and working rate (ie rate of dredging and filling) would not be increased. Waste generation would also not be greater than that predicted in approved EIA report with no changes in volume of excavation, dredging and reclamation as well as number of construction workers required.	No
6.1 (d)	An increase in throughput or scale of the project leading to physical additions or alterations that are likely to violate the guidelines or criteria in this technical memorandum without mitigation measures in place	Under the latest sequence, the extent of reclamation and dredging are the same as that presented in the approved EIA Report and the EP-354/2009A. No change in scale of Project is identified.	No
6.1 (e)	A change resulting in physical works that are likely to affect rare, endangered or protected species, or an important ecological habitat, or site of cultural heritage.	Construction method will be the same between the latest and original sequence such that changes in physical works are not anticipated.	No

Item	Requirements	Major Findings	Material Change?
6.2	The environmental impact of a designated project, for which an environmental permit has been issued, is considered to be materially changed if the environmental performance requirements set out in the EIA report for this project may be exceeded or violated, even with the mitigation measures in place.	<p>It is assumed in the approved EIA Report that the northern landfall reclamation will commence at Portion N-c and followed by Portion N-b and Portion N-a. This original construction sequence is assumed based on the construction programme requirement rather than the environmental performance / impacts of such sequence.</p> <p>Given the similarity between the original and latest construction sequence as assessed for <i>Item 6.1</i> above and the mitigation measures recommended in the EP, approved EIA Report and Environmental Monitoring and Audit Manual of the Project will be adopted for the construction of the latest sequence, it is considered that the implementation of the latest sequence would not lead to any material change of environmental impact of the Project.</p> <p>Please also refer to <i>Section 4</i> for detailed discussion of the assessment of the potential environmental impacts associated with the adoption of the latest construction sequence.</p>	No

Annex D

Summary of Changes

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections	Content
1	Introduction
1.1	n/a
1.2	Engineer's Supervising Officer's Representative (ER) changes to Supervising Officers' Representative (SOR)
1.3	Table 1.1 is revised in accordance to the scopes of <i>Contract No. HY/2012/08</i>
1.4	Scope of the EM&A programme is revised in accordance to the scopes of <i>Contract No. HY/2012/08</i>
1.5	Mitigation/enhancement measures recommended by the TM-CLKL EIA during detailed design phase are updated in accordance to the scopes of <i>Contract No. HY/2012/08</i>
1.6	n/a
2	Project Description
2.1	n/a
2.2	Sequence of construction is revised and supplementary information is provided as Annex C of this Manual. Scopes of Toll Plaza are irrelevant to this Contract, and thus removed.
2.3	n/a
2.4	Clauses related to Southern Reclamation are irrelevant to this Contract, and thus removed.
2.5	Table 2.2 is amended as Table 2.1 and details related to works area in Lantau are irrelevant to this Contract and thus removed
2.6	Table 2.3 amended as Table 2.2, and clauses related to sewage generation of Southern Landfall and Toll Plaza are inapplicable to this Contract, and thus removed.
2.7	Project programme is updated in accordance to the scopes of work under <i>Contract No. HY/2012/08</i> .
2.8	Interface with HKBCF and HZMB, HKLR, Tuen Mun Western By-pass is updated
2.9	n/a

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections		Content
3	Air Quality	
3.1		
3.2		
3.3		
3.4		This section is completely revised based on the Enhanced TSP Monitoring Plan submitted to EPD in accordance with Condition 2.4 of the EP-354/2009/A.
3.5		
3.6		
3.7		
3.8		
4	Noise	
4.1		Revised to clarify that noise monitoring is not relevant to the Contract.
4.2		Revised to include noise mitigation measures.
4.3		Not used.
4.4		Not used.
4.5		Not used.
4.6		Not used.
4.7		Not used.
4.8		Not used.

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections	Content
5	Water Quality
5.1	n/a
5.2	Mitigation measures related to construction sequence are revised in accordance to the Notification of Changes in Construction Sequence (summarized in Annex C). Silt curtain arrangements irrelevant to this Contract are indicated as not relevant/not used.
5.3	Clauses related to Southern Landfall are indicated as not relevant
5.4	ER is amended to SOR
5.5	ER is amended to SOR
5.6	Water quality monitoring stations applicable to <i>Contract No. HY/2012/08</i> are retained, otherwise indicated as not relevant or removed.
5.7	n/a
5.8	n/a
5.9	ER is amended to SOR. Relocation of Mf sediment is not applicable to this Contract and this indicated as not relevant.
5.10	n/a
5.11	Operational Phase Monitoring is revised.
5.12	n/a
6	Ecology
6.1	n/a
6.2	n/a
6.3	Table 6.1 is revised with item inapplicable to this Contract being indicated as not relevant.
6.4	Baseline walkover survey and Bore Piling Monitoring Programme are not applicable to this Contract, thus indicated as not relevant and/or removed. Details on coral translocation are also revised to incorporate requirements of the Detailed Coral

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections	Content
	Translocation Methodology which was submitted to the EPD in accordance with Condition 2.6 of the EP-354/2009A.
6.5	Clause 6.5.3.5 is supplementary information to clarify the arrangement of vessel-based line transect dolphin impact monitoring under this Contract.
6.6	Mitigation measures inapplicable to this Contract are removed.
7	Landscape and Visual Assessment
7.1	Figures number relevant to this Contract are retained
7.2	n/a
7.3	n/a
7.4	n/a
7.5	n/a
7.6	Mitigation measures inapplicable to this Contract are removed.
8	Waste Management and Contaminated Land
8.1	Marine sediment disposal is updated based on the latest Sediment Quality Report for this Contract. Estimated quantities of C&D wastes generated as stated in the latest Waste Management Plan (WMP) submitted by Contractor of <i>Contract No. HY/2012/08</i> are provided/updated as Table 8.1.
8.2	n/a
8.3	Table 8.1 is amended as Table 8.2 and the recommended waste disposal sites are updated as per the WMP prepared by the Contractor dated 24 September 2013.

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections	Content
9	Cultural Heritage
9.1	Clarify as not applicable to this Contract.
9.2	Not applicable to this Contract and thus removed.
9.3	Not applicable to this Contract and thus removed.
9.4	Not applicable to this Contract and thus removed.
9.5	Not applicable to this Contract and thus removed.
10	Landfill Gas Hazard Assessment
10.1	Clarify as not applicable to this Contract.
10.2	Not applicable to this Contract and thus removed.
11	Site Environmental Audit
11.1	n/a
11.2	n/a
11.3	n/a
11.4	n/a

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections	Content
12 Reporting	
12.1 n/a	
12.2 n/a	
12.3 n/a	
12.4 n/a	
12.5 n/a	
12.6 n/a	
12.7 n/a	
12.8 n/a	
12.9 n/a	
12.1 n/a	
12.11 n/a	
Figures Key: Removed/Not used = "X"; Amended = "A"; Adopted = "O"; *Additional Figure	
Figure 1.1 O	
Figure 1.2 O	
Figure 2.1 O	
Figure 2.2a O	
Figure 2.2b O	
Figure 2.3a A	
Figure 2.3b O	

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections		Content
Figure 2.3c	O	
Figure 2.4a	A	
Figure 2.4b	X	
Figure 2.5a	O	
Figure 2.5b	O	
Figure 2.5c	O	
Figure 2.6a	X	
Figure 2.6b	X	
Figure 2.6c	X	
Figure 2.7	X	
Figure 2.8a	O	
Figure 2.8b	X	
Figure 2.9a	A	
Figure 2.9b	X	
Figure 2.9c	X	
Figure 3.1	O	
Figure 3.2a	A	
Figure 3.2b*	A	
Figure 4.1	O	
Figure 4.2	X	
Figure 5.1	A	
Figure 5.2	X	
Figure 5.3	X	

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections		Content
Figure 5.4	O	
Figure 5.5a	X	
Figure 5.5b	X	
Figure 5.5c	X	
Figure 5.6a	X	
Figure 5.6b	X	
Figure 5.6c	X	
Figure 5.9	X	
Figure 5.10	X	
Figure 6.1	O	
Figure 6.2	A	
Figure 6.3	A	
Figure 6.4	X	
Figure 7.1.1.1	O	
Figure 7.1.1.2	O	
Figure 7.1.1.3	X	
Figure 7.1.1.4	X	
Figure 7.1.1.5	X	
Figure 7.2.1.1	O	
Figure 7.2.1.2	O	
Figure 7.2.1.3	X	
Figure 7.2.1.4	X	
Figure 7.2.1.5	X	

Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link - Northern Sub-sea Tunnel Section
Summary of changes for Contract Specific EM&A Manual
Our Reference: 0212330 Annex D_Summary of Changes_Rev a_2013_11_14.docx

Sections		Content
Figure 7.3.1.1	O	
Figure 7.3.1.2	X	
Figure 7.3.1.3	X	
Figure 7.3.1.4	X	
Figure 7.3.2.1	O	
Figure 9.1	X	
Figure 12.1	O	
Appendixes		
Appendix A		Clauses of environmental mitigation and enhancement measure inapplicable to <i>Contract No. HY/2012/08</i> are removed
Appendix B		n/a
Supplementary Information		
Annex A		Silt curtain arrangements inapplicable to <i>Contract No. HY/2012/08</i> are removed, whilst silt curtain arrangement proposed by the <i>Contract No. HY/2012/08</i> Contractor is provided
Annex B		Figures relevant to <i>Contract No. HY/2012/08</i> are retained and complied in this Annex.
Annex C		Supplementary information to summarize the construction sequence under <i>Contract No. HY/2012/08</i>
Annex D		Additional information to indicate the changes in the Contract Specific EM&A Manual

Note: General changes on the document include fonts, incident, margin, footer and header

Appendix A

Environmental Mitigation and Enhancement Measure Implementation Schedules

(Adopted from: CINOTECH (2011) Agreement No.
CE35/2011 EP Baseline Environmental Monitoring for
Hong Kong-Zhuhai-Macao Bridge
Tuen Mun-Chep Lap Kok Link – Investigation. Updated
EM&A Manual for Tuen Mun-Chek Lap Kok Link)

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel Section

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
4.8.1	3.8	An effective watering programme of twice daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;	All areas / throughout construction period	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		n/a
4.8.1	3.8	Watering of the construction sites in Lantau for 8 times/day and in Tuen Mun for 12 times/day to reduce dust emissions by 87.5% and 91.7% respectively and shall be undertaken.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel Section

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8. 1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel Section

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		any earthworks excavation activity on the site.							
4.8.1	3.8	Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit	All representative existing ASRs / throughout construction period	Contractor	EM&A Manual		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel Section

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
Marine Works (Sequence A)									
6.10 Figure 6.2a Appendix D6a	Annex A	Construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. The protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2a and detailed in Appendix D6a. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation;	All areas/ prior to dredging and backfilling works	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10	-	a maximum of 50% public fill to be used for all seawall filling below +2.5mPD for TM-CLKL southern and northern landfalls.	TM-CLKL seawall filling	Contractor	TM-EIAO		Y		n/a
6.10	-	a maximum of 30% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL southern landfall	TM-CLKL southern landfall reclamation filling	Contractor	TM-EIAO		Y		n/a
6.10	-	a maximum of 100% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL northern landfall	TM-CLKL northern landfall reclamation filling	Contractor	TM-EIAO		Y		n/a
6.10	-	Use of cage type silt curtains round all	All areas dredging works	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		grab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works.							
	Figure 1.1 of Annex C	A layer of floating type silt curtain will be applied when dredging and reclamation works are being undertaken at Portion N-a as shown in Figure 1.1 of Annex C of the EM&A Manual.	All areas/ through out marine works	Contractor	TM-EIAO		Y		n/a
6.10	-	Trailer suction hopper dredgers shall not allow mud to overflow.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	The use of Lean Material Overboard (LMOB) systems shall be prohibited.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10 Figure 6.2b Appendix D6b	Annex A	For other parts of the reclamation works construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. It should be noted that the protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2b and detailed in Appendices D6b. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation; - Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and - Reclamation dredging and filling for Portion 1 of HKLR;	TM-CLKL northern landfall, Portion D of HKBCF and HKLR	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10	-	The filling material for the other parts of the works are the same as Sequence A;	All other areas/backfilling works	Contractor	TM-EIAO		Y		n/a
6.10	5.7	Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM-CLKL southern reclamation. Cage type silt curtains will be applied round all grab dredgers at other works area	HKBCF, HKLR and TM-CLKL grab dredging	Contractor	TM-EIAO		Y		n/a
6.10	Annex A	A layer of floating type silt curtain will be applied around all works as defined in Appendix D6b	All areas/ through out marine works	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10	-	TM-CLKL northern landfall: - Reclamation filling shall not proceed until at least 200m section of leading seawall at both the east and west sides	All areas/ through out marine works	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		of the reclamation are formed above +2.5 mPD, except for 100m gaps for marine access;							
General Marine Works									
6.10	-	Use of TMB for the construction of the submarine tunnel.	Tunnel works / Construction phase	Contractor	TM-EIAO		Y		n/a
6.10	-	Export dredged spoils from NWWCZ.	All areas as much as possible / dredging activities	Contractor	DASO Permit conditions		Y		n/a
6.10	-	Where public fill is proposed for filling below +2.5mPD, the fine content in the public fill will be controlled to 25%	All areas/ backfilling works	Contractor	TM-EIAO		Y		n/a
6.10	-	Where sand fill is proposed for filling	All areas/ backfilling works	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		below +2.5mPD, the fine content in the sand fill will be controlled to 5%.							
6.10	-	Mechanical grabs shall be designed and maintained to avoid spillage and should seal tightly while being lifted.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Barges and hopper dredgers shall have tight fitting seals to their bottom openings to prevent leakage of material.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water. Barges or hoppers shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10	-	Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	The works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	5.2	Silt curtain shall have proved effectiveness from the producer and shall be fully maintained throughout the works by the	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		contractor.							
6.10	-	The daily maximum production rates shall not exceed those assumed in the water quality assessment.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	The dredging and filling works shall be scheduled to spread the works evenly over a working day.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
Land Works									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Sewage effluent and discharges from on-site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Storm drainage shall be directed to storm	All areas/ throughout	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.	construction period						
6.10	-	Silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Measures should be taken to prevent the washout of construction materials, soil, silt	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		or debris into any drainage system.							
6.10	-	Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	5.8	Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
6.10	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for off site disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		cleaned up immediately.							
6.10	-	Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance		Y		n/a
6.10	-	All fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	n/a
6.10	Section 5	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good	All areas/ throughout construction period	Contractor	EM&A Manual		Y		N/A

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Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementat ion Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		working practice.							
Water Quality Monitoring									
6.10	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen. Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period. One year operation phase water quality monitoring at designated stations	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual		Y	Y	N/A

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ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Ecology

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
8.14	6.3	Specification for and implement pre, during and post construction dolphin abundance monitoring.	All Areas/Detailed Design/ during construction works/post construction	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All dredging and reclamation areas/Detailed Design/during all reclamation and dredging works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600m ² in an area where fishing activities are prohibited.	Area of prohibited fishing activities/Detailed Design/towards end of construction period	TM-CLKL/ HKBCF Design Consultant/ TM-CLKL/ HKBCF Contractor	TMEIA	Y		Y	AFCD

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Ecology

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for dredging and reclamation works	All areas/ Detailed Design/during dredging and reclamation works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.15	6.5	Audit coral translocation success	Post translocation	Contractor	TMEIA		Y		n/a

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Ecology

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA		Y		AFCD/LCSD
7.13	6.5	Spoil heaps shall be covered at all times.	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Construction activities should be restricted to the proposed works boundary	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a

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ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a

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Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a

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Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (OM6)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a

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ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA		Y		n/a
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material		Y		n/a
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.		Y		n/a
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures	Contract Mobilisation	Contractor	TMEIA		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		including waste reduction, reuse and recycling							
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	The surplus surcharge should be transferred to a fill bank	Reclamation areas / after surcharge works	Contractor	TMEIA		Y		n/a
12.6	8.1	Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			n/a
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

Legend: D=Design, C=Construction, O=Operation

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Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6	8.1	Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.	Reclamation areas / throughout dredging works	Contractor	TMEIA		Y		n/a
12.6	8.1	Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

Legend: D=Design, C=Construction, O=Operation

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Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		be considered for segregation and storage activities.							
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows: f Suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; f Having a capacity of <450L unless the specifications have been approved by the EPD; and f Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. f Clearly labelled and used solely for the storage of chemical wastes; f Enclosed with at least 3 sides; f Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20%	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		by volume of the chemical waste stored in the area, whichever is greatest; <i>f</i> Adequate ventilation; <i>f</i> Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and <i>f</i> Incompatible materials are adequately separated.							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.							
12.6	8.1	All waste containers shall be in a secure area on hardstanding;	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminium cans, plastic bottles, etc should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA		Y		n/a
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual		Y		n/a

Legend: D=Design, C=Construction, O=Operation

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Contract No. HY/2012/08
TUEN MUN – CHEK LAP KOK LINK
Northern Connection Sub-sea Tunnel

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Cultural Heritage

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
11.8	Section 9	EM&A in the form of audit of the mitigation measures	All areas / throughout construction period	Highways Department	EIAO-TM		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government

Appendix B

Environmental Proformas

(Adopted from: CINOTECH (2011) Agreement No.
CE35/2011 EP Baseline Environmental Monitoring for
Hong Kong-Zhuhai-Macao Bridge
Tuen Mun-Chep Lap Kok Link – Investigation. Updated
EM&A Manual for Tuen Mun-Chek Lap Kok Link)

Proforma for Construction Phase EM&A Programme

COMPLAINT LOG

Ref: _____

Log Ref.	Date / Location	Complainant/ Date of Contract	Details of Complaint	Investigation / Mitigation Action	File Closed

Filed by Environmental Team Leader _____

Date: _____

EIA Ref*	EM&A Log Ref	Environmental Protection Measures*	Location/ Timing	Implementation Agent	Implementation Stages**			
					Des	C	O	Dec

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project

** Des- Design, C-Construction, O-Operation, Dec- Decommissioning

Signed by Project Proponent: _____

Date: _____

IMPLEMENTATION STATUS PROFORMA

Ref: _____

Ref**	Environmental Protection Measures*	Implementation Status

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project

** EIA Ref/ EM&A Log Ref/ Design Document Ref

Signed by Environmental Team Leader _____

Date: _____

Audited by Independent Environment Checker _____

Date: _____

DATA RECOVERY SCHEDULE

Ref: _____

Date	Air Quality Monitoring									Noise Monitoring						
	Monitoring Station*									Monitoring Station*						
	A02	A06	A07	A21	A24	A34	A36	A40	A42	R2	R5	R7	R14	R16	R21	R24
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
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20																
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																
31																
% of R																

* Research type of parameters
 % of R The percentage of Data Recovery is the natural monitoring over the scheduled monitoring

Signed by Environmental Team Leader

Date:

SITE INSPECTION PROFORMA

Ref: _____

Date	Location	Req # Ref.*	Observation / Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* EIA Ref/ EM&A Log Ref/ Design Document Ref/ Environmental Protection Contract Clause

** Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies

*** The required completion date to confirm the specified Environmental Protection Action

This Proforma is an:

Environmental Protection Instruction for

Date:

Signed by Environmental Team Leader

Date:

Copy to Independent Environmental Checker

PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA

Ref: _____

Ref*	Proposed Construction Method*	Location/ Working Period	Anticipated Impacts	Recommended Mitigation Measures

* EIA Ref / EM&A Log Ref / Design Ref

** Details of equipment, vehicles, plants, processes, technologies for the option of construction method

Signed by Environmental Team Leader

Date:

Audited by Independent Environment Checker

Date:

REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref*	Environmental License / Permit*	Control Area / Facility / Location	Effective Date

* Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions

** File reference of the licensee / permittee

Signed by Environmental Team Leader _____

Date: _____

Audited by Independent Environment Checker _____

Date: _____

Proforma for Operational Phase EM&A Programme

IMPLEMENTATION STATUS PROFORMA

Ref: _____

EIA Ref*	EM&A	Environmental Protection Measures*	Location/ Timing	Implementation Agent	Implementation Stages**			
	Log Ref				Des	C	O	Dec

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project

** Des- Design, C-Construction, O-Operation, Dec- Decommissioning

Signed by Project Proponet _____

Date: _____

REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref*	Environmental License / Permit*	Control Area / Facility / Location	Effective Date

* *Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions*
** *File reference of the licensee / permittee*

Signed by Environmental Team Leader _____

Date: _____

Audited by Independent Environment Checker _____

Date: _____

IMPLEMENTATION STATUS PROFORMA

Ref: _____

Ref**	Environmental Protection Measures*	Implementation Status

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project

** EIA Ref/ EM&A Log Ref/ Design Document Ref

Signed by Environmental Team Leader

Date:

Audited by Independent Environment Checker

Date:

**Sample Template for Interim Notifications of Environmental Quality Limits
Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Prepared by: _____

Designation: _____

Signature: _____

Date: _____

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