

# MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

## CONTRACT SPECIFIC ENVIRONMENTAL MONITORING & AUDIT MANUAL

August 2015 (Rev. 8)


**Client:** China Harbour Engineering Co., Ltd.

**Project:** Contract No. HY/2013/03  
Hong Kong-Zhuhai-Macao Bridge  
Hong Kong Boundary Crossing Facilities -  
Vehicle Clearance Plazas and  
Ancillary Buildings and Facilities

**Report No.:** 0165/15/ED/0046

Prepared  
by: Sandra Pang

Reviewed  
by: Bong Yu

Certified  
by: 

Arthur Cheng

Environmental Team Leader

4 February 2016

By Fax (3468 2076) and By Post

AECOM Asia Co. Ltd.  
The PRE's Office  
5 Ying Hei Road, Tung Chung, Lantau  
Hong Kong

Attention: Mr. Michael Tovey

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/2013/03 – HZMB HKBCF – Vehicle Clearance Plazas and  
Ancillary Buildings and Facilities  
Contract Specific EM&A Manual (Rev. 8)**

Reference is made to the Environmental Team's submission of Contract Specific EM&A Manual (Rev. 8) certified by the ET Leader (ET's ref.: "MCL/ED/0055/2016/C" dated 1 February 2016) and provided to us via e-mail on 1 February 2016.

We are pleased to inform you that we have no adverse comment on the captioned submission. We write to verify the captioned submission in accordance with Condition 1.9 of the Environmental Permit No. EP-353/2009/I.

Thank you very much for your attention and please feel free to contact the undersigned should you require further information.

Yours faithfully,  
For and on behalf of  
Ramboll Environ Hong Kong Limited



Raymond Dai  
Independent Environmental Checker

c.c.	HyD	Mr. Matthew Fung	(By Fax: 3188 6614)
	HyD	Mr. Ken Woo	(By Fax: 3188 6614)
	MCL	Mr. Arthur Cheng	(By Fax: 2450 8032)
	CHEC	Mr. Johnason Ko	(By Fax: 2887 3014)

Internal: DY, YH, LP, CL, ENPO Site

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Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong

Tel : +852-2450 8238  
Fax : +852-2450 8032  
E-mail : mcl@fugro.com.hk  
Website : www.materialab-consultant.com

Date 1 February 2016

Our Ref. MCL/ED/0055/2016/C

Ramboll Environ Hong Kong Limited  
(formerly ENVIRON Hong Kong Limited)  
Room 2403, 24/F, Jubilee Centre,  
18 Fenwick Street, Wan Chai,  
Hong Kong

BY HAND

Attn.: Mr. Raymond Dai, IEC

Dear Sir,

**Particular Specification Clause 25.29 – Contract Specific EM&A Manual for  
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities –  
Vehicle Clearance Plazas and Ancillary Buildings and Facilities (HY/2013/03)**

Pursuant to Clause 25.29 (10) of the Particular Specification, we are pleased to submit the Contract Specific EM&A Manual (Rev. 8) for the captioned project for your verification.

Should you require further information, please do not hesitate to contact our Ms Sandra Pang at 3565 4156 or the undersigned at 3565 4115.

Yours faithfully,  
for and on behalf of  
MATERIALAB CONSULTANTS LIMITED



Arthur Cheng  
Environmental Team Leader

AC/by

c.c. AECOM – Mr. P.K. Lee, Mr. W.S. Ng, Ms. Miranda Wong  
RAMBOLL ENVIRON – Mr. Ray Yan, Mr. Andy Wong  
CHEC – Mr. Marko Chan

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Report No.: 0165/15/ED/0046

## CONTENTS

Chapter	Title	Page
<b>1.</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Background	1
1.2	Purpose of the EM&A Manual	2
<b>2.</b>	<b><u>CONTRACT DESCRIPTION</u></b>	<b>4</b>
2.1	<u>Contract</u> Description	4
2.2	Implementation Programme	4
2.3	Concurrent Projects during Construction Phase	5
<b>3.</b>	<b><u>CONTRACT ORGANISATION</u></b>	<b>6</b>
3.1	<u>Contract</u> Organisation	6
<b>4.</b>	<b>ENVIRONMENTAL SUBMISSION</b>	<b>9</b>
4.1	Introduction	9
4.2	Environmental Management Plan (EMP)	9
4.3	Waste Management Plan	9
4.4	Construction Method Statement	10
<b>5.</b>	<b>AIR QUALITY</b>	<b>11</b>
5.1	Air Quality Parameters	11
5.2	Monitoring Equipment	11
5.3	Laboratory Measurement / Analysis	12
5.4	Monitoring Locations	13
5.5	Baseline Monitoring for Fugitive Dust	14
5.6	Impact Monitoring for Fugitive Dust	15
5.7	Action / Limit Levels	15
5.8	Event and Action Plan	16
5.9	Mitigation Measures	20
5.10A	Reporting of Monitoring Data to ENPO	20
<b>6.</b>	<b>NOISE</b>	<b>21</b>
6.1	Noise Quality Parameters	21
6.2	Monitoring Equipment	21
6.3	Monitoring Locations	21
6.4	Baseline Monitoring for Construction Noise	22
6.5	Impact Monitoring for Construction Noise	23
6.6	Event and Action Plan for Construction Noise	23
6.7	Mitigation Measures	25



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Report No.: 0165/15/ED/0046

6.8A	Reporting of Monitoring Data to ENPO	26
<b>7.</b>	<b>SEDIMENT QUALITY</b>	<b>27</b>
7.1	Summary	27
<b>8.</b>	<b>WASTE MANAGEMENT</b>	<b>28</b>
8.1	General	28
8.2	Waste EM&A Requirements	28
<b>9.</b>	<b>WATER QUALITY</b>	<b>31</b>
9.1	Water Quality Parameters	31
9.2	Monitoring Equipment	32
9.3	Laboratory Measurement / Analysis	34
9.4	Monitoring Locations	35
9.5	Baseline Monitoring for Water Quality	37
9.6	Efficiency of Silt Curtain and Cage Curtain	38
9.7	Impact Monitoring for Water Quality	38
9.8	Post-construction Monitoring	40
9.9	Impact Operation Phase Monitoring	40
9.10	Event and Action Plan	40
9.11	Mitigation Measures	43
<b>10.</b>	<b>ECOLOGY</b>	<b>44</b>
10.1	Introduction	44
10.2	Ecological Mitigation Measures and Implementations	44
10.3	Monitoring and Audit for Ecology	47
10.4	Monitoring Locations	49
10.5	Baseline Monitoring for Ecology	50
10.6	Impact Monitoring for Ecology	50
10.7	Post-construction Monitoring for Ecology	54
10.8	Event and Action Plan	54
<b>11.</b>	<b>FISHERIES</b>	<b>56</b>
11.1	Summary	56
<b>12.</b>	<b>CULTURAL HERITAGE</b>	<b>57</b>
12.1	Summary	57
<b>13.</b>	<b>HAZARD TO LIFE</b>	<b>58</b>
13.1	Summary	58

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Report No.: 0165/15/ED/0046

<b>14.</b>	<b>LANDSCAPE &amp; VISUAL IMPACT</b>	<b>59</b>
14.1	Introduction	59
14.2	Monitoring Details	59
14.3	Baseline Monitoring	62
14.4	Action Plan for Landscape and Visual Works	63
<b>15.</b>	<b>SITE ENVIRONMENTAL AUDIT</b>	<b>64</b>
15.1	Site Inspection	64
15.2	Compliance with Legal and Contractual Requirements	64
15.3	Environmental Complaints	65
<b>16.</b>	<b>REPORTING</b>	<b>67</b>
16.1	General	67
16.2	Baseline Monitoring Report	67
16.3	Monthly EM&A Reports	68
16.4	Quarterly EM&A Summary Reports	71
16.5	Final EM&A Review Report	72
16.6	Data Keeping	73
16.7	Interim Notifications of Environmental Quality Limit Exceedances	73

## FIGURES

Figure 1-1	Current Master Layout Plan for HKBCF
Figure 1-2	Location of Box Culvert
Figure 5-1	Air Quality Monitoring Stations
Figure 6-1	Noise Monitoring Stations
Figure 9-1	Water Quality Monitoring Stations
Figure 10-1	Transect Lines for CWD Monitoring

## LIST OF TABLES

Table 5.1	Air Monitoring Locations
Table 5.2	Action / Limit Levels for Air Quality
Table 5.3	Event / Action Plan for Air Quality
Table 6.1	Proposed Airborne Construction Noise Monitoring Locations
Table 6.2	Action and Limit Levels for Construction Noise
Table 6.3	Event / Action Plan for Construction Noise Monitoring
Table 8.1	Waste Management Checklist
Table 9.1	Laboratory Analysis for SS
Table 9.2	Water Quality Monitoring Stations (construction phase)
Table 9.3	Action and Limit Levels for Water Quality

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Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

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Table 9.4	Event and Action Plan for Water Quality
Table 10.1	Summary of Dolphin Monitoring Equipment Requirements
Table 10.2	Event and Action Plan
Table 10.3 (a)	Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL)
Table 10.3 (b)	Derived Value of Action Level (AL) and Limit Level (LL) for Chinese White Dolphin Monitoring
Table 14.1	Monitoring Programme
Table 14.2	Proposed Mitigation Measures during Construction and Operation Phases
Table 14.3	Proposed format for Preliminary Funding, Implementation, Management and Maintenance Proposal
Table 14.4	Action Plan

## LIST OF APPENDICES

Appendix A	Tentative Construction Programme
Appendix B	Environmental Mitigation Implementation Schedule (EMIS)
Appendix C	<u>Contract</u> Organisation for Environmental Works
Appendix D	Sample Data Sheets for Monitoring
Appendix E	Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Report No.: 0165/15/ED/0046

**1. INTRODUCTION****1.1 Background**

1.1.1 Not applicable.

*Hong Kong Link Road (N/A)*

1.1.2 Not applicable.

1.1.3 Not applicable.

1.1.4 Not applicable.

*Hong Kong Boundary Crossing Facility*

1.1.5 An application (No ESB-183/2008) for an Environmental Impact Assessment (EIA) Study Brief under Section 5(1) of the Environmental Impact Assessment Ordinance (EIAO) was submitted by Highways Department (the Project Proponent) on 12 March 2008 with a Project Profile (No. PP-346/2008) for the Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities (the Project). EPD issued an EIA Study Brief (No: ESB-183/2008) on April 2008 to the Project Proponent to carry out an EIA study.

1.1.6A The environmental impact assessment (EIA) report (Hong Kong – Zhuhai – Macao Bridge Hong Kong Boundary Crossing Facilities – EIA Report (Register No. AEIAR-145/2009) (HKBCFEIA) and the environmental monitoring and audit (EM&A) Manual (original EM&A Manual), for the Project were approved by Environmental Protection Department (EPD) in October 2009.

1.1.7A EPD subsequently issued the Environmental Permit (EP) for HKBCF in November 2009 (EP-353/2009) and the Variation of Environmental Permit (VEP) on 24 June 2010 (EP-353/2009/A; VEP-315/2010), 16 November 2010 (EP-353/2009/B; VEP-327/2010), 25 November 2011 (EP-353/2009/C; VEP-343/2011), 7 March 2012 (EP-353/2009/D; VEP-355/2012), 16 October 2012 (EP-353/2009/E; VEP-380/2012), 24 April 2013 (EP-353/2009/F; VEP-402/2013), 06 August 2013 (EP-353/2009/G; VEP-410/2013), 19 January 2015 (EP-353/2009/H; VEP-463/2015), and 17 July 2015 (EP-353/2009/I; VEP-477/2015). The Project is a designated project and is governed by the current permits for the Project, i.e. the amended EPs issued in July 2015 (EP-353/2009/I).

1.1.7B This Contract Specific Environmental Monitoring and Audit (EM&A) Manual is prepared for “Contract No. HY/2013/03 Hong Kong–Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Vehicle Clearance Plazas and Ancillary Buildings and Facilities” (hereafter referred to as “the Contract”) for the Highways Department of Hong Kong Special Administrative Region (HKSAR) Government. The Contract, which is part of the HKBCF Project, was awarded to China Harbour Engineering Company Limited (CHEC) (hereafter

Report No.: 0165/15/ED/0046

referred to as “the Contractor”) and MaterialLab Consultants Limited (MCL) was appointed as the Environmental Team (ET) by the Contractor.

1.1.7C Subsequent to EIA Study Brief of TMCLKL being prepared and based upon the proposed schemes for the Hong Kong-Zhuhai-Macao Bridge (HZMB) and HKBCF, it was decided to integrate the TMCLKL 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.

1.1.7D This Contract Specific EM&A Manual is submitted to fulfil the requirement stated in the Clause 25.29 of the Particular Specification and to include all project-related contents from the original EM&A Manual for the Contract. This would help to facilitate compliance with the EPs (EP-353/2009/I).

### Contract Description

1.1.7E The Contract comprises of the construction of supporting facilities of the Boundary Crossing Facilities for the Project including the key elements listed in Section 2.1.2.

1.1.7F The location layout plan for the HKBCF is given in **Figure 1-1**.

## **1.2 Purpose of the EM&A Manual**

1.2.1 The purposes of this EM&A Manual are to:

- Guide the set up of an EM&A programme to ensure compliance with the EIA recommendations;
- Specify the requirements for monitoring equipment;
- Propose environmental monitoring points, monitoring frequency etc.;
- Propose Action/Limit Level;
- Propose Event/Action Plan; and
- Assess the effectiveness of the recommended mitigation measures.

1.2.2 The Contract Specific EM&A Manual was prepared to outline the monitoring and audit programme for the construction of the Contract and to provide systematic procedures for monitoring and auditing and minimization of the environmental impacts associated with the construction.

1.2.3 Hong Kong environmental regulations and the Hong Kong Planning Standards and Guidelines (HKPSG) have served as environmental standards and guidelines in the preparation of this Contract Specific EM&A Manual. In addition, it has been prepared in accordance with the requirements stipulated in Annex 21 of the Technical Memorandum on the EIA Process (TM-EIAO).

1.2.4 This Manual contains the following information:

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Report No.: 0165/15/ED/0046

- Responsibilities of the Contractor, the Engineer or Engineer's Representative (ER), Environmental Team (ET), and the Independent Environmental Checker (IEC) under the context of the EM&A;
- Role of the Environmental Protection Office (ENPO );
- Contract organisation for the EM&A works;
- The basis for and description of the broad approach underlying the EM&A programme;
- Details of the methodologies to be adopted, including all laboratories and analytical procedures, and details on quality assurance and quality control programme;
- The rationale on which the environmental monitoring data will be evaluated and interpreted;
- Definition of Action and Limit levels;
- Establishment of Event and Action plans;
- Requirements for reviewing pollution sources and working procedures required in the event of non-compliance with the environmental criteria and complaints;
- Requirements for presentation of environmental monitoring and audit data and appropriate reporting procedures; and
- Requirement for reviewing the EIA prediction and the effectiveness of the migrations measures, environmental management system and the EM&A programme.

1.2.5 For the purpose of this manual, the ER shall refer to the Engineer as defined in the Construction Contract, in cases where the Engineer's powers have been delegated to the ER, in accordance with the Construction Contract. The ET Leader, who shall be responsible for and in charge of the ET, shall refer to the person, delegated the role of executing the environmental monitoring and audit requirements.

Report No.: 0165/15/ED/0046

## **2. CONTRACT DESCRIPTION**

### **2.1 Contract Description**

*Hong Kong Link Road*

2.1.1 N/A

*Hong Kong Boundary Crossing Facilities*

2.1.2 N/A

2.1.3A The proposed HKBCF will comprise the following:

- i. Cargo clearance facilities including kiosks for clearance of good vehicles, customs inspection platforms, X-ray building, etc.;
- ii. Passenger related facilities including processing kiosks and examination facilities for private cars and coaches, annexure for examination of accompanying passengers of private cars, etc.;
- iii. Accommodation/offices for the facilities (like fire station, police station, buildings for ImmD, C&ED, AFCD, FHED, DofH etc.) of the Government departments providing services in connection with the HKBCF;
- iv. Provision of transport and miscellaneous facilities inside the HKBCF including public transport interchange (PTI), transport drop-off and pick-up areas, vehicle holding areas, passenger queuing areas, road networks, footbridges, fencing, sewerage and drainage systems, sewage treatment plant and treated effluent disposal facilities, water supply system, building services works, electronic system, and traffic control and information system including traffic control and surveillance system (TCSS), etc.;
- v. Provision of roads connecting the BCF to the Hong Kong Link Road (HKLR), the Tuen Mun – Chek Lap Kok Link (TM-CLKL) and the Hong Kong International Airport (HKIA), expect the part of road works in HKIA entrusted to the HKLR project;
- vi. Reprovisioning of the affected HKIA's facilities, expect those affected by the Automated People Mover (APM) system such as the existing east rescue berth;
- vii. TCSS under sub-clauses (iii) and (iv) above except the civil works provision and power supply for the part of road works in HKIA entrusted to the HKLR project; and
- viii. TCSS (except civil works provision and power supply) of the HKLR and TMCLKL Southern Connection.

## **2.2 Implementation Programme**

2.2.1A Construction of the HKBCF Vehicle Clearance Plazas and Ancillary Buildings and Facilities will be commenced in late August 2015 and shall be completed by late August 2017.

2.2.2 **Appendix A** illustrates the tentative construction programme for the Project. All the key construction activities are shown with the tentative dates for commencement and completion.

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Report No.: 0165/15/ED/0046

- 2.2.3 Detailed EIA assessments were conducted and presented in the relevant EIA reports. All necessary mitigation measures were identified and recommended in the original EM&A Manuals. The mitigation measures which are applicable to the Contract were extracted from Environmental Mitigation Implementation Schedule in the original EM&A Manuals and are given in **Appendix B**. It specifies the extent, locations, time frame and responsibilities for the implementation of the environmental mitigation measures identified.

### **2.3 Concurrent Projects during Construction Phase**

- 2.3.1 N/A

- 2.3.2 The construction of Main Bridge of the HZMB within the Guangdong water would also be concurrent with the construction of HKBCF and southern landfall of TM-CLKL. The tentative commissioning date is also in Year 2016.

- 2.3.3 Another concurrent project during the construction of HKBCF and southern landfall of TM-CLKL is the 72 ha reclamation for Lantau Logistics Park. This has been considered as a concurrent project.

- 2.3.4A Construction of HZMB Hong Kong Link Road (HKLR) and TM-CLKL were commenced in Year 2012 and scheduled to open in Year 2016 for HKLR and in Year 2017 for TM-CLKL in matching the commissioning date of HKBCF.



Report No.: 0165/15/ED/0046

**3. CONTRACT ORGANISATION****3.1 Contract Organisation**

3.1.1 The proposed contract organisation and lines of communication with respect to environmental protection works are shown in Appendix C.

3.1.2 The leader of the ET shall be an independent party from the Contractor and has relevant professional qualifications, and have at least 7 years of experience in conducting EM&A projects subject to approval of the Engineer's Representative (ER), Independent Environmental Checker (IEC) and EPD.

3.1.3 The responsibilities of respective parties are:

3.1.3.1 The Contractor

- employ an Environmental Team (ET) to undertake monitoring, laboratory analysis and reporting of environmental monitoring and audit;
- provide assistance to ET, IEC and ENPO in carrying out monitoring and auditing;
- provide site and works information upon the request of ET, IEC or ENPO within two working days of such request;
- participate in site inspections undertaken by the ET, as required, and undertake any corrections as instructed by the Engineer;
- submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans;
- implement measures to reduce impact where Action and Limit levels are exceeded;
- adhere to the procedures for environmental complaint investigation as set out in Section 15.3 of this EM&A Manual; and
- adhere to the agreed procedures for carrying out complaint investigation.

3.1.3.2 Environmental Team (ET)

- set up all the required environmental monitoring stations;
- monitor various environmental parameters as required in the Contract Specific EM&A Manual;
- analyse the environmental monitoring and audit data and review the success of EM&A programme to cost-effectively confirm the adequacy of mitigation measures implemented and the validity of the EIA predictions and to identify any adverse environmental impacts arising;
- to conduct environmental investigation and submit the ET Leader certified investigation report to the Contractor, IEC, ENPO and ER upon receive of environmental enquiry and/or complaint;
- carry out site inspection to investigate and audit the Contractors' site practice, equipment and work methodologies with respect to pollution control and environmental mitigation, and take proactive actions to pre-empt problems;

Report No.: 0165/15/ED/0046

- audit and prepare audit reports on the environmental monitoring data and site environmental conditions;
- report on the environmental monitoring and audit results to the IEC, ENPO, Contractor, the ER and EPD or its delegated representative;
- recommend suitable mitigation measures to the Contractor in the case of exceedance of Action and Limit levels in accordance with the Event and Action Plans;
- undertake regular on-site audits/inspections and report to the Contractor, IEC, ENPO and the ER of any potential non-compliance; and
- follow up and close out non-compliance actions.

#### 3.1.3.3 Engineer or Engineer's Representative (ER)

- supervise the Contractor's activities and ensure that the requirements in the Contract Specific EM&A Manual are fully complied with;
- inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
- Assist the IEC and ENPO to audit the results of the EM&A works carried out by the ET; and
- Comply with the agreed Event and Action Plan in the event of any exceedance.

#### 3.1.3.4 Independent Environmental Checker (IEC)

- review the EM&A works performed by the ET (at not less than monthly intervals);
- audit the monitoring activities and results (at not less than monthly intervals);
- report the audit results to the ER and EPD in parallel;
- review the EM&A reports (monthly and quarterly summary reports) submitted by the ET;
- review the proposal on mitigation measures submitted by the Contractor in accordance with the Event and Action Plans;
- check the mitigation measures that have been recommended in the EIA and this Manual, and ensure they are properly implemented in a timely manner, when necessary; and
- report the findings of site inspections and other environmental performance reviews to ER and EPD.

#### 3.1.3.5 Environmental Protection Office (ENPO)

Notwithstanding the above, given that the Tuen Mun - Chek Lap Kok Link (TMCLKL), HKBCF and HKLR will be constructed concurrently, an Environmental Protection 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:

- coordinate 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;

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Report No.: 0165/15/ED/0046

- review cumulative impacts including possible sources/causes of exceedance and recommending suitable remedial actions;
- liaise with the mainland project teams for HZMB Main Section to identify and assess any cross-boundary cumulative impacts in order to establish suitable remedial actions where necessary; and
- coordinate the assessment and response to complaints/enquires from locals, green groups, district councils or the public at large.

The exact responsibilities and organisation of the ENPO have been defined by the Project Proponent in accordance with the relevant Environmental Permits.

- 3.1.4 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Contract.
- 3.1.5 The ET Leader shall have at least 7 years of experience in conducting EM&A for infrastructure projects. His qualification shall be vetted by the ER and the IEC.

Report No.: 0165/15/ED/0046

#### **4. ENVIRONMENTAL SUBMISSION**

##### **4.1 Introduction**

- 4.1.1 The Contractor shall prepare the Environmental Management Plan (EMP) (including a Waste Management Plan), Construction Method Statement and obtain approval from ER, IEC and relevant authorities to encompass the recommended environmental protection / mitigation measures with respect to their latest construction methodology and programme. All environmental submission shall be certified by the ET leader before seeking verification from the IEC.

##### **4.2 Environmental Management Plan (EMP)**

- 4.2.1 A systematic EMP shall be set up by the Contractor to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in the EIA, EM&A and EMIS. The ER and the IEC will audit the implementation status against the EMP and advise the necessary remedial actions required. These remedial actions shall be enforced by the ER through contractual means.
- 4.2.2 The EMP will define in detail how the Contractor (together with its sub-Contractors) implements the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the EIA documentation.
- 4.2.3 The review of on-site environmental performance shall be undertaken by ER and IEC through a systematic checklist and audit once the construction commences. The environmental performance review programme comprises a regular assessment on the effectiveness of the EMP. Reference should be made to ETWBTC 19/2005 "Environmental Management on Construction Sites" or its latest versions, and any other relevant Technical Circulars.

##### **4.3 Waste Management Plan**

- 4.3.1 As part of the EMP, the Contractor shall include a WMP for the construction of the project in accordance with the ETWBTC(W) No. 19/2005 and submit to the ET, IEC for verification and deposit with EPD, at least 1 month before the commencement of the construction of the Project. Where waste generation is unavoidable, the opportunities for recycling or reusing should be maximised. If wastes cannot be recycled, recommendations for appropriate disposal routes should be provided in the WMP. A method statement for stockpiling and transportation of the excavated materials and other construction wastes should also be included in the WMP and approved before the commencement of construction. All mitigation measures arising from the approved WMP shall be fully implemented. In addition to the above, the WMP should also include the following:

- Waste management policy;
- Record of generated waste;
- Waste reduction target;

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Report No.: 0165/15/ED/0046

- Waste reduction programme;
- Role and responsibility of waste management team;
- Benefit of waste management;
- Reuse, recycling and disposal plans;
- Analysis of waste materials; and
- Monitoring and action plan.

4.3.2 For the purpose of enhancing the management of Construction and Demolition (C&D) materials including rock, and minimising its generation at source, construction would be undertaken in accordance with the Environment, Transport and Works Bureau Technical Circular (Works) No. 33/2002 - Management of Construction and Demolition Material Including Rock, or its latest versions. The management measures stipulated in the Technical Circular should be incorporated into the WMP.

#### **4.4 Construction Method Statement**

4.4.1 In case the Contractor would like to adopt alternative construction methods or implementation schedules, it is required to submit details of methodology and equipment to the ER for approval before the work commences. Any changes in construction method shall be reflected in a revised EMP or the Contractor will be required to demonstrate the manner in which the existing EMP should accommodate the proposed changes. The Contractor may need to apply for a Further Environmental Permit (FEP) from EPD before commencement of any construction activities.

Report No.: 0165/15/ED/0046

**5. AIR QUALITY****5.1 Air Quality Parameters**

- 5.1.1 Monitoring TSP levels and auditing air quality impact during construction phase shall be carried out by the ET to ensure that any deteriorating air quality could be swiftly detected and followed by rectifications.
- 5.1.2 1-hour and 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The 24-hour 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 of the IEC, 1-hour TSP levels can be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method, to indicate short event impacts.
- 5.1.3 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, and any other local atmospheric factors affecting or affected by site conditions, etc., shall be recorded down in detail. A sample data sheet is shown in **Appendix D**.

**5.2 Monitoring Equipment**

- 5.2.1 High volume samplers (HVSs) complying with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:
- a. 0.6 - 1.7 m<sup>3</sup> per minute adjustable flow range;
  - b. Equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
  - c. Installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
  - d. Capable of providing a minimum exposed area of 406cm<sup>2</sup>;
  - e. Flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
  - f. Equipped with a shelter to protect the filter and sampler;
  - g. Incorporated with an electronic mass flow rate controller or other equivalent devices;
  - h. Equipped with a flow recorder for continuous monitoring;
  - i. Provided with a peaked roof inlet;
  - j. Incorporated with a manometer;
  - k. Capable to hold and seal the filter paper to the sampler housing at horizontal position;
  - l. Easily changeable filter; and
  - m. Capable of operating continuously for a 24-hour period.
- 5.2.2 The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. They shall ensure that sufficient number of HVSs with an appropriate calibration kit is available for carrying out the baseline monitoring, regular impact monitoring and ad-hoc monitoring. The HVSs 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.

Report No.: 0165/15/ED/0046

- 5.2.3 Initial calibration of dust monitoring equipment shall be conducted 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 ET shall provide the relevant calibration data and laboratory calibration certificate which should be properly document for future reference by the IEC and other concerned parties. All the data should be converted into standard temperature and pressure condition.
- 5.2.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded in the data sheet as mentioned in **Appendix D.**
- 5.2.5 If the ET leader proposes alternative dust monitoring equipment / methodology (e.g. use a direct reading dust meter to measure 1-hour TSP levels) after the approval of this EM&A manual, he shall seek approval from the IEC by submitting sufficient information to the IEC indicating that the instrument is capable of achieving a comparable result to the HVS. The instrument should also be calibrated regularly as specified by the equipment's manufacturer, in which the laboratory calibration certificate shall be submitted to the IEC for approval. The 1-hour sampling shall also be determined periodically by the HVS to check the validity and accuracy of the results measured by direct reading method, and the checking results shall also submitted to the IEC for approval.
- 5.2.6 Wind data monitoring equipment shall also be provided and set up for logging wind speed and wind direction near the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the IEC. For installation and operation of wind data monitoring equipment, the following points shall be observed:
- Wind sensors should be installed 10m above ground so that they are clear of obstructions or turbulence caused by buildings.
  - The wind data should be captured by a data logger. The data shall be downloaded for analysis at least once a month.
  - Wind data monitoring equipment should be re-calibrated at least once every six months.
  - Wind direction should be divided into 16 sectors of 22.5 degrees each.
- 5.2.7 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon the approval from the ER and agreement from the IEC.
- 5.3 Laboratory Measurement / Analysis**
- 5.3.1 A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments to handle the dust samples collected, shall be available for sample analysis, and equipment calibration and maintenance. The laboratory should be HOKLAS accredited.
- 5.3.2 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 ER and the measurement procedures shall be witnessed by the IEC. Any measurement performed by

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

the laboratory shall be demonstrated to the satisfaction of the ER and IEC. IEC shall regularly audit to the measurement performed by the laboratory to ensure the accuracy of measurement results. The ET Leader shall provide the ER with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

5.3.3 Filter paper of size 8" x 10" shall be labelled before sampling. It shall be a clean filter paper with no pinholes, and shall be conditioned in a humidity-controlled chamber for over 24-hours and be pre-weighed before use for the sampling.

5.3.4 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 readout down to 0.1mg. The balance shall be regularly calibrated against a traceable standard.

5.3.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

## 5.4 Monitoring Locations

5.4.1 **Figure 5-1** and **Table 5.1** shows the locations of the proposed air quality monitoring stations. The status and locations of air sensitive receivers may change after issuing this EM&A manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from the ER and agreement from the IEC.

**Table 5.1 Air Monitoring Locations**

Identification No.	Location (ASR ID)
AMS 6	Dragonair/CNAC (Group) Building (A80)
AMS 7#	Hong Kong SkyCity Marriott Hotel

Note:

1. The monitoring results for AMS6 and AMS7A will be reported in the monthly EM&A Reports prepared for Contract Nos. HY/2011/03 and HY/2010/02 respectively.
  2. The ET of this Contract should conduct impact air quality monitoring at the AMS listed in the table as part of EM&A programme according to the latest notification from ENPO when the monitoring station(s) is/are no longer covered by another ET of the HZMB project. The ET of the Contract shall communicate and share the monitoring data to the ET(s) of other works contracts if the air quality monitoring station(s) is/are as part of EM&A programme.
- # The Air Quality Monitoring Station, AMS7A (Chu Kong Air-Sea Union Transportation Co. Ltd.), has been relocated back to the original location AMS7 (Hong Kong SkyCity Marriott Hotel) of the updated EM&A Manual as approved by EPD. The air monitoring at AMS7 will start from January 2016.

5.4.2 When alternative monitoring locations are proposed, the proposed site should, as far as practicable:

- a. be at the site boundary or such locations close to the major dust emission source;
- b. be close to the sensitive receptors; and
- c. take into account the prevailing meteorological conditions.

5.4.3 The ET shall agree with the ER in consultation with the IEC on the position of the HVS for the installation of the monitoring equipment. When positioning the samplers, the following points shall be noted:

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- a. a horizontal platform with appropriate support to secure the samplers against gusty wind should be provided;
- b. no two samplers should be placed less than 2 meters apart;
- c. the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- d. a minimum of 2 meters of separation from walls, parapets and penthouses is required for rooftop samplers;
- e. a minimum of 2 meters separation from any supporting structure, measured horizontally is required;
- f. no furnace or incinerator flue is nearby;
- g. airflow around the sampler is unrestricted;
- h. the sampler is more than 20 meters from the dripline;
- i. any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;
- j. permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- k. a secured supply of electricity is needed to operate the samplers.

5.4.4 The ENPO may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed/ relocated during any stage of the construction phase.

## **5.5 Baseline Monitoring for Fugitive Dust**

5.5.1 Baseline monitoring shall be carried out at all of the designated monitoring locations (see **Table 5.1**) for at least 14 consecutive days prior to the commissioning of major construction works to obtain daily 24-hour TSP samples. The selected baseline monitoring stations should reflect baseline conditions at the impact stations. 1-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

5.5.2 During the baseline monitoring, there should not be any major construction or dust generation activities in the vicinity of the monitoring stations. Before commencing baseline monitoring, the ET shall inform the IEC of the baseline monitoring programme such that, if required, the IEC can conduct on-site audit to ensure accuracy of the baseline monitoring results.

5.5.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations, the ET Leader shall carry out the monitoring at alternative locations that can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER and agreed with the IEC.

5.5.4 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC, ENPO and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to ER for approval.

Report No.: 0165/15/ED/0046

5.5.5 Ambient conditions may vary seasonally and shall be reviewed once every three months. When the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining the 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 change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, should be revised. The revised baseline levels and air quality criteria should be agreed with the IEC, ENPO and EPD.

5.5.6A ET of Contract No. HY/2013/03 will make reference to the baseline monitoring previously conducted under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works. The Contract No. HY/2013/03 is one of the construction contracts for the HZMB and there are no significant changes to the ambient conditions since the commencement of construction of the HZMB

## 5.6 Impact Monitoring for Fugitive Dust

5.6.1 ET shall carry out impact monitoring during the entire construction period. For regular impact monitoring, the sampling frequency of at least once in every 6 days, shall be strictly observed at all the monitoring stations for 24-hour TSP monitoring. For 1-hour TSP monitoring, the sampling frequency of at least 3 times in every 6 days should be undertaken when the highest dust impact occurs. Before commencing impact monitoring, the ET shall inform the IEC of the impact monitoring programme such that the IEC can conduct on-site audit to ensure accuracy of the monitoring results.

5.6.2 The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and be strictly followed by the ET.

5.6.3 In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in the following section, shall be conducted within the specified timeframe after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified, and agreed with the ER and the IEC.

## 5.7 Action / Limit Levels

5.7.1 The results of baseline monitoring form the basis for determining the air quality criteria for impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 5.2** shows the Action and Limit levels to be used.

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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**Table 5.2 Action / Limit Levels for Air Quality**

Parameters	Location	Action	Limit
24-hour TSP Level	AMS6*	173µg/m <sup>3</sup>	260µg/m <sup>3</sup>
	AMS7#+	183µg/m <sup>3</sup>	
1-hour TSP Level	AMS6*	360µg/m <sup>3</sup>	500µg/m <sup>3</sup>
	AMS7#+	370µg/m <sup>3</sup>	

\* Reference is made to EPD conditional approval of the omission of air monitoring station (AMS 6) for the project issued and became effective on 19 November 2012.

# Reference is made to ET's proposal of relocation of AMS7 (Hong Kong SkyCity Marriott Hotel) on 2 February 2015 and EPD's memo dated on 05 February 2015 regarding the approval of ET's proposal for relocating air monitoring station from AMS7 to AMS7A for Contract No. HY/2010/02. The aforesaid relocation was completed and AMS7A was effective since 5 February 2015.

+ The Air Quality Monitoring Station, AMS7A (Chu Kong Air-Sea Union Transportation Co. Ltd.), has been relocated back to the original location AMS7 (Hong Kong SkyCity Marriott Hotel) of the updated EM&A Manual as approved by EPD. The air monitoring at AMS7 will start from January 2016.

## 5.8 Event and Action Plan

- 5.8.1 Should non-compliance of the air quality criteria occur, actions in accordance with the Action Plan in **Table 5.3** shall be carried out.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

**Table 5.3 Event / Action Plan for Air Quality**

Event	Action			
	ET	IEC	ER	Contractor
<b>Action Level</b>				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform IEC and ER; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
2. Exceedance for two or more consecutive samples	1. Identify source; 2. Inform IEC and ER; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency to daily; 6. Discuss with IEC and Contractor on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise Implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER within 3 working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

Event	Action			
	ET	IEC	ER	Contractor
<b>Limit Level</b>				
1. Exceedance for one sample	1. Identify source, investigate the causes of exceedance and propose remedial measures; 2. Inform ER, Contractor and EPD; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency to daily; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Check monitoring data submitted by ET; 2. Check Contractor's working method; 3. Discuss with ET and Contractor on possible remedial measures; 4. Advise the ER on the effectiveness of the proposed remedial measures; 5. Supervise implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Amend proposal if appropriate.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

Event	Action			
	ET	IEC	ER	Contractor
2. Exceedance for two or more consecutive samples	1. Notify IEC, ER, Contractor and EPD; 2. Identify source; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency to daily; 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to IEC within 3 working days of notification; 3. Implement the agreed proposals; 4. Resubmit proposals if problem still not under control; 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

Report No.: 0165/15/ED/0046

## **5.9 Mitigation Measures**

- 5.9.1 The approved EIA Report has recommended dust control measures including 8 times of watering per day. During the operation of the barging facilities, good site practices such as road surface paving, dust enclosures, wheels wash facilities would be implemented to reduce the generation of dust.
- 5.9.2 All the proposed mitigation measures are summarised in the Environmental Mitigation Implementation Schedule (EMIS) in **Appendix B**.

## **5.10A Reporting of Monitoring Data to ENPO**

- 5.10A.1 The Assignment, which involves multiple construction contracts, would be constructed concurrently with other major infrastructures such as the HKLR and TM-CLKL. These interface projects will be overviewed by the ENPO. The ENPO will also oversee and coordinated the cumulative environmental issues arising from the concurrent projects.
- 5.10A.2 To facilitate the ENPO to evaluate environmental impacts and investigate complains, the ET Leader shall provide the impact air quality monitoring results within one week after monitoring event. If the 1-hr TSP is measured by direct reading, the results shall be submitted to ENPO in the next working day. The ET Leader shall follow ENPO's requirements on the data submission format and procedures as per the current ET's practice and enable rapid response by all concerned parties.

Report No.: 0165/15/ED/0046

## **6. NOISE**

### **6.1 Noise Quality Parameters**

6.1.1 Construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). Leq, 30 mins shall be used as the monitoring parameter for the time period between 0700 and 1900 hours on normal weekdays. For all other time periods, Leq 5 min shall be employed for comparison with the Noise Control Ordinance (NCO) criteria.

6.1.2 As supplementary information for data auditing, statistical results such as L<sub>10</sub> and L<sub>90</sub> shall also be obtained for reference. A sample data sheet is shown in **Appendix D**.

### **6.2 Monitoring Equipment**

6.2.1 As referred to in the Technical Memorandum (TM) issued under the NCO, sound level meters in compliance with the International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agrees to within 1.0 dB.

6.2.2 Noise measurements should be made in accordance with standard acoustical principles and practices in relation to weather conditions.

6.2.3 The ET is responsible for the provision, installation, operation, maintenance, dismantle of the monitoring equipment. He/she shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad-hoc monitoring. All the equipment and associated instrumentation shall be clearly labeled.

6.2.4A Due to refusal of establishing at monitoring location NMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual for Contract No. HY/2010/02, noise monitoring was conducted at site boundary of the site office area at Works Area WA2 (NMS3B). Same baseline and Action Level for noise, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative noise monitoring location.

### **6.3 Monitoring Locations**

6.3.1 The information and location of construction noise monitoring stations are presented in **Table 6.1** and shown in **Figure 6-1** respectively.



**Table 6.1 Proposed Airborne Construction Noise Monitoring Location**

ID	Description
NMS2	Seaview Crescent
NMS3B	Site Boundary of Site Office Area at Works Area WA2

Note:

1. The monitoring results for NMS2 and NMS3B will be reported in the monthly EM&A Reports prepared for Contract No. HY/2010/02 respectively.
2. The ET of this Contract should conduct impact noise monitoring at the NMS listed in the table as part of EM&A programme according to the latest notification from ENPO when the monitoring station(s) is/are no longer covered by another ET of the HZMB project. The ET of the Contract shall communicate and share the monitoring data to the ET(s) of other works contracts if the noise monitoring station(s) is/are as part of EM&A programme.
3. The Action and Limit Levels for schools will be applied for alternative noise monitoring station NMS3B.

6.3.2 When alternative noise monitoring location is proposed, the monitoring location shall be chosen based on the following criteria:

- At locations close to the major site activities which are likely to have noise impacts;
- Close to the most affected existing noise sensitive receivers; and
- For monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The ET shall seek approval from ER and agreement from the IEC to the proposal of alternative monitoring location.

6.3.3 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receiver building façade and be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB (A) shall be made to the free field measurements. The ET shall agree with the IEC on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same position.

6.3.4 The ENPO may, depending on site conditions and monitoring results, decide whether additional monitoring locations shall be included or any monitoring locations could be removed/relocated during any stage of the construction phase.

## **6.4 Baseline Monitoring for Construction Noise**

6.4.1 The ET shall carry out baseline monitoring prior to the commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels  $L_{eq}$ ,  $L_{10}$  and  $L_{90}$  shall be carried out daily for a period of at least two weeks in a sample period of 5 minutes or 30 minutes between 07:00 and 19:00, and 5 minutes between 19:00 and 07:00. A schedule on the baseline monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

Report No.: 0165/15/ED/0046

6.4.2 In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the IEC, ENPO and EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

6.4.3A ET of Contract No. HY/2013/03 will make reference to the baseline monitoring previously conducted under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works. The Contract No. HY/2013/03 is one of the construction contracts for the HZMB and there are no significant changes to the ambient conditions since the commencement of construction of the HZMB

## 6.5 Impact Monitoring for Construction Noise

6.5.1 During normal construction working hour (07:00-19:00 Monday to Saturday), monitoring of Leq 30 min noise levels (as six consecutive Leq 5 min readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

6.5.2 If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the school during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

6.5.3 In case of non-compliance with the construction noise criteria, more frequent monitoring, as specified in the Action Plan, shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

6.5.4 A schedule on the compliance monitoring shall be submitted to the ER and IEC for approval before the monitoring starts.

## 6.6 Event and Action Plan for Construction Noise

6.6.1 The Contract No. HY/2013/03 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Vehicle Clearance Plazas and Ancillary Buildings and Facilities is under the same Environmental Permit (EP-353/2009/I). The Action and Limit Levels of Monitoring Stations NMS2 and NMS3B were accepted by EPD and used until the completion of HZMB Project. The Action and Limit Levels for construction noise are defined in **Table 6.2**. Should non-compliance of the criteria occur, actions in accordance with the Action Plan in **Table 6.3** shall be taken.

**Table 6.2 Action and Limit Levels for Construction Noise**

Time Period	Action Level	Limit Level
07:00-19:00 hours on normal weekdays	When one documented complaint is received	75 dB(A)*

Note: If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the Noise Control Authority have to be followed.

\* Reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
 Profit Industrial Building,  
 1-15 Kwai Fung Crescent, Kwai Fong,  
 Hong Kong.

Tel : (852)-24508238  
 Fax : (852)-24508032  
 Email : mcl@fugro.com.hk



Report No.: 0165/15/ED/0046

**Table 6.3 Event / Action Plan for Construction Noise Monitoring**

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. <u>Notify IEC and Contractor;</u> 2. <u>Identify source, investigate the causes of exceedance and propose remedial measures;</u> 3. Report the results of investigation to the IEC, ER and Contractor; 4. Discuss with the Contractor and formulate remedial measures; 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analysed results submitted by the ET; 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly; 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of failure in writing; 2. Notify Contractor; 3. Require Contractor to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC; 2. Implement noise mitigation proposals.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Event	Action			
	ET	IEC	ER	Contractor
Limit Level	<ol style="list-style-type: none"> <li>1. Inform IEC, ER, EPD and Contractor;</li> <li>2. Identify source;</li> <li>3. Repeat measurements to confirm findings;</li> <li>4. Increase monitoring frequency;</li> <li>5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented;</li> <li>6. Inform IEC, ER and EPD the causes and actions taken for the exceedances;</li> <li>7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results;</li> <li>8. If exceedance stops, cease additional monitoring.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>2. Review Contractor remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>3. Supervise the implementation of remedial measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Confirm receipt of notification of failure in writing;</li> <li>2. Notify Contractor;</li> <li>3. Require Contractor to propose remedial measures for the analysed noise problem;</li> <li>4. Ensure remedial measures properly implemented;</li> <li>5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.</li> </ol>	<ol style="list-style-type: none"> <li>1. Take immediate action to avoid further exceedance;</li> <li>2. Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>3. Implement the agreed proposals;</li> <li>4. Resubmit proposals if problem still not under control;</li> <li>5. Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

## 6.7 Mitigation Measures

6.7.1 The approved EIA Report has recommended construction noise control measures including the use of quiet plant and temporary noise barriers. All the proposed mitigation measures are summarised in the EMIS in **Appendix B**.

6.7.2 N/A

6.7.3A Also, the Working Paper for Environmental Studies of HKBCF has recommended control measures. The recommended noise control measures are summarised as follows:

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

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- Good site practices and noise management techniques;
- Use of site hoarding;
- Use of movable noise barrier and full enclosure for relatively static plant;
- Use of “quiet” plant and working methods;
- Sequencing operation of construction plant equipment; and
- Rescheduling to avoid noise construction works during school examination.

### **6.8A Reporting of Monitoring Data to ENPO**

- 6.8A.1 The Assignment, which involves multiple construction contracts, would be constructed concurrently with other major infrastructures such as the HKLR and TM-CLKL. These interface projects will be overviewed by the ENPO. The ENPO will also oversee and coordinate the cumulative environmental issues arising from the concurrent projects.
- 6.8A.2 To facilitate the ENPO to evaluate environmental impacts and investigate complaints, the ET Leaders shall provide the impact noise monitoring results within one working day after the monitoring event. The ET Leader shall follow ENPO's requirement on the data submission format and procedure.

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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### 7. SEDIMENT QUALITY

#### 7.1 Summary

- 7.1.1 The sediment quality data has been reviewed and the findings of the site investigation for sediment quality in relation to the current study area for HKBCF and TMCLKL is summarised in the EIA Report, there is no requirement on environmental monitoring and audit for sediment quality.
- 7.1.2 The requirements as recommended in ETWB TC 34/2002 Management of Dredged/Excavated Sediment will be adopted for sediment disposal.

Report No.: 0165/15/ED/0046

**8. WASTE MANAGEMENT****8.1 General**

- 8.1.1 The quantity and generation pattern of construction waste have been forecasted. Construction waste reduction measures, including on-site sorting, reuse excavated materials in reclamation etc. are deployed in the construction methodology to minimize the surplus materials to be disposed off-site. Disposal of chemical waste should be performed by a licensed waste hauler.
- 8.1.2 All the proposed mitigation measures are stipulated in the approved EIA Report and summarized in the EMIS in **Appendix B**.
- 8.1.3 The types and quantities of waste that would be generated during the operational phase have been assessed. It is anticipated there would not be any insurmountable impacts during the operation phase. A trip-ticket system should be operated to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal.
- 8.1.4 Recommendations have been made to ensure proper treatment and proper disposal of these wastes in the EIA Report and all the proposed mitigation measures are stipulated in the EIA Report, and are summarized in the EMIS in **Appendix B**.
- 8.1.5 EM&A requirements are required for waste management during the construction phase only and the effective management of waste arising during the construction phase will be monitoring 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.

**8.2 Waste EM&A Requirements**

- 8.2.1 The Contractor shall pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant license/permits for waste disposal. The 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.
- 8.2.2 The Contractor shall refer to the relevant booklets issued by the EPD when applying for the license/permit and the ET shall refer to these booklets for auditing purposes.

Report No.: 0165/15/ED/0046

- 8.2.3 During the site inspections and the document review procedures, 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.
- 8.2.4 The Contractor's waste management practices should be audited with reference to the checklist detailed in **Table 8.1** below:

**Table 8.1 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 hauliers are used for waste collection.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER 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 ER 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 ER and IEC of the non-compliance. The ER 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 ER and IEC of the non-compliance. The ER shall instruct the Contractor to clean the storage area and/or cover the waste.



**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
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 ER and IEC of the non-compliance. The ER 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 ER and IEC of the non-compliance. The ER 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 ER and IEC of the non-compliance. The ER 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 ER and IEC of the non-compliance. The ER 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, ER – Engineer's Representative

Report No.: 0165/15/ED/0046

**9. WATER QUALITY****9.1 Water Quality Parameters**

9.1.1 This Contract involves minor marine works for disposal of sediment to marine dumping site, and it is anticipated the majority of construction works will be land-based. With proper implementation of recommended mitigation measures and with the implementation of regular site audit to ensure proper implementation of the mitigation measures and for compliance checking, no adverse water quality impact would be expected. All water quality monitoring details, requirements for this Contract shall be referred to the EM&A Reports prepared under Contract No. HY/2010/02.

9.1.2 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.

9.1.3 The guidelines outlined in the Practice Note for Professional Persons Environmental Consultative Committee (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 suspended solid (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.
- 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.

Report No.: 0165/15/ED/0046

- 9.1.4 Upon completion of the HKLR / HKBCF development, stormwater drainage systems would be completed to collect stormwater generated from the whole area including new roads. Sewage generated from the HKBCF development would be treated on site to fulfil effluent limit for discharge. Additional mitigation measures would not be required.
- 9.1.5 N/A
- 9.1.6 Dissolved oxygen (DO), turbidity (NTU), suspended solids (SS) and other general in situ parameters shall be monitored at all designated marine water quality monitoring stations during the whole construction period. DO and turbidity should be measured in-situ whereas SS should be determined by an accredited laboratory.
- 9.1.7 Other relevant data shall also be recorded, 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.
- 9.1.8 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.
- 9.1.9 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.

## **9.2 Monitoring Equipment**

### *Dissolved Oxygen and Temperature Measuring Equipment*

- 9.2.1 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:
- a DO level in the range of 0 - 20 mg/ L and 0 - 200% saturation; and
  - a temperature of 0 - 45 degree Celsius.
- 9.2.2 It should have a membrane electrode with automatic temperature compensation complete with a cable.
- 9.2.3 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.

### *Turbidity Measurement Instrument*

- 9.2.4 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).

Report No.: 0165/15/ED/0046

### *Sampler*

- 9.2.5 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).

### *Water Depth Detector*

- 9.2.6 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.

### *Salinity*

- 9.2.7 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.

### *pH Measuring Equipment*

- 9.2.8 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).

### *Sample Containers and Storage*

- 9.2.9 Water samples for SS should be stored in high density polythene bottles with no preservative added, 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.

### *Monitoring Position Equipment*

- 9.2.10 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.

### *Calibration of In-situ Instruments*

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

- 9.2.11 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.

### *Back-up Equipment and Vessels*

- 9.2.12 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.
- 9.2.13 The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions (within  $\pm 1.75$  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 ER, IEC, ENPO and EPD.

## 9.3 Laboratory Measurement / Analysis

- 9.3.1 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 9.1**.

**Table 9.1 Laboratory Analysis for SS**

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

- 9.3.2 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 ER. The ET Leader shall provide the ER 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.

## **9.4 Monitoring Locations**

9.4.1 The water quality monitoring stations, control stations and locations for during the construction and operation phase of HKBCF is shown in **Figure 9-1**. The demarcation of the monitoring stations for different projects will be further determined by the ENPO before the commencement of the construction.

The following criteria shall be considered for the selection of monitoring stations:

- i. Impact stations (IS) within 250m – 500m envelope of the construction works.
- ii. Sensitive receiver stations (SR) near to key sensitive receivers.
- iii. Control / far field stations (CS) at representative locations with less influence by the projects 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 353/2009). Therefore, monitoring of nutrients and heavy metals of Mf Stations are no longer required.

9.4.2 The co-ordinates of the proposed monitoring stations during the construction phase are listed in **Table 9.2**. As shown in **Figure 9-1**, the proposed locations for the sensitive receiver monitoring stations represent the typical sensitive receivers around the project works.

**Table 9.2 Water Quality Monitoring Stations (construction phase)**

Station	Description	East	North	Parameters to be measured
IS5	Impact Station (Close to HKBCF construction site)	811579	817106	DO, Turbidity, SS
IS(Mf)6	Impact Station (Close to HKBCF construction site)	812101	817873	DO, Turbidity, SS
IS7	Impact Station (Close to HKBCF construction site)	812244	818777	DO, Turbidity, SS
IS8	Impact Station (Close to HKBCF construction site)	814251	818412	DO, Turbidity, SS
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	DO, Turbidity, SS
IS10	Impact Station (Close to HKBCF construction site)	812577	820670	DO, Turbidity, SS
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716	DO, Turbidity, SS
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497	DO, Turbidity, SS
IS17	Impact Station (Close to HKBCF construction site)	814539	820391	DO, Turbidity, SS
SR3	Sensitive receivers (San Tau SSSI)	810525	816456	DO, Turbidity, SS
SR4(N)	Sensitive receivers (Tai Ho)	814705	817859	DO, Turbidity, SS
SR5	Sensitive receivers (Artificial Reef in NE Airport)	811489	820455	DO, Turbidity, SS
SR6	Sensitive receivers (Sha Chau and Lung Kwu Chau Marine Park)	805837	821818	DO, Turbidity, SS
SR7	Sensitive receivers (Tai Mo Do)	814293	821431	DO, Turbidity, SS
SR10A[1]	Sensitive receivers (Ma Wan FCZ) 1	823741	823495	DO, Turbidity, SS
SR10B(N)[1]	Sensitive receivers (Ma Wan FCZ) 2	823683	823187	DO, Turbidity, SS
CS(Mf)3	Control Station	809989	821117	DO, Turbidity, SS
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS
CS4	Control Station	810025	824004	DO, Turbidity, SS
CS6	Control Station	817028	823992	DO, Turbidity, SS
CSA[2]	Control Station	818103	823064	DO, Turbidity, SS

Note

[1]: Additional monitoring station for Ma Wan FCZ.

[2]: Additional control monitoring station for Ma Wan FCZ.

**9.4.3**

Control stations 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. If there are any changes on the monitoring location, that shall be submitted 4 weeks before commencement of baseline monitoring for EPD approval. ET of Contract No. HY/2013/03 will make reference

Report No.: 0165/15/ED/0046

to the baseline monitoring previously conducted under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works.

9.4.4 *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. 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, ENPO and EPD.

9.4.5 The ENPO may, depending on site conditions and monitoring results, decides whether additional monitoring locations shall be included or any monitoring location could be removed/relocated during any stage of the construction phase after getting approval from EPD.

## **9.5 Baseline Monitoring for Water Quality**

9.5.1 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 9.4 above. The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood (within  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  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.

9.5.2 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.

9.5.3 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.

9.5.4 Refer to Section 9.5.6A for the specific implementation for this contract.

9.5.5 Refer to Section 9.5.6A for the specific implementation for this contract.



Report No.: 0165/15/ED/0046

- 9.5.6A ET of Contract No. HY/2013/03 will make reference to the baseline monitoring previously conducted under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works. The Contract No. HY/2013/03 is one of the construction contracts for the HZMB and there are no significant changes to the ambient conditions since the commencement of construction of the HZMB.

**9.6 Efficiency of Silt Curtain and Cage Curtain**

- 9.6.1 N/A
- 9.6.2 N/A
- 9.6.3 N/A
- 9.6.4 N/A
- 9.6.5 N/A
- 9.6.6 N/A
- 9.6.7 N/A

**9.7 Impact Monitoring for Water Quality***Reclamation*

- 9.7.1 N/A
- 9.7.2 N/A

*Relocation of Mf Sediment with Reclamation Area*

- 9.7.3 N/A
- 9.7.4 N/A

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

- 9.7.5 N/A

*Marine Transportation*

- 9.7.6A Marine transportation would require during the construction. During the construction period, monitoring shall be undertaken 3 days per week, at mid-flood (within  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  hour of the predicted time) tides, with sampling / measurement at the designated monitoring stations. Replicate 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 ER. If the depth is less than 3 m, only the mid-depth measurements need to be taken subject to the approval of the ER. 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.

- 9.7.6B If the impact monitoring results indicate that marine transportation have caused adverse impacts on water quality at the monitoring stations, appropriate actions should be taken and additional mitigation measures should be implemented as necessary. Water quality monitoring frequency has to be increased to once per day when marine transportation is undertaken. 24-hour monitoring of turbidity should be implemented as and when necessary. The monitoring results should be made available to the EPD, ER and IEC within eight working days.

#### *Construction of Box Culvert*

- 9.7.6C As discussed in Section 2.1.3A, the construction of box culverts at the HKBCF (shown in **Figure 1-2**) would be predominantly land-based. While the level of the box culvert would be partly below the high water mark, measures such as use of cofferdam wall would be adopted as necessary to minimize the intrusion of groundwater into works areas. Precast box culvert would be used and adopted in the construction procedure, and it is unlikely that the effluent from box culvert construction contains high level of contaminations. In case seepage of groundwater occurs, groundwater would be pumped out from works areas and discharged to the storm system via silt trap. As no groundwater would be directly discharged into drainages and sea, water quality impacts would not be expected. Similarly, any intrusion of seawater during the construction of the last section of the box culverts near the sea would be also pumped out from works area and discharged to the storm system via silt trap. To minimize the potential water quality impact from the construction of the box culverts, good site practices regarding site runoff control as stated in sections below shall be strictly applied to prevent site run off from entering the marine water without appropriate treatment. Marine vessels/plant will not be engaged for box culvert construction and Dolphin Watching Plan will be required.
- 9.7.6D The cofferdam would be constructed in the form of sheet piles which have been applied in other contracts of this Project, such as during the construction of the pilecaps and piles. According to EIA Report Section 10.7.3.17: Vibratory piler for installation of sheet piling – Sheet piling into the soft seabed sediment (i.e. not requiring to drill onto rock surface) is required along the northern edge of HKBCF reclamation for protecting the reclamation site

from water current. To minimize the acoustic disturbance to Chinese White Dolphin (CWD), sheet piles wall will be driven by using vibratory piler, which is a type of silence piling equipment and the noise generated is anticipated to be minimal. All equipment for installation of cofferdam would be land based. However, this might still results in some disturbance to the sediments in the immediate vicinity of the sheet piles. Floating type silt curtain should be deployed to enclose the cofferdam installation. The Contractor shall be responsible for the design, installation and maintenance of the floating type silt curtain to minimize the impacts on water quality. The design and specification of the floating type silt curtains should be submitted by the Contractor to the Engineer, ET, IEC/ENPO and EPD for approval. As shown in **Figure 1-2**, the last section of the box culverts near the sea at the northern edge of HKBCF is located within the site boundary, for which the use of cofferdam and silt curtain will not lead to additional habitat loss, including temporary. The Contractor shall submit the Dolphin Watching Plan to EPD prior to the commencement of marine works of the Project in accordance with EP condition 2.6.

## **9.8 Post-construction Monitoring**

- 9.8.1 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  $\pm 1.75$  hour of the predicted time) and mid-ebb (within  $\pm 1.75$  hour of the predicted time) tides, for at least 4 weeks.

## **9.9 Impact Operation Phase Monitoring**

9.9.1 N/A

9.9.2 N/A

## **9.10 Event and Action Plan**

- 9.10.1 The Action and Limit levels for water quality are defined in **Table 9.3**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 9.4** shall be carried out.

9.10.2 N/A

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

**Table 9.3 Action and Limit Levels for Water Quality**

Parameters	Action	Limit
DO in mg L <sup>-1</sup>	Surface and Middle = 5.0 Bottom = 4.7	Surface and Middle = 4.2 (except 5 mg/L for FCZ) Bottom = 3.6
SS in mg L <sup>-1</sup> (depth-averaged) at all monitoring stations and control stations	23.5 and 120% of upstream control station's SS at the same tide of the same day*	34.4 and 130% of upstream control station's SS at the same tide of the same day and 10mg/L for WSD Seawater intakes*
Turbidity in NTU (depth-averaged)	27.5 and 120% of upstream control station's turbidity at the same tide of the same day*	47.0 and 130% of upstream control station's turbidity at the same tide of the same day*

\* Remarks: Reference is made to EPD approval of adjustment of water quality assessment criteria issued and became effective on 18 February 2013.

Notes:

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

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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**Table 9.4 Event and Action Plan for Water Quality**

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

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

Event	ET Leader	IEC	ER	Contractor
Limit level being exceeded by one sampling day	<ol style="list-style-type: none"><li>1. Repeat measurement on next day of exceedance to confirm findings;</li><li>2. Identify source(s) of impact;</li><li>3. Inform IEC, contractor, ER and EPD;</li><li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li><li>5. Discuss mitigation measures with IEC, ER and Contractor.</li></ol>	<ol style="list-style-type: none"><li>1. Check monitoring data submitted by ET and Contractor's working method;</li><li>2. Discuss with ET and Contractor on possible remedial actions;</li><li>3. Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly.</li></ol>	<ol style="list-style-type: none"><li>1. Confirm receipt of notification of failure in writing;</li><li>2. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li><li>3. Request Contractor to review the working methods.</li></ol>	<ol style="list-style-type: none"><li>1. Inform the ER and confirm notification of the non-compliance in writing;</li><li>2. Rectify unacceptable practice;</li><li>3. Check all plant and equipment and consider changes of working methods;</li><li>4. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER.</li></ol>
Limit level being exceeded by two or more consecutive sampling days	<ol style="list-style-type: none"><li>1. Repeat measurement on next day of exceedance to confirm findings;</li><li>2. Identify source(s) of impact;</li><li>3. Inform IEC, contractor, ER and EPD;</li><li>4. Check monitoring data, all plant, equipment and Contractor's working methods;</li><li>5. Discuss mitigation measures with IEC, ER and Contractor;</li><li>6. Ensure mitigation measures are Implemented.</li></ol>	<ol style="list-style-type: none"><li>1. Check monitoring data submitted by ET and Contractor's working method;</li><li>2. Discuss with ET and Contractor on possible remedial actions;</li><li>3. Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly;</li><li>4. Supervise the implementation of mitigation measures.</li></ol>	<ol style="list-style-type: none"><li>1. Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li><li>2. Request Contractor to critically review the working methods;</li><li>3. Make agreement on the mitigation measures to be implemented;</li><li>4. Ensure mitigation measures are properly implemented;</li><li>5. 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.</li></ol>	<ol style="list-style-type: none"><li>1. Take immediate action to avoid further exceedance;</li><li>2. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li><li>3. Implement the agreed mitigation measures;</li><li>4. Resubmit proposals of mitigation measures if problem still not under control;</li><li>5. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</li></ol>

### 9.11 Mitigation Measures

- 9.11.1 The approved EM&A Manual has recommended water quality control and mitigation measures. The Contractor should be responsible for the design and implementation of these measures as summarised in **Appendix B**.
- 9.11.2A The construction method stipulated in Section 9.1.10 shall be followed during construction of box culverts to minimize the associated potential water quality impact.

Report No.: 0165/15/ED/0046

**10. ECOLOGY****10.1 Introduction**

- 10.1.1 The EIA Report has assessed the ecological impacts caused by the construction and operation phases. Mitigation measures have been recommended in the EIA to ensure compliance with the relevant legislative requirements. The mitigation measures and ecological monitoring surveys are stated on this manual in the sections below. Baseline monitoring methodology have been prepared under Contract No. HY/2010/02 and shall be applicable for this Contract.

**10.2 Ecological Mitigation Measures and Implementations***Marine Water Quality*

- 10.2.1 Low disturbance construction method: Any significant changes in water quality or turbidity should be avoided. This could be mitigated through construction methods.
- 10.2.2 N/A
- 10.2.3 N/A
- 10.2.4 Good Site Practices - Effluent monitoring should be incorporated to make sure that the discharged effluent from construction sites meet the relevant effluent discharge guidelines.
- 10.2.5 Strict enforcement on No-dumping – To avoid dredging the Chinese White Dolphin habitat, restrictions prohibiting dumping of rubbish, food, oil or chemical will be strictly enforced.
- 10.2.6 Site runoff control – For works on land, standard site runoff control measures will be established and strictly enforced to ensure that discharge of contaminated or silt-laden runoff into North Lantau waters is minimized.
- 10.2.7 Spill response plan - In the event of vessels operating in the works areas transporting oil or other hazardous chemicals, an oil-spill response plan, with specific provisions for protection marine ecology and dolphins, will be formulated.
- 10.2.8 N/A

*Territorial Disturbance*

- 10.2.9 The impact from this minor and short-term source can be reduced by good site practices, including strictly following the permitted work hours, using quieter machines where practicable, and avoiding excessive lightings during night time.

*Sedimentation from Land-based Works Area*

Report No.: 0165/15/ED/0046

- 10.2.10 Although the extent of earthwork will not affect habitats of Romer's tree Frog, good site practices (e.g. watering to reduce dust generation, prevention of siltation of freshwater habitats) are still recommended to be implemented. Site runoff should be desilted to reduce the potential of suspended sediments, organics and other contaminants to enter streams and stranding freshwater (which are potential breeding habitats of Romer's Tree Frog). Caution must be taken to avoid runoff entering the area in which Romer's Tree Frog has been recorded.

*Marine Noise and Disturbance*

## 1) Bored Piling

10.2.11 N/A

10.2.12 N/A

10.2.13 N/A

## 2) Sheet Piling

10.2.14 N/A

10.2.15 N/A

3) Works Vessels

- 10.2.16 Dolphin Exclusion Zone – dolphin exclusion zone of 250m radius should be implemented in the HKBCF and HKLR reclamation sites during the installation of the perimeter silt curtains and any re-deployment of the perimeter silt curtains. Works will be suspended when any Chinese White Dolphin (CWD) is found within the exclusion zone.

- 10.2.17A Dolphin Watching Plan - A dolphin watching plan for works areas will also be included in the EM&A programme. Once the silt curtains are installed or re-deployed, the construction works would be conducted inside the silt curtains and a dolphin exclusion zone is not needed. The plan would include regular inspection of the silt curtains, visual inspection of the waters surrounded by the curtains, and an action plan should be devised to cope with any unpredicted incidents such as in case dolphins are found within the waters surrounded by the silt curtains. ET of Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works will implement the Dolphin Watching Plan. For the specific implementation for this contract, ET of Contract No. HY/2013/03 shall communicate with the ET of Contract No. HY/2010/02 and share the monitoring data of the dolphin watching as part of EM&A programme. The marine works of Contract No. HY/2013/03 is anticipated to commence at the end of 2016. The Contractor of HY/2013/03 shall submit the Dolphin Watching Plan to EPD in accordance with EP condition 2.6 prior to the commencement of marine works and implement their own Dolphin Watching Plan as part of EM&A programme when the dolphin watching is/are no longer covered by



## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

ET of Contract No. HY/2010/02. The Dolphin Watching Plan shall be certified by ET and verified by IEC before submission to ER, AFCD, and EPD for approval, at least one month before the commencement of marine works.

10.2.18 N/A

### *Marine Traffic*

- 10.2.19 Vessel speed limit control – It is known that fast-moving vessels are a threat to dolphins and porpoises, a speed limit of 10 knots will be strictly enforced within the work areas. This speed limit for vessels within the boundaries of the Sha Chau/Lung Kwu Chau Marine Park appears to be effective in protecting the dolphins from vessel collisions.
- 10.2.20 Skipper training – Captains of construction vessels working in the West Lantau waters and near the Brothers Islands should undergo training to learn about local dolphins and porpoises. They should be trained to be aware of the protocol for “dolphin friendly” vessel operation (reference made to Code of Conduct for Dolphin Watching Activities available from AFCD).
- 10.2.21 Predefined and regular routes for working vessels – Captains of all working vessels should be required to use regular travel routes, in order to minimize the chance of vessel collision. And the routes would not go through the dolphin hotspot in Brothers Islands.

### *Road Surface Runoff*

- 10.2.22 Silt-grease trap should be deployed to prevent a direct input of road surface runoff to the marine waters.

### *Chemical Spillage*

- 10.2.23 A Maritime Oil Spill Response Plan (MOSRP) has been developed by Marine Department to deal with oil spill and their potential hazard to the Hong Kong waters. The main objective of the MOSRP is to ensure a timely and effective response to oil spillages and/or their potential treats in the Hong Kong waters.
- 10.2.24 Similar to the Shenzhen Western Corridor project, a Spill Response Plan will be formulated to deal with the accidental event of the serious spillage of oil or other hazardous chemicals and it should be at least 1 month before the commencement of the construction of the Project. A Spill Response Plan in this regard will be primarily for safety issues and water quality, but could also help to safeguard the dolphin population. It will detail the actions to be taken in the event of accidental spillage of oil or other hazardous chemicals from construction activities including vessels operating of for the Project, with specific provisions for protecting marine ecology and the Chinese White Dolphins. Following the example of Shenzhen Western Corridor, it will be specified in the contingency plan that AFCD must be alerted by the Hong Kong Police Force or Fire Service Department in case an accident of spillage of chemical or oil is reported.

Report No.: 0165/15/ED/0046

*Precautionary/Enhancement Measures*

10.2.25 N/A

10.2.26 N/A

10.2.27 N/A

**10.3 Monitoring and Audit for Ecology**

10.3.1 An ecological monitoring and audit programme would be needed for the Project. The monitoring programme will include monitoring of physical parameters such as air, noise and water quality, and ecological aspects such as CWD. The ecological monitoring and audit programme will monitor potential impacts through construction activities, and will verify the assessments which were made in the EIA report. The monitoring includes the following tasks:

10.3.2 Vessel-based dolphin monitoring – A dolphin monitoring programme at Northeast and Northwest Lantau, in particular the dolphin sighting hotspots (e.g. Brothers Islands) and areas where juveniles have been sighted, should be set up to verify the predictions of impacts and to ensure that there are no unforeseen impacts on the dolphin population during construction phase. The monitoring period should cover the pre-construction phase (baseline conditions), the entire period of construction phase (tentatively 2012 – 2016), and at least two years after the completion of construction works<sup>1</sup>.

10.3.2.1A The dolphin monitoring should adopt line-transect vessel survey method, and cover the following line-transect survey areas as in AFCD annual marine mammal monitoring programme:

- Northeast Lantau survey area; and
- Northwest Lantau survey area.

10.3.2.1B On each survey day, the survey vessel will depart from Tung Chung Development Pier or nearest convenient and safe location. Observation for incidental sighting will begin immediately at the beginning of the transect lines as defined by AFCD monitoring programme. 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.

<sup>1</sup> This Contract involves impact monitoring of dolphins during construction phase only. The responsibility of post construction vessel-based dolphin monitoring (at least two years after the completion of construction works) will be assigned to relevant contract by the Authority in the later stage of the Hong Kong-Zhuhai-Macao Bridge project.

Report No.: 0165/15/ED/0046

- 10.3.2.1C 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 (e.g. pair-trawl fishing vessels).
- 10.3.2.1D 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”.
- 10.3.2.1E 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.
- 10.3.2.1F 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.
- 10.3.2.1G 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.
- 10.3.2.1H A summary of equipment requirement is summarized in **Table 10.1** below.

**Table 10.1 Summary of Dolphin Monitoring Equipment Requirements**

<b>Equipment</b>	<b>Type</b>
Vessel for Monitoring	A monitoring boat which should have a flying bridge or upper deck with a relatively unobstructed forward visibility (270° – 90°) 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)

- 10.3.2.1I As the project will last for a few years, the ET Leader should seek approval from the IEC, AFCD and EPD on an appropriate methodology and parameters to be recorded. A detailed ecological monitoring plan with specification and detailed methodology for baseline monitoring will be prepared prior to the baseline monitoring, and submitted to AFCD and EPD for approval.
- 10.3.2.1J In order to provide a suitable long-term dataset for comparison, baseline, impact and post-construction phase dolphin monitoring will employ an identical methodology and follow the same line transects.
- 10.3.3 N/A
- 10.3.4 N/A
- 10.3.5 N/A
- 10.3.6 N/A
- 10.3.7 The ecological monitoring surveys shall be undertaken by suitably qualified specialist(s), (i.e. dolphin specialist), who shall have sufficient (at least 5-10 years) relevant post-graduate experience and publication in the respective aspects and should be independent of the construction contractor and should form part of the independent ET. Approval on the specialist(s) responsible for ecological monitoring survey shall be sought from AFCD and EPD. The IEC may audit the work of the ET if deemed necessary.
- 10.3.8A The ecology monitoring requirements, monitoring equipment, monitoring parameters, frequency and duration, monitoring methodology, monitoring schedule, meteorological information of Contract No. HY/2013/03 will be referenced to the EM&A Reports prepared for Contract No. HY/2010/02.

## **10.4 Monitoring Locations**

- 10.4.1 The dolphin monitoring should adopt line-transect vessel survey method, and cover the following line-transect survey areas as in AFCD annual marine mammal monitoring programme:

Report No.: 0165/15/ED/0046

- Northeast Lantau survey area; and
- Northwest Lantau survey area.

The transect lines and layout map have been provided by AFCD and are shown in **Figure 10-1**.

10.4.2 N/A

10.4.3 N/A

10.4.4 N/A

10.4.5 N/A

## **10.5 Baseline Monitoring for Ecology**

10.5.1 Baseline for dolphin monitoring shall be established by two surveys per month in each survey area stated in Section 10.4.1 for a period of three months prior to the commencement of works and agreed with AFCD. The purpose of the baseline monitoring is to establish pre-construction conditions prior to the commencement of the works and to demonstrate the suitability of the proposed monitoring method.

10.5.2A ET of Contract No. HY/2013/03 will make reference to the baseline monitoring previously conducted under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works.

10.5.2 N/A

10.5.3 N/A

10.5.4 N/A

10.5.5 As this project will last for a few years, the ET Leader should seek approval from the IEC, AFCD and EPD on an appropriate methodology and parameters to be recorded. A detailed ecological monitoring plan with specification and detailed methodology will be prepared prior to the baseline monitoring, and submitted to AFCD and EPD for approval. ET of Contract No. HY/2013/03 will make reference to the ecological monitoring plan and detailed methodology previously prepared under Contract No. HY/2010/02 Hong Kong – Zhuhai – Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities – Reclamation Works.

## **10.6 Impact Monitoring for Ecology**

10.6.1 Dolphin monitoring will be conducted twice a month in each survey area stated in Section 10.4.1 throughout the entire construction period with marine works under Contract No. HY/2013/03.

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

10.6.2 N/A

10.6.3 N/A

10.6.4 Should dolphin sighting numbers, density or the distribution pattern in the construction or post construction<sup>2</sup> be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction baseline activity, the ET should inform AFCD and investigate the possible causes of the change. Appropriate actions and a further monitoring should be recommended and additional mitigation measures should be implemented as necessary. Data should then be re-assessed and the need for any further monitoring established. The monitoring results should be made available to EPD, AFCD, ER and IEC within 2 weeks after the last survey day of the monitoring month.

10.6.5 N/A

10.6.6A The data from impact monitoring should be compared with 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. 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 impact and post-construction<sup>2</sup> dolphin monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.

10.6.6B Comparison of the impact and post-construction<sup>2</sup> dolphin monitoring with that of over the pre-construction baseline 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 10.2**.

<sup>2</sup> This Contract involves impact monitoring of dolphin during construction phase only. The responsibility of post construction dolphin monitoring will be assigned to relevant contract by the Authority in the later stage of the Hong Kong-Zhuhai-Macao Bridge project.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
 Profit Industrial Building,  
 1-15 Kwai Fung Crescent, Kwai Fong,  
 Hong Kong.

Tel : (852)-24508238  
 Fax : (852)-24508032  
 Email : mcl@fugro.com.hk



Report No.: 0165/15/ED/0046

**Table 10.2 Event and Action Plan**

Event	ET Leader	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor;</li> <li>5. Check monitoring data.</li> <li>6. Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and finding with the ET and the Contractor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Discuss monitoring with the IEC and any other measures proposed by the ET;</li> <li>2. If ER/SOR is satisfied with the proposal of any other measures, ER/SOR to signify the agreement in writing on the measures to be implemented.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Discuss with the ET and the IEC and propose measures to the IEC and the ER/SOR;</li> <li>3. Implement the agreed measures.</li> </ol>

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk



Report No.: 0165/15/ED/0046

Event	ET Leader	IEC	ER	Contractor
Limit Level	<ol style="list-style-type: none"> <li>1. Repeat statistical data analysis to confirm findings;</li> <li>2. Review all available and relevant data, including raw data and statistical analysis results of other parameters covered in the EM&amp;A, to ascertain if differences are as a result of natural variation or previously observed seasonal differences;</li> <li>3. Identify source(s) of impact;</li> <li>4. Inform the IEC, ER/SOR and Contractor of findings;</li> <li>5. Check monitoring data;</li> <li>6. Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> <li>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, ER/SOR and 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.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check monitoring data submitted by ET and Contractor;</li> <li>2. Discuss monitoring results and findings with the ET and the Contractor;</li> <li>3. Attend the meeting to discuss with ET, ER/SOR and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>4. Review proposals for additional monitoring and any other mitigation measures submitted by ET and Contractor and advise ER/SOR of the results and findings accordingly.</li> <li>5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Attend the meeting to discuss with ET, IEC and Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>2. If ER/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, ER/SOR to signify the agreement in writing on such proposals and any other mitigation measures.</li> <li>3. Supervise the implementation of additional monitoring and/or any other mitigation measures.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>2. Attend the meeting to discuss with ET, IEC and ER/SOR the necessity of additional dolphin monitoring and any other potential mitigation measures.</li> <li>3. Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary.</li> <li>4. Implement the agreed additional dolphin monitoring and/or any other mitigation measures.</li> </ol>



Report No.: 0165/15/ED/0046

**10.7 Post-construction Monitoring for Ecology**

10.7.1 N/A

10.7.2 N/A

10.7.3 N/A

10.7.4 N/A

10.7.5 N/A

**10.8 Event and Action Plan**

10.8.1A The Action and Limit levels for Chinese White Dolphin Monitoring are defined in **Table 10.3(a) and 10.3(b)**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 10.2** shall be carried out.

10.8.1B An action plan has been 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 baseline monitoring activity following the impact and post-construction monitoring<sup>3</sup>, the ET should inform AFCD and investigate the possible causes of the change. Appropriate actions and a further monitoring should be recommended and additional mitigation measures should be implemented as necessary. Data should then be re-assessed and the need for any further monitoring established. The action plan should be undertaken within a period of 1 month after a significant difference has been determined.

10.8.1C For the purpose of the EM&A works, the “significance” level which will trigger the action plan shall be proposed by the ET as part of the post-construction monitoring programme<sup>3</sup> design to be agreed with AFCD and EPD prior to the monitoring being undertaken.

**Table 10.3(a) Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL)**

	<b>North Lantau Social Cluster</b>	
	<b>NEL</b>	<b>NWL</b>
Action Level	(STG < 70% of baseline) & (ANI < 70% of baseline)	(STG < 70% of baseline) & (ANI < 70% of baseline)
Limit Level	[(STG < 40% of baseline) & (ANI < 40% of baseline)] AND [(STG < 40% of baseline) & (ANI < 40% of baseline)]	

For North Lantau Social Cluster, action level will be trigger if either NEL or NWL fall below the criteria; limit level will be triggered if both NEL and NWL fall below the criteria.

<sup>3</sup> This Contract involves impact monitoring of dolphins during construction phase only. The responsibility of post construction dolphin monitoring will be assigned to relevant contract by the Authority in the later stage of the Hong Kong-Zhuhai-Macao Bridge project.

**MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

**Table 10.3(b) Derived Value of Action Level (AL) and Limit Level (LL) for  
Chinese White Dolphin Monitoring**

	<b>North Lantau Social Cluster</b>	
	<b>NEL</b>	<b>NWL</b>
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)]	

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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### 11. FISHERIES

#### 11.1 Summary

- 11.1.1 The EIA report identified and assessed the potential impacts related to fisheries and marine culture.
- 11.1.2 The water quality monitoring and audit requirements are included in Section 9 Water Quality.
- 11.1.3 As mentioned in the approved EIA report, there are no further monitoring and audit for fisheries are required.

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Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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## 12. CULTURAL HERITAGE

### 12.1 Summary

- 12.1.1 The marine archaeology investigation has concluded that there is no underwater cultural heritage within the study area. No adverse impact on marine archaeological is anticipated. Hence, further investigation or mitigation measure is not required.
- 12.1.2 The HKBCF is located in the waters to be north-east of the Airport. It would not have any impacts on known built heritage and archaeological site. Mitigation measure is not required for built heritage and terrestrial archaeology.

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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### 13. HAZARD TO LIFE

#### 13.1 Summary

- 13.1.1 The HKBCF is a newly reclaimed site, it is anticipated that blasting work will not be required during the construction of the Assignment. Therefore no explosives Quantitative Risk Assessment (QRA) is required and hence no mitigation measure is required.

Report No.: 0165/15/ED/0046

**14. LANDSCAPE & VISUAL IMPACT****14.1 Introduction**

- 14.1.1 The approved EIA Report has recommended landscape and visual mitigation measures (refer to Section 14 of EIA Report) to be undertaken during both the construction and operation phases of the project. This section outlines the monitoring and audit of these measures for HKBCF.

**14.2 Monitoring Details**

- 14.2.1 The design, implementation and maintenance of landscape mitigation measures should be checked to ensure that any potential conflicts between the proposed landscape measures and any other works of the assignment would be resolved as early as practical without affecting the implementation of the mitigation measures. **Table 14.1** shows the monitoring programme.

**Table 14.1 Monitoring Programme**

Stage	Monitoring Task	Monitoring Report	Form of Approval	Frequency
Detailed Design	Checking of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken during detailed design phase, to ensure that they fulfil the intention of the mitigation measures. Any changes to the design, including design changes on site should also be checked.	Not Required	Not Required	At the end of the Detailed Design Phase
Construction	Checking of the contractor's operations during the construction period.	Report on Contractor's compliance by ET	Counter-signature of report by IEC	Bi-weekly
Establishment Works	Checking of the planting works during the 12-month Establishment Period after completion of the construction works.	Report on Contractor's compliance by ET	Counter-signature of report by IEC	Every 2 months
Long Term Management (10 year)	Monitoring of the long-term management of the planting works in the period up to 10 years after completion of the construction works.	Report on compliance by ET or Maintenance Agency as appropriate	Counter-signature of report by Management Agency	Annually

Notes: Environmental Team (ET) – employed by the Contractor  
Environmental Permit (EP).

**Detailed Design Phase**

Report No.: 0165/15/ED/0046

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- 14.2.2 The mitigation measures, which are proposed in the EIA to mitigate the landscape and visual impacts, should be embodied into the detailed engineering design, landscape design drawings and contract documents. The Detailed Design should be checked to ensure that the measures are fully incorporated. Potential conflicts with civil engineering, geotechnical, structural, lighting, signage, drainage and underground utilities should be resolved as early as practical.
- 14.2.3 The following mitigation measures are proposed to avoid and reduce the identified impacts.
- Minimise the footprint of project and that the quantity of landscape character units and landscape resources affected;
  - Minimise temporary works areas for construction works;
  - Undertaking good site practices by applying hydroseeding on temporary stockpiles and reclamation areas;
  - Conservation of topsoil for reuse;
  - Waste limitation by recycling of felled trees into woodchip mulch for use in landscaped areas.
- 14.2.4 The following design measures will be developed during detailed design stage to remedy and compensate unavoidable impacts:
- Roadside planting and planting along the edge of the reclamation is proposed;
  - Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;
  - Protection measures for the trees to be retained during construction activities;
  - Not applicable as no bridge columns will be constructed under Contract No. HY/2013/03;
  - Fine-tuning the location of the bridge columns to avoid visually-sensitive locations;
  - Not applicable as the aesthetic design of the bridge is for HKLR Contract.
  - Not applicable as the decorative urban design is related to the HKLR Contract.
  - Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed;
  - Not applicable as the peripheral of and within HKBCF is outside of scope.
  - Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline.
  - Providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF; and
  - Fine-tuning the sizes of the structural members to minimise the bulkiness of buildings and adjustment of building arrangement to minimise disturbance to surrounding vegetation in the HKBCF.
  - Not applicable as the aesthetic design on the viaduct, tunnel portals, at grade roads and reclamation are related to the HKLR Contract.

- 14.2.5 The following mitigation measures should be monitored during construction and operation phases:

**Table 14.2 Proposed Mitigation Measures during Construction and Operation Phases**

Stage	Description of Mitigation Measures
During Construction Phase	<u>Mitigate both Landscape and Visual Impacts</u>  G1. Grass-hydroseed bare soil surface and stock pile areas. G2. N/A for this Contract is related to construction of bridge. G3. N/A for this Contract as it is for HKLR. G4. For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonic atmosphere of the HKBCF (see Figure 14.3.1 for example). G5. Vegetation reinstatement and upgrading to disturbed areas. G6. Maximize new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed. G7. N/A for this Contract as it is out of site boundary. G8. N/A for this Contract as it is for seawall. G9. N/A for this Contract as it is for new coastline.
	<u>Mitigate Visual Impacts</u>  V1. Minimise time for construction activities during construction period. V2. Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKBCF construction.
During Operation Phase	<u>Mitigate both Landscape and Visual Impacts</u>  G10. Provide proper planting maintenance on the new planting areas to enhance the aesthetic degree. V3. Lighting design to minimise glare at night. Decorative road lighting to be considered during detailed design stage.

Note:

- Figure 14.3.1 – Landscape Master Plan showing the general arrangement of HKBCF with mitigation. This Plan is preliminary only and subject to further development in detailed design stage. (see Figure 14.3.1 of the EIA Report)
- Figure 14.4.2 – Details of mitigation measure – G9 for the new coastline. (see Figure 14.4.2 of the EIA Report).

- 14.2.6 An implementation programme will be prepared as required by TM-EIAO. Reference will be made to the ETWB TC(W) No. 2/2004 on Maintenance of Vegetation and Hard Landscape Features which defines the management and maintenance responsibilities for natural vegetation and landscape works, including both softworks and hardworks, and the authorities for tree preservation and felling. Enhanced conventional approach was agreed to adopt for management, operation and maintenance of the HKBCF. Under the enhanced conventional approach, instead of having various departments taking turns to chair a management committee, a single department would be designated as the Convenor to be responsible for the overall coordination and management of the HKBCF, with the advice and collaboration of an Inter-departmental Management Committee (MC) comprising representative from all user department. The relevant departments have agreed that Highways Department (HyD), being the project proponent of the HZMB, should be the Convenor. The format of the preliminary arrangement of implementation programme under the approved EIA Report is listed in **Table 14.3**.



**Table 14.3 Proposed format for Preliminary Funding, Implementation, Management and Maintenance Proposal**

Mitigation Items	Funding & Implementation Unit (See Remark)	Maintenance Unit (See Remark)
<i>During Construction</i>		
V1 and V2	Project Proponent (i.e. HyD)	The Contractor
G3* and G4	Project Proponent /Initiating Department (e.g. the relevant User Department of the building)	Project Proponent / Initiating Department (e.g. the relevant User Department of the building)
G1, G2*, G3*, G6, G7*, G8* and G9*	Project Proponent (i.e. HyD)	HyD / LCSD
<i>During Operation</i>		
V3	Project Proponent (i.e. HyD)	HyD
G10	Project Proponent (i.e. HyD)	HyD/LCSD

Note: The proposed mitigation measures and arrangements are tentative. The responsible parties are also tentative and subject to further agreements amongst the Government Departments.

\* N/A for this Contract

### *Construction Phase & Establishment Period*

- 14.2.7 The implementation of landscape construction works and subsequent maintenance operations during the 12-month Establishment Period must be supervised by qualified Landscape Resident Site Staff (Registered Landscape Architect or Professional Member of the Hong Kong Institute of Landscape Architects).
- 14.2.8 Measures to mitigate landscape and visual impacts during construction should be checked to ensure compliance with the intended aims of the measures.
- 14.2.9 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.

### *Long Term Management (10 Years)*

- 14.2.10 The planting works shall be monitored during the first 10 years of the operation phase of the project. Any areas of vegetation which is failed to establish, should be corrected by the relevant maintenance parties at the earliest opportunity. The maintenance requirement of the planting works stated under the 10-Year Management Programme is included in the monitoring requirement.

## **14.3 Baseline Monitoring**

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

- 14.3.1 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 ER. The approved photographic record shall be submitted to the Project Proponent, ET, IEC, ENPO and EPD for record.

### 14.4 Action Plan for Landscape and Visual Works

**Table 14.4 Action Plan**

Event	Action			
	ET	IEC	ER	Contractor
Conflicts occur	• Check and certify Contractor's proposed remedial design conforms to the requirements of EP and prepare checking report(s).	• Check and verify ET Leader certified Contractor's proposed remedial design.	• Supervise the Contractor to carry out the proposed remediation work.	• Propose remedial design and carry out the proposed work.

Report No.: 0165/15/ED/0046

**15. SITE ENVIRONMENTAL AUDIT****15.1 Site Inspection**

- 15.1.1 Site inspection provides an effective and direct means to initiate and enforce specified environmental protection and pollution control measures at the works area. These shall be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented.
- 15.1.2 The ET Leader shall be responsible for formulating the environmental site inspections, the deficiency and action reporting system, and for carrying out the site inspection works. Within 21 days of the construction contract commencement, he/she shall submit a proposal for site inspection and deficiency and action reporting procedures to the Contractor for agreement, and to the ER for approval. The ET's proposal for rectification would be made known to the IEC.
- 15.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental situations outside the works area which is likely to be affected, directly or indirectly, by the site activities. The following information should be made reference in conducting the inspection:
- i. EIA recommendations on environmental protection and pollution control mitigation measures; works progress and programme;
  - ii. Works progress and programme;
  - iii. Individual works methodology proposals (which shall include proposal on associated pollution control measures);
  - iv. Contract specifications on environmental protection;
  - v. Relevant environmental protection and pollution control laws; and
  - vi. Previous site inspection results.
- 15.1.4 The Contractor shall keep the ET Leader updated with all relevant information on the construction contract necessary for him/her to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works shall be submitted to the IEC and the Contractor within 1 working day. The Contractor shall follow the procedures and time-frame as stipulated in the environmental site inspection, and the deficiency and action reporting system formulated by the ET Leader, to report on any remedial measures subsequent to the site inspections.
- 15.1.5 Ad-hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

**15.2 Compliance with Legal and Contractual Requirements**

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Report No.: 0165/15/ED/0046

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- 15.2.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which construction activities must comply.
- 15.2.2 In order that the works comply with the contractual requirements, all works method statements submitted by the Contractor to the ER for approval shall be sent to the ET Leader for vetting to ensure sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix B**.
- 15.2.3 The ET Leader 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 laws can be prevented.
- 15.2.4 The Contractor shall regularly copy relevant documents to the ET Leader so that checking can be carried out. The document shall at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence / permits under the environmental protection laws, and copies of all valid licences / permits. The site diary and environmental records shall be made available for the inspection by the relevant parties.
- 15.2.5 After reviewing the document, the ET Leader shall advise the IEC and Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET Leader's review concludes that the current status on licence / permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he/she shall also advise the Contractor and the ER accordingly.
- 15.2.6 Upon receipt of the advice, the Contractor shall undertake immediate actions to correct the situation. The ER shall follow up to ensure that appropriate action has been taken in order to satisfy contractual and legal requirements.

### **15.3 Environmental Complaints**

- 15.3.1 Complaints shall be referred to the ET Leader for action. The ET Leader shall undertake the following procedures upon receipt of any complaint:
- Log complaint and date of receipt onto the complaint database and inform the IEC immediately;
  - Investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
  - For each incident of environmental complaint received, prepare and certify the complaint investigation report. The certified complaint investigation report shall be submitted to the IEC and ER for verification;

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

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- iv. Identify mitigation measures in consultation with the IEC if a complaint is valid and due to works;
- v. Advise the Contractor if mitigation measures are required;
- vi. Review the Contractor's response to identify mitigation measures, and the updated situation;
- vii. If the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- viii. Undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
- ix. Report investigation results and subsequent actions to complainant (if the source of complaint is EPD, the results should be reported within the timeframe assigned by the EPD); and
- x. Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

Report No.: 0165/15/ED/0046

**16. REPORTING****16.1 General**

16.1.1 Reports can be provided in an electronic medium upon agreeing the format with the ER and EPD. This would enable a transition from a paper/historic and reactive approach to an electronic/real time proactive approach. All the monitoring data (baseline and impact) shall also be submitted on diskettes or other approved media. The formats for air quality and noise to be submitted shall be separately agreed.

16.1.2 Once the monitoring data are available (e.g. noise, dust, water quality etc) and vetted by the IEC, the ET is responsible to upload the relevant data to the dedicated website established and maintained by ENPO. The ET Leader shall follow ENPO's requirements on the data submission format and procedure.

16.1.3 Types of reports that the ET Leader shall prepare and submit include baseline monitoring report, monthly EM&A report, quarterly EM&A summary report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly, quarterly summary and final review EM&A reports shall be made available to the Director of Environmental Protection.

**16.2 Baseline Monitoring Report**

16.2.1 The ET Leader shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the Contractor, the IEC, the ER and EPD. The ET Leader shall liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format shall be agreed with the EPD prior to submission.

16.2.2 Baseline monitoring report shall include at least the following:

- i. Executive summary (about half a page);
- ii. Brief project background information;
- iii. Drawings showing locations of the baseline monitoring stations;
- iv. Monitoring results (in both hard and diskette copies) together with the following information:
  - Monitoring methodology
  - Name of laboratory and types of equipment used and calibration details;
  - Parameters monitored;
  - Monitoring locations;
  - Monitoring date, time, frequency and duration; and
  - Quality assurance (QA) / quality control (QC) results and detection limits;
- v. Details of influencing factors, including:
  - Major activities, if any, being carried out on the site during the period;
  - Weather conditions during the period; and

Report No.: 0165/15/ED/0046

- Other factors which might affect results;
- vi. Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data, the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;
- vii. Revisions for inclusion in the EM&A Manual; and
- viii. Comments, recommendations and conclusions.

### **16.3 Monthly EM&A Reports**

- 16.3.1 The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the ET Leader. The EM&A report shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly EM&A report shall be submitted to the following parties: the Contractor, the IEC, the ER and EPD. Before submission of the first EM&A report, the ET Leader shall liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.
- 16.3.2 The ET leader shall review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

#### *First Monthly EM&A Report*

- 16.3.3 The first monthly EM&A report shall include at least the following:
- i. Executive summary (1-2 pages):
    - Breaches of Action and Limit levels;
    - Complaint log;
    - Notifications of any summons and successful prosecutions;
    - Reporting changes; and
    - Future key issues.
  - ii. Basic project information:
    - Project organisation including key personnel contact names and telephone numbers;
    - Programme;
    - Management structure, and
    - Works undertaken during the month.
  - iii. Environmental status:
    - Works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc); and
    - Drawings showing the assignment area, any environmental sensitive receivers and the locations of the monitoring and control stations (with co- ordinates of the monitoring locations).
  - iv. A brief summary of EM&A requirements including:
    - All monitoring parameters;

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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Report No.: 0165/15/ED/0046

- Environmental quality performance limits (Action and Limit levels);
- Event-Action Plans;
- Environmental mitigation measures, as recommended in the approved EIA Report; and
- Environmental requirements in contract documents.
- v. Implementation status:
  - Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA.
- vi. Monitoring results (in both hard and diskette copies) together with the following information:
  - Monitoring methodology;
  - Name of laboratory and types of equipment used and calibration details;
  - Parameters monitored;
  - Monitoring locations;
  - Monitoring date, time, frequency, and duration;
  - Graphical plots of monitored parameters in the month annotated against;
  - Major activities being carried out on site during period;
  - Weather conditions during the period;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- vii. Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
  - Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- viii. Others
  - An account of the future key issues as reviewed from the works programme and work method statements;
  - Advice on the solid and liquid waste management status;
  - Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule, and complaint log summarising the EM&A of the period; and
  - Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.

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*Subsequent EM&A Reports*

## 16.3.4 Subsequent monthly EM&amp;A reports shall include the following:

- i. Executive summary (1 - 2 pages):
  - Breaches of Action and Limit levels;
  - Complaint log;
  - Notifications of any summons and successful prosecutions;
  - Reporting changes; and
  - Future key issues.
- ii. Basic project information:
  - Project organisation including key personnel contact names and telephone numbers;
  - Programme;
  - Management structure, and
  - Works undertaken during the month.
- iii. Environmental status:
  - Construction programme with fine tuning of construction activities showing the inter-relationship with environmental protection / mitigation measures for the month;
  - Works undertaken during the month with illustrations (such as location of works, daily excavation rate, etc.); and
  - Drawing showing the assignment area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- iv. Implementation status:
  - Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the approved EIA Report.
- v. Monitoring results (in both hard and diskette copies) together with the following information:
  - Monitoring methodology;
  - Name of laboratory and types of equipment used and calibration details;
  - Parameters monitored;
  - Monitoring locations;
  - Monitoring date, time, frequency, and duration;
  - Weather conditions during the period;
  - Graphical plots of monitored parameters in the month annotated against;
  - Major activities being carried out on site during period;
  - Any other factors which might affect the monitoring results; and
  - QA/QC results and detection limits.
- vi. Report on non-compliance, complaints, and notifications of summons and successful prosecutions:
  - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
  - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;

Report No.: 0165/15/ED/0046

- Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;
  - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
  - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.
- vii. Others
- An account of the future key issues as reviewed from the works programme and work method statements;
  - Advice on the solid and liquid waste management status; and
  - Comments (for example, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the EM&A programme) and conclusions.
- viii. Appendices
- 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:
    - a) Major activities being carried out on site during the period;
    - b) Weather conditions during the period; and
    - c) Any other factors that might affect the monitoring results.
  - Monitoring schedule for the present and next reporting period;
  - Cumulative statistics on complaints, notifications of summons and successful prosecutions; and
  - Outstanding issues and deficiencies.

## **16.4 Quarterly EM&A Summary Reports**

16.4.1 A quarterly EM&A summary report of around 5 pages shall be produced and shall contain at least the following information:

- i. Executive summary (about half a page);
- ii. Basic project information including a synopsis of the assignment organisation, programme, contacts of key management, and a synopsis of works 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 approved EIA Report.
- iv. Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the approved EIA Report, summarised in the updated implementation schedule;

Report No.: 0165/15/ED/0046

- v. Drawings showing the assignment area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- vi. Graphical plots of any trends in monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
  - 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 non-compliance (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 a review of pollution sources and working procedures;
- x. A summary description of actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- xi. A summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- xii. A summary record of notification of summons 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;
- xiii. Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and the performance of the environmental management system, that is, of the overall EM&A programme); recommendations (for example, any improvement in the EM&A programme) and conclusions for the quarter; and
- xiv. Contacts of Project Proponent and any hotline telephone number for the public to make enquiries.

## **16.5 Final EM&A Review Report**

16.5.1 The final EM&A report should contain at least the following:

- i. Executive summary (1 - 2 pages);
- ii. Drawings showing the assignment area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- iii. Basic project information including a synopsis of the assignment organisation, contacts of key management, and a synopsis of work undertaken during the course of the assignment or past twelve months;
- iv. A brief summary of EM&A requirements including:
  - Environmental mitigation measures, as recommended in the approved EIA 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 approved EIA Report, summarised in the updated implementation schedule;

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- vi. Graphical plots and statistical analysis of the trends of monitored parameters over the course of the assignment, including the post-assignment monitoring for all monitoring stations annotated against:
  - 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 non-compliance (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. Advice on the solid and liquid waste management status;
- xi. Provide clear-cut decisions on the environmental acceptability of the assignment with reference to the specific impact hypothesis;
- 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. A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control legislation, locations and nature of the breaches, investigation follow-up actions taken and results;
- xiv. A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations;
- xv. Comments (for example, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall EM&A programme); and
- xvi. Recommendations and conclusions (for example, a review of success of the overall EM&A programme to cost-effectively identify deterioration and to initiate prompt effective mitigatory action when necessary).

## **16.6 Data Keeping**

- 16.6.1 No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly EM&A reports. However, any such document shall be well kept by the ET Leader and be ready for inspection upon request. All relevant information shall be clearly and systematically recorded in the document. Monitoring data shall also be recorded in magnetic media form, and the software copy must be available upon request. Data format shall be agreed with EPD. All documents and data shall be kept for at least one year following completion of the construction contract.

## **16.7 Interim Notifications of Environmental Quality Limit Exceedances**

- 16.7.1 With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the ET leader shall immediately notify the IEC, ENPO and EPD, as appropriate. The notification shall be followed up with advice to IEC, ENPO and EPD on the results of the investigation, proposed actions and success of the actions taken, with any

## MATERIALAB CONSULTANTS LIMITED

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

The logo for MaterialLab, featuring the word "MaterialLab" in a bold, sans-serif font. The text is white and is set against a black rectangular background. The background has a thin white border on the top and bottom edges.

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necessary follow-up proposals. A sample template for the interim notifications is presented in **Appendix E**.

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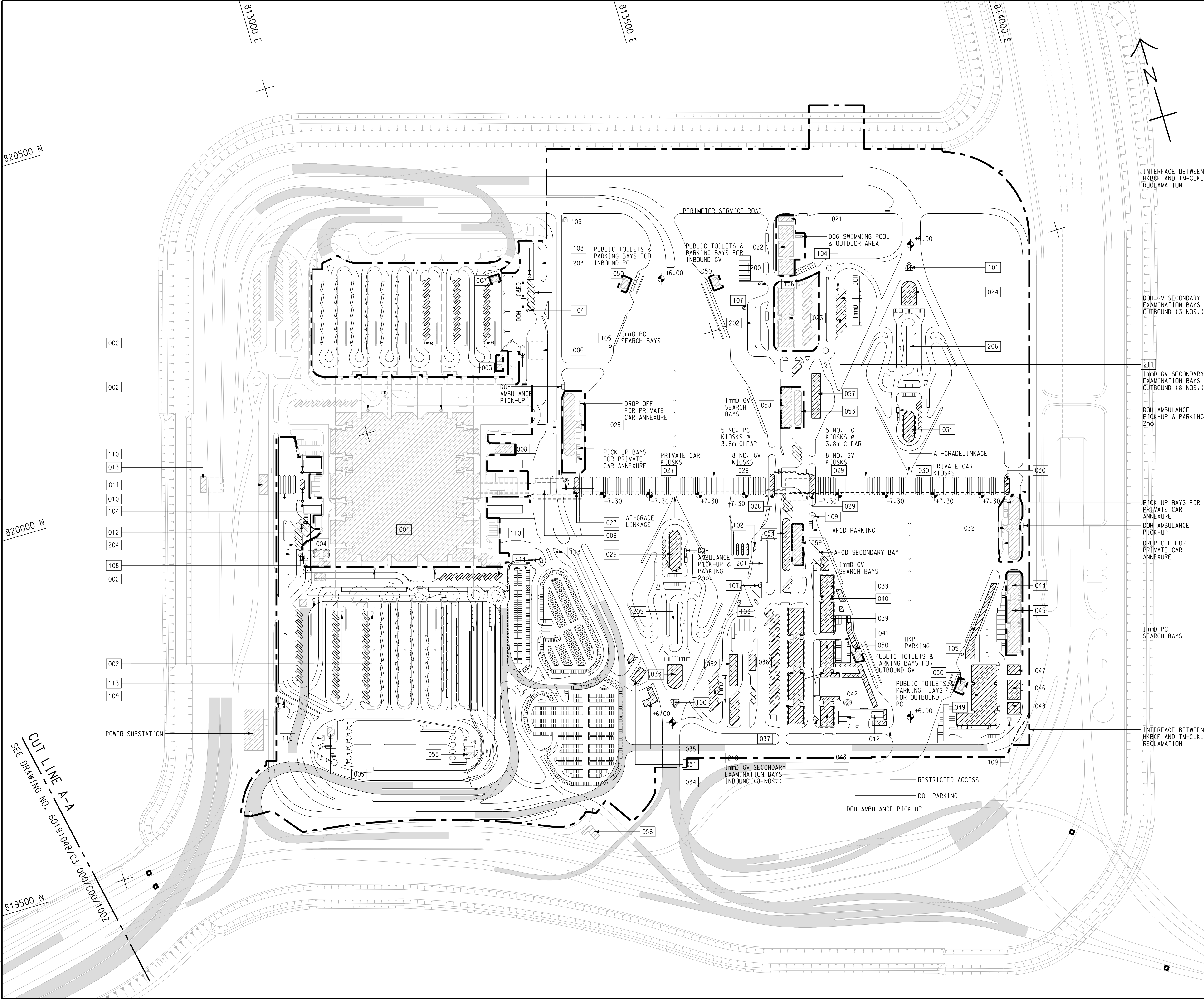
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### **Figure 1-1**

#### **Current Master Layout Plan for HKBC**



NOTE :

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH  
DRAWING NO. 60191048/C3/000/C00/1003.

LEGEND:

- SITE BOUNDARY
- VIADUCT
- BUILDING/FACILITIES

INTERFACE BETWEEN  
HKBCF AND TM-CLKL  
RECLAMATION

DOH GV SECONDARY  
EXAMINATION BAYS  
OUTBOUND (3 NOS.)

Immd GV SECONDARY  
EXAMINATION BAYS  
OUTBOUND (8 NOS.)

DOH AMBULANCE  
PICK-UP & PARKING  
2nos.

PICK UP BAYS FOR  
PRIVATE CAR  
ANNEXURE  
DOH AMBULANCE  
PICK-UP  
DROP OFF FOR  
PRIVATE CAR  
ANNEXURE

Immd PC  
SEARCH BAYS

INTERFACE BETWEEN  
HKBCF AND TM-CLKL  
RECLAMATION

-	TENDER DRAWING	BWCW SCI	MAR.14
---	----------------	----------	--------

REV.	DESCRIPTION	DATE
01	ISSUED FOR TENDER	2014/03/26

HONG KONG-ZHUHAI-MACAO BRIDGE  
HONG KONG BOUNDARY CROSSING FACILITIES  
VEHICLE CLEARANCE PLAZAS AND  
ANCILLARY BUILDINGS AND FACILITIES

Figure 1- 1  
Current Layout Plan

SHEET 1 OF 2

**AECOM**  
Rogers Stirk Harbour + Partners  
BURO HAPPOLD ATKINS ADI

**Aedas**

DRG.NO. 60191048/C3/000/C00/1001  
圖紙編號

DESIGNED BY 設計	CONTRACT NO. 合約編號	P. DIR. APPROVED 負責人
BWCW	HY/2013/03	TKH
DRAWN BY 繪圖	STATUS 階段	
WSY		
SCALE 比例		
A1 1 : 2500		
DIMENSIONS ARE IN 尺寸單位		
METRES		

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CUT LINE A-A  
SEE DRAWING NO. 60191048/C3/000/C00/1002

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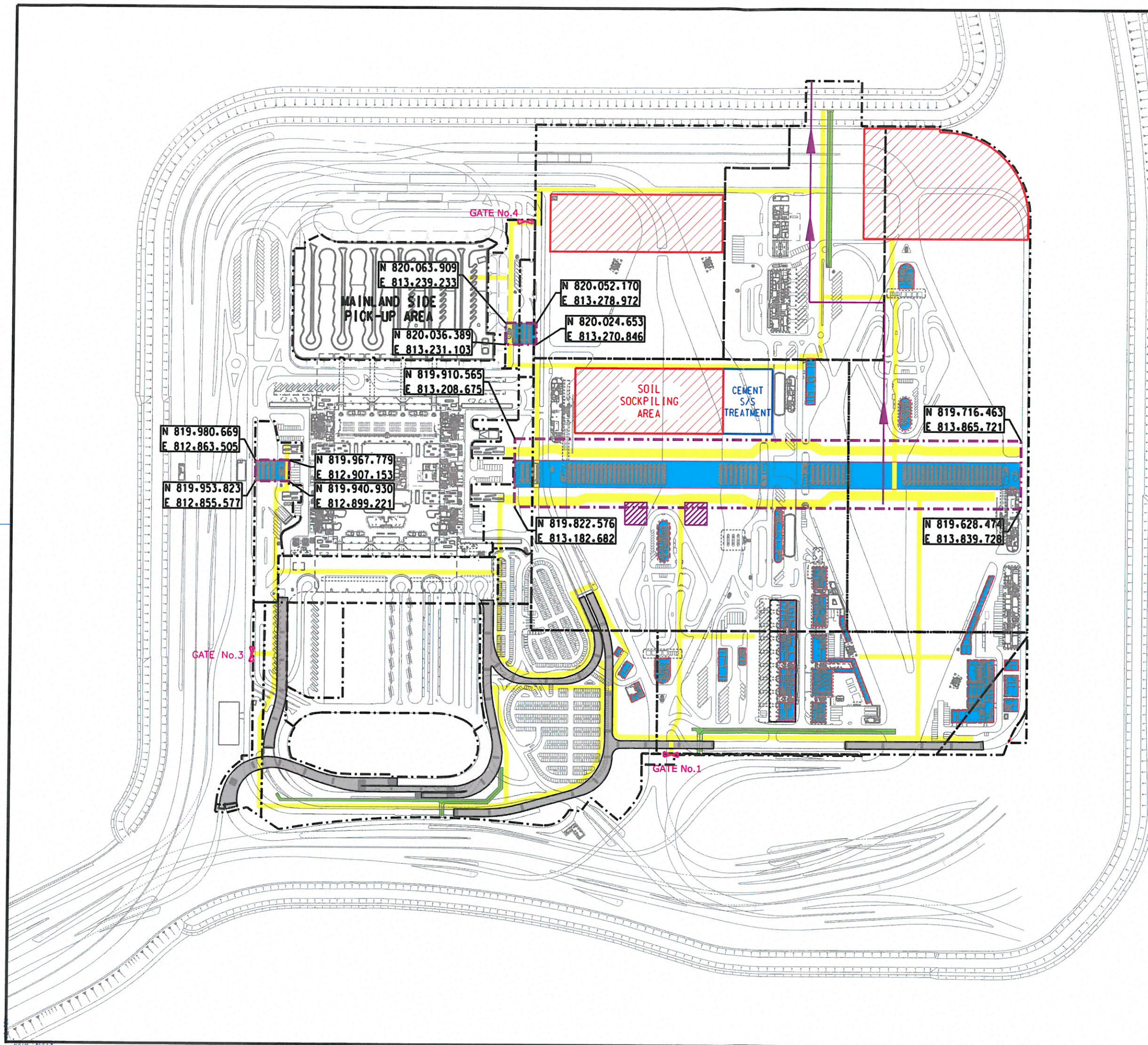
Report No.: 0165/15/ED/0046

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**Figure 1-2**






**Location of Box Culvert**





**LEGEND :**

- STORAGE AREA
- MAIN ACCESS
- TEMPORARY DRAINAGE
- BOX CULVERTS

-	FIRST ISSUE		29/07/15
REV. 修訂	DESCRIPTION 內容摘要	CHECKED 查核	DATE 日期
CLIENT 委託人	 <b>路政處 HIGHWAYS DEPARTMENT</b> 港珠澳大橋香港工程管理局 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office		
<b>PROJECT TITLE</b> 工程項目名稱 <b>HONG KONG-ZHUHAI-MACAO BRIDGE</b> <b>HONG KONG BOUNDARY CROSSING FACILITIES</b> <b>- VEHICLE CLEARANCE PLAZAS AND</b> <b>ANCILLARY BUILDINGS AND FACILITIES</b>			
<b>CONSULTANT</b> 工程顧問  <b>Rogers Stirk Harbour + Partners</b> <b>BURO HAPPOLD ATKINS ADI</b> 		+	+
<b>MAIN CONTRACTOR</b> 主要承建商  <b>中國港灣工程有限責任公司</b> <b>CHINA HARBOUR</b> <b>ENGINEERING COMPANY LTD</b>		+	+
<b>DRAWING TITLE</b> 圖紙標題 <div style="text-align: center;"> <p>Figure 1-2</p> <p>Location of Box Culverts</p> </div>			
<b>DRGNO.</b> 圖紙編號 <b>CHEC300/CUE/200017-</b>			
DESIGNED BY 設計 <b>HY. LEUNG</b>	CONTRACT NO. 合約編號 <b>HY/2013/03</b>	CONTRACTOR APPROVED 批准人 	
DRAWN BY 繪圖 <b>MARCO</b>	STATUS 階段 <b>DESIGN</b>		
SCALE 比例 <b>1 : 5000 @ A3</b>			
DIMENSIONS ARE IN 尺寸單位 <b>METRES</b>			
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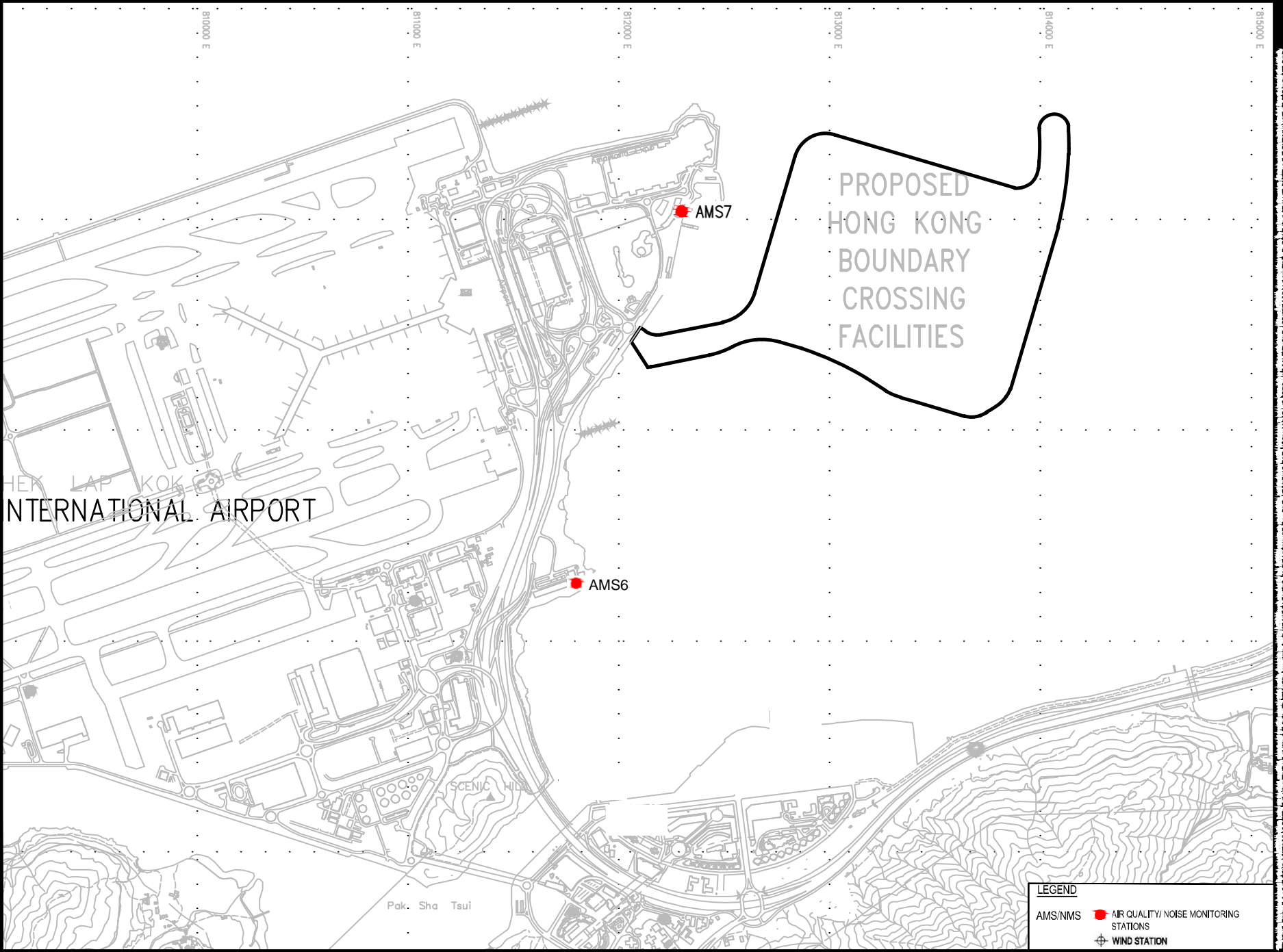
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### **Figure 5-1**

#### **Air Quality Monitoring Stations**



**LEGEND**

AMS/NMS		AIR QUALITY/ NOISE MONITORING STATIONS
		WIND STATION

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### **Figure 6-1**

#### **Noise Monitoring Stations**



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### **Figure 9-1**

#### **Water Quality Monitoring Stations**





**LEGEND**

- IS  
IMPACT STATIONS

CS  
CONTROL / FAR FIELD STATIONS

SR  
SENSITIVE RECEIVERS STATIONS

## SETTING OUT SCHEDULE

MONITORING STATIONS	CO-ORDINATES	
	EASTING	NORTHING
IS5	811579	817106
IS(Mf)6	812101	817873
IS7	812244	818777
IS8	814251	818412
IS(Mf)9	813273	818850
IS10	812577	820670
IS(Mf)11	813562	820716
IS(Mf)16	814328	819497
IS17	814539	820391
SR3	810525	816456
SR4(N)	814705	817859
SR5	811489	820455
SR6	805837	821818
SR7	814293	821431
SR10A	823741	823495
SR10B(N)	823683	823187
CS(Mf)3	809989	821117
CS(Mf)5	817990	821129
CS4	810025	824004
CS6	817028	823992
CSA	818103	823064

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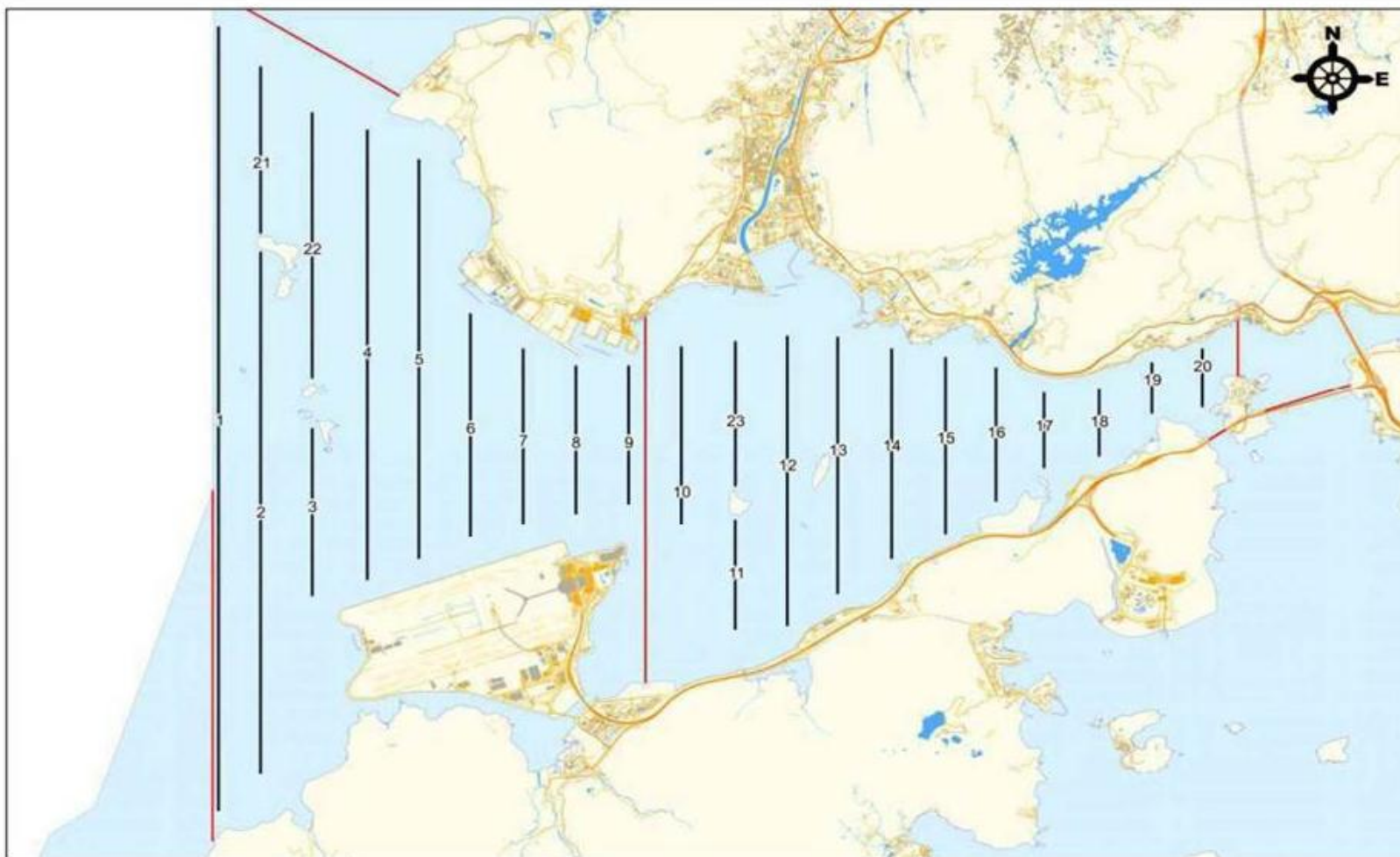
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### **Figure 10-1**

#### **Transect Lines for CWD Monitoring**





**Remarks:**

\*Transect 10 is now 3.6km in length due to the HKBCF construction site.

^Coordinates for transect lines 1, 2, 7, 8, 9 and 11 have been updated in respect to the Proposal for Alteration of Transect Line for Dolphin Monitoring approved by EPD on 19 August 2015. The total transect length for both NEL and NWL combined is 108km.

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### **Appendix A**

#### **Tentative Construction Programme**

Activity ID		Activity Name			Original Duration	Start	Finish	2015												2016												2017					
								Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun			
HKBCF - VCP & Ancillary Buildings and Facilities, Rev. 2					1593	10-Apr-15	05-Oct-18																														
CONTRACT DATES					1593	10-Apr-15	05-Oct-18																														
PORTION A1					581	19-Jun-15	07-Jun-17																														
Portion A1 Structures					575	27-Jun-15	07-Jun-17																														
Bridge A9					510	14-Sep-15	07-Jun-17																														
Retaining Wall W8-1					190	16-Sep-16	12-May-17																														
Retaining Wall W9-1					191	31-Aug-16	25-Apr-17																														
Box Culvert D					440	08-Aug-15	02-Feb-17																														
047 - Fresh Water Pumping Station, Portion A1 & A2					479	15-Aug-15	28-Mar-17																														
049 - Sewage Treatment Plant, Portion A1 & A2					575	27-Jun-15	07-Jun-17																														
Portion A1 Buildings					581	19-Jun-15	07-Jun-17																														
External Works for Portion A1					581	19-Jun-15	07-Jun-17																														
PORTION A2					578	24-Jun-15	07-Jun-17																														
PORTION B					557	20-Jul-15	07-Jun-17																														
Portion B Structures					510	03-Aug-15	24-Apr-17																														
Portion B Buildings					515	20-Jul-15	12-Apr-17																														
External Works for Portion B					557	20-Jul-15	07-Jun-17																														
PORTION C					471	20-Jul-15	18-Feb-17																														
PORTION D					557	16-Nov-15	04-Oct-17																														
PORTION E					448	17-Sep-15	22-Mar-17																														
PORTION F					438	16-Nov-15	12-May-17																														
PORTION G					480	22-Oct-15	07-Jun-17																														
Portion G Structures					480	22-Oct-15	07-Jun-17																														
Box Culvert C					402	06-Jan-16	18-May-17																														
Bridge A1					388	13-Feb-16	07-Jun-17																														
Bridge A2					392	13-Jan-16	15-May-17																														
Bridge A3					432	17-Dec-15	07-Jun-17																														
Bridge A4					386	05-Dec-15	25-Mar-17																														
Bridge A5					371	05-Dec-15	08-Mar-17																														
Bridge A6					449	21-Nov-15	02-Jun-17																														
Bridge A7a, A7b, A7c					462	12-Nov-15	07-Jun-17																														
Bridge A8					474	22-Oct-15	31-May-17																														
Retaining Walls W1-1, W3-1, W5-1 & W7-1					394	03-Feb-16	07-Jun-17																														
Portion G Buildings					453	21-Nov-15	06-Jun-17																														
External Works for Portion G					454	21-Nov-15	07-Jun-17																														
PORTION J					433	16-Dec-15	07-Jun-17																														
PORTION K					362	15-Mar-16	07-Jun-17																														
PORTION M					267	15-Mar-16	08-Feb-17																														
PORTION N					357	21-Mar-16	07-Jun-17																														
PORTION P					231	24-Aug-16	07-Jun-17																														
PORTION Q					140	22-Aug-16	10-Feb-17																														
PORTION R					141	10-Dec-16	07-Jun-17																														
Test & Commission					165	24-Dec-16	07-Jun-17																														
								2015												2016												2017					
								Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun			

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Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

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Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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### **Appendix B**

#### **Environmental Mitigation Implementation Schedule (EMIS)**

## Environmental Measures Implementation Schedule

### – Hong Kong Boundary Crossing Facilities Vehicle Clearance Plazas and Ancillary Buildings and Facilities

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements or standards for the measures to achieve?
<b>Air Quality</b>							
S5.5.6.1	A1	1) The contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	To control the dust impact to within the HKAQO and TMEIA criteria (Ref. 1-hr and 24hr TSP levels are 50Q <sub>y</sub> gm <sup>3</sup> and 260/tfn <sup>3</sup> , respectively)
S5.5.6.2	A2	<p>2) Proper watering of exposed spoil should be undertaken throughout the construction phase:</p> <ul style="list-style-type: none"> <li>Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or backfilled or reinstated where practicable within 24 hours of the excavation or unloading;</li> <li>Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;</li> <li>A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones.</li> <li>The load of dusty materials on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty materials do not leak from the vehicle;</li> <li>Where practicable, vehicle washing facilities with high pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcores;</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	To control the dust impact to within the HKAQO and TMEIA criteria (Ref. 1-hr and 24hr TSP levels are 50Q <sub>y</sub> gm <sup>3</sup> and 260/tfn <sup>3</sup> , respectively)

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements o standards for the measures to achieve?
S5.5.6.2	A2	<ul style="list-style-type: none"> <li>• When there are open excavation and reinstatement works, hoarding of not less than 2.4m high should be provided as far as practicable along the site boundary with provision for public crossing. Good site practice shall also be adopted by the Contractor to ensure the conditions of the hoardings are properly maintained throughout the construction period;</li> <li>• The portion of any road leading only to construction site that is within 30m of a vehicle entrance or exit should be kept clear of dusty materials,</li> <li>• Surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously;</li> <li>• Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;</li> <li>• Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first floor level up to the highest level of the scaffolding;</li> <li>• Any skip hoist for material transport should be totally enclosed by impervious sheeting;</li> <li>• Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	To control the dust impact to within the HKAQO and TMEIA criteria (Ref. 1-hr and 24hr TSP levels are 50Q <sub>y</sub> gm"3 and 260/tfn" 3, respectively)

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S5.5.6.2	A2	<ul style="list-style-type: none"> <li>• Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed;</li> <li>• Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and</li> <li>• Exposed earth should be properly treated by compaction, turfing, hydroseeding, vegetation planting or sealing with latex, vinyl, bitumen, shotcrete or other suitable surface stabiliser within six months after the last construction activity on the construction site or part of the construction site where the exposed earth lies</li> </ul>	Good construction site practices to control the dust impact at the nearby sensitive receivers to within the relevant criteria.	Contractor	All construction sites	Construction stage	To control the dust impact to within the HKAQO and TMEIA criteria (Ref. 1-hr and 24hr TSP levels are 500 µg/m³ and 260 µg/m³, respectively)
S5.5.6.3	A3	3) The Contractor should undertake proper watering on all exposed spoil (with at least 8 times per day) throughout the construction phase.	Control construction dust	Contractor	All construction sites	Construction stage	To control the dust impact
S5.5.6.4	A4	4) Engineer to incorporate the controlled measures into the Particular Specification (PS) for the civil work. The PS should also draw the contractor's attention to the relevant latest Practice Notes issued by EPD.	Control construction dust	Engineer	All construction sites	Design Stage	Air Pollution Control (Construction Dust) Regulation
S5.5.6.4	A5	5) Implement regular dust monitoring under EM&A programme during the construction stage.	Monitor the 24 hr and 1hr TSP levels at the representative dust monitoring stations to ensure compliance with relevant criteria throughout the construction period.	Contractor	Selected representative dust monitoring station	Construction stage	<ul style="list-style-type: none"> <li>• Air Pollution Control (Construction Dust) Regulation</li> <li>• To control the dust impact to within the HKAQO and TM-EIA criteria (Ref. 1-hr and 24hr TSP levels are 500 µg/m³ and 260 µg/m³, respectively)</li> </ul>

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S5.5.7.1	A6	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant;</p> <ul style="list-style-type: none"> <li>• Loading, unloading, handling, transfer or storage of any dusty materials should be carried out in totally enclosed system;</li> <li>• All dust-laden air or waste gas generated by the process operations should be properly extracted and vented to fabric filtering system to meet the emission limits for TSP;</li> <li>• Vents for all silos and cement/pulverised fuel ash (PFA) weighing scale should be fitted with fabric filtering system;</li> <li>• The materials which may generate airborne dusty emissions should be wetted by water spray system;</li> <li>• All receiving hoppers should be enclosed on three sides up to 3m above unloading point;</li> <li>• All conveyor transfer points should be totally enclosed;</li> <li>• All access and route roads within the premises should be paved and wetted; and</li> <li>• Vehicle cleaning facilities should be provided and used by all concrete trucks before leaving the premises to wash off any dust on the wheels and/or body</li> </ul>	Monitor the 24 hr and 1hr TSP levels at the representative dust monitoring stations to ensure compliance with relevant criteria throughout the construction period.	Contractor	Selected representative dust monitoring station	Construction stage	<ul style="list-style-type: none"> <li>• Air Pollution Control (Construction Dust) Regulation</li> <li>• To control the dust impact to within the HKAQO and TM-EIA criteria (Ref. 1-hr and 24hr TSP levels are 500 <math>\mu\text{g}/\text{m}^3</math> and 260 <math>\mu\text{g}/\text{m}^3</math>, respectively)</li> </ul>
S5.5.2.7	A7	<p>The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point:</p> <ul style="list-style-type: none"> <li>• All road surface within the barging facilities will be paved;</li> <li>• Dust enclosures will be provided for the loading ramp;</li> <li>• Vehicles will be required to pass through designated wheels wash facilities; and</li> <li>• Continuous water spray at the loading points</li> </ul>	Control construction dust	Contractor	All construction sites	Construction stage	Air Pollution Control (Construction Dust) Regulation



EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements or standards for the measures to achieve?
<b>Construction Noise (Air borne)</b>							
S6.4.10	N1	<p>1) Use of good site practices to limit noise emissions by considering the following:</p> <ul style="list-style-type: none"> <li>• only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;</li> <li>• machines and plant (such as trucks, cranes) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;</li> <li>• plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;</li> <li>• silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;</li> <li>• mobile plant should be sited as far away from NSRs as possible and practicable;</li> <li>• material stockpiles, mobile container site office and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>	Control construction airborne noise by means of good site practices	Contractor	All construction sites	Construction stage	Noise Control Ordinance
S6.4.11	N2	2) Install temporary hoarding located on the site boundaries between noisy construction activities and NSRs. The conditions of the hoardings shall be properly maintained throughout the construction period.	Reduce the construction noise levels at low-level zone of NSRs through partial screening.	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• Noise Control Ordinance</li> <li>• Annex 5, TM-EIA</li> </ul>
S6.4.12	N3	3) Install movable noise barriers (typically density @14kg/m acoustic mat or full enclosure close to noisy plants including compressor, generators, saw.	Screen the noisy plant items to be used at all construction sites	Contractor	For plant items listed in Appendix 6D of the EIA report at all construction sites	Construction stage	<ul style="list-style-type: none"> <li>• Noise Control Ordinance</li> <li>• Annex 5, TM-EIA</li> <li>• 75dB(A) for Residential premises</li> <li>• The movable barrier should achieve at least 5dB(A) and the full enclosure should be designed to achieve 10dB(A)</li> </ul>

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S6.4.13	N4	4) Select "Quiet plants" which comply with the BS 5228 Part 1 or TM standards.	Reduce the noise levels of plant items	Contractor	For plant items listed in Appendix 6D of the EIA report at all construction site	Construction stage	<ul style="list-style-type: none"> <li>• Noise Control Ordinance</li> <li>• Annex 5, TM-EIA</li> </ul>
S6.4.14	N5	5) Sequencing operation of construction plants where practicable	Operate sequentially within the same work site to reduce the construction airborne noise	Contractor	All construction sites where practicable	Construction stage	<ul style="list-style-type: none"> <li>• Noise Control Ordinance</li> <li>• Annex 5, TM-EIA</li> </ul>
S5.1	N6	6) Implement a noise monitoring under EM&A programme.	Monitor the construction noise levels at the selected representative locations	Contractor	Selected representative noise monitoring station	Construction stage	<ul style="list-style-type: none"> <li>• Noise Control Ordinance</li> <li>• Annex 5, TM-EIA</li> <li>• 75dB(A) for residential premises</li> </ul>
<b>Operational Noise</b>							
S6.8.4	N7	1) The maximum allowable Sound Power Level (SWLs) for the following shall be compiled with during the selection of facility equipment. <ul style="list-style-type: none"> <li>• Sewage Treatment Plant;</li> <li>• Electric Substation;</li> <li>• Seawater Intake; and</li> <li>• Ventilation Building for the Scenic Hill Tunnel.</li> </ul>	Ensure the compliance of operational noise at the sensitive receivers	Engineer	Fixed noise sources	Design stage	<ul style="list-style-type: none"> <li>• NCO and its TM</li> <li>• TM-EIA</li> </ul>
	N8	2) The Engineer shall incorporate the requirements for noise commissioning of fixed plant noise sources in the Particular Specification.	Ensure compliance with relevant requirements	Engineer	Fixed noise sources	Design stage	<ul style="list-style-type: none"> <li>• NCO and its TM</li> <li>• TM-EIA</li> </ul>
<b>Sediment</b>							
S7.3	S1	1) The requirements as recommended in ETWB TC 34/2002 Management of Dredged/Excavated Sediment shall be included in the Particular Specification as appropriate.	Develop sediment disposal arrangement	Engineer	All construction sites	Design stage	<ul style="list-style-type: none"> <li>• Waste Disposal Ordinance</li> <li>• ETWB TC 34/2002</li> </ul>

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<b>Waste Management (Construction Waste)</b>							
S8.3.8	WM1	<p><u>Construction and Demolition Material</u></p> <p>The following mitigation measures should be implemented in handling the waste:</p> <ul style="list-style-type: none"> <li>• Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;</li> <li>• Carry out on-site sorting;</li> <li>• Make provisions in the Contract documents to allow and promote the use of recycled aggregates where appropriate;</li> <li>• Implement a trip-ticket system for each works contract to ensure that the disposal of C&amp;D materials are properly documented and verified; and</li> <li>• Implement an enhanced Waste Management Plan similar to E7WBTC (Works) No. 19/2005 - "Environmental Management on Construction Sites" to encourage on-site sorting of C&amp;D materials and to minimize their generation during the course of construction.</li> <li>• In addition, disposal of the C&amp;D materials onto any sensitive locations such as agricultural lands, etc. should be avoided. The Contractor shall propose the final disposal sites to the Project Proponent and get its approval before implementation</li> </ul>	Good site practice to minimize the waste generation and recycle the C&D materials as far as practicable so as to reduce the amount for final disposal	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>• Land (Miscellaneous Provisions). Ordinance</li> <li>• Waste Disposal Ordinance</li> <li>• ETWB TC 19/2005</li> </ul>

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S8.3.9-S8.3.11	WM2	<p><u>C&amp;D Waste</u></p> <ul style="list-style-type: none"> <li>Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&amp;D materials. The use of more durable formwork or plastic facing for the construction works should be considered. Use of wooden hoardings should not be used, as in other projects. Metal hoarding should be used to enhance the possibility of recycling. The purchasing of construction materials will be carefully planned in order to avoid over ordering and wastage.</li> <li>The Contractor should recycle as much of the C&amp;D materials as possible on-site. Public fill and C&amp;D waste should be segregated and stored in different containers or skips to enhance reuse or recycling of materials and their proper disposal. Where practicable, concrete and masonry can be crushed and used as fill. Steel reinforcement bar can be used by scrap steel mills. Different areas of the sites should be considered for such segregation and storage.</li> </ul>	Good site practice to minimize the waste generation and recycle the C&D materials as far as practicable so as to reduce the amount for final disposal	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>Land (Miscellaneous Provisions) Ordinance</li> <li>Waste Disposal Ordinance</li> <li>ETWB TC 19/2005</li> </ul>
S8.3.12-S8.3.15	WM3	<p><u>Chemical Waste</u></p> <ul style="list-style-type: none"> <li>Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.</li> <li>Containers used for the storage of chemical wastes should be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; have a capacity of less than 450 liters unless the specification has been approved by the EPD; and display a label in English and Chinese in accordance with instructions prescribed in Schedule 2 of the regulation.</li> <li>The storage area for chemical wastes should be clearly labeled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20 % of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated</li> </ul>	Control the chemical waste and ensure proper storage handling and disposal	Contractor	All construction sites	Construction stage	<ul style="list-style-type: none"> <li>Waste Disposal (Chemical Waste) (General) Regulation</li> <li>Code of Practice on the Packaging, Labelling and Storage of Chemical Waste</li> </ul>

		<ul style="list-style-type: none"> <li>• Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre which also offers chemical waste collection service and can supply the necessary storage containers; or be to a reuser of the waste, under approval from the EPD.</li> </ul>					
EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements or standards for the measures to achieve?
S8.3.16	WM4	<u>Sewage</u> <ul style="list-style-type: none"> <li>• Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state which will not deter the workers from utilizing these portable toilets. Night soil should be collected by licensed collectors regularly.</li> </ul>	Proper handling of sewage from worker to avoid odour pest and litter impacts	Contractor	All construction sites	Construction stage	Waste Disposal Ordinance
S8.3.17	WM5	<u>General Refuse</u> <ul style="list-style-type: none"> <li>• General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes.</li> <li>• A reputable waste collector should be employed by the Contractor to remove general refuse from the site, separately from construction and chemical wastes, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law.</li> <li>• Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their deposit should be provided if feasible.</li> <li>• Office wastes can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Contractor.</li> <li>• Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.</li> </ul>	Minimize production of the general refuse and avoid odour, pest and litter impacts	Contractor	All construction sites	Construction stage	Waste Disposal Ordinance

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<b>Waste Management ( Operational Waste)</b>							
S8.4.3	WM6	<p>Chemical Waste</p> <p>The requirements given in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes should be followed in handling of these chemical wastes. A trip-ticket system should be operated in accordance with the Waste Disposal (Chemical Waste) (General) Regulation to monitor all movements of chemical wastes which will be collected by a licensed collector to a licensed facility for final treatment and disposal,</p>	Minimize production of the Waste	Operator	All logistic lots	Operational Stage	

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<b>Water Quality ( Construction Phase)</b>							
S9.11.1.7	W2	<p><u>Land Works</u> General construction activities on land should also be governed by standard good working practice. Specific measures to be written into the works contracts should include:</p> <ul style="list-style-type: none"> <li>• wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters;</li> <li>• 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;</li> <li>• storm drainage shall be directed to storm 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;</li> <li>• 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;</li> <li>• temporary access roads should be surfaced with crushed stone or gravel;</li> <li>• rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities;</li> <li>• measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system;</li> <li>• open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms;</li> <li>• 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;</li> <li>• discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system;</li> </ul>	To control construction water quality	Contractor	Land-based works area	Construction Stage	TM-EIAO

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S9.11.1.7	W2	<ul style="list-style-type: none"> <li>• 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;</li> <li>• wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain;</li> <li>• the section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel;</li> <li>• wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects;</li> <li>• 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;</li> <li>• the contractors shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and cleaned up immediately;</li> <li>• waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance;</li> <li>• 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; and</li> <li>• surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.</li> </ul>	To control construction water quality	Contractor	Land-based works area	Construction Stage	TM-EIAO



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<b>Water Quality ( Operation Phase)</b>							
S9.8.3.15	W4	Upon completion of the development, stormwater drainage systems would be completed to collect stormwater generated from the whole area including new roads. Sewage generated from the development would be collected by the sewerage systems for delivery to sewage treatment plant at HKBCF. Additional mitigation measures would not be required.	Control water quality	Scheme designers	Stormwater Infrastructure	Operational Stage	<ul style="list-style-type: none"> <li>• TM-water</li> <li>• Water Pollution Control Ordinance</li> </ul>
<b>Ecology ( Construction Phase)</b>							
S10.7	E4	<ul style="list-style-type: none"> <li>• Watering to reduce dust generation; prevention of siltation of freshwater habitats; Site runoff should be desilted, to reduce the potential for suspended sediments, organics and other contaminants to enter streams and standing freshwater</li> </ul>	Prevent Sedimentation from Land-based works areas	Contractor	Land-based works areas	During construction	TM-Water
S10.7	E5	<ul style="list-style-type: none"> <li>• Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time</li> </ul>	Prevent disturbance to terrestrial fauna and habitats	Contractor	Land-based works areas	During construction	
S10.7	E8	<ul style="list-style-type: none"> <li>• Control vessel speed</li> <li>• Skipper training</li> <li>• Predefined and regular routes for working vessels; avoid Brother Islands.</li> </ul>	Minimise marine traffic disturbance on dolphins	Contractor	Land-based works areas	During construction	
<b>Ecology ( Operational Phase)</b>							
S.10.7	E13	<ul style="list-style-type: none"> <li>• Install silt-grease trap in the drainage system collecting surface runoff</li> </ul>	Minimise impact on marine ecology	Designer	Reclamation area	During construction	TM-Water
S10.7	E14	<ul style="list-style-type: none"> <li>• Maritime Oil Spill Response Plan (MOSRP);</li> <li>• Contingency plan.</li> </ul>	Minimise impacts on marine ecology	Marine Dept	HKBCF	During operation	
<b>Fisheries</b>							
S11.7	F4	<ul style="list-style-type: none"> <li>• Maritime Oil Spill Response Plan (MOSRP);</li> <li>• Contingency plan.</li> </ul>	Minimise impacts on marine ecology	Marine Dept	HKBCF	During operation	

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<b>Landscape &amp; Visual (Detailed Design Phase)</b>							
S14.3.3.1	LV1	<p>General design measures include:</p> <ul style="list-style-type: none"> <li>• Roadside planting and planting along the edge of the HKBCF Island is proposed;</li> <li>• Transplanting of mature trees in good health and amenity value where appropriate and reinstatement of areas disturbed during construction by compensatory hydro-seeding and planting;</li> <li>• Protection measures for the trees to be retained during construction activities;</li> <li>• Optimizing the sizes and spacing of the bridge columns;</li> <li>• Fine-tuning the location of the bridge columns to avoid visually-sensitive locations;</li> <li>• Providing planting area around peripheral of HKBCF for tree planting screening effect;</li> <li>• Providing salt-tolerant native trees along the planter strip at affected seawall and newly reclaimed coastline;</li> <li>• For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF; and</li> <li>• Fine-tuning the sizes of the structural members to minimize the bulkiness of buildings and adjustment of building arrangement to minimise disturbance to surrounding vegetation in the HKBCF.</li> </ul>	Minimise visual and landscape impact	Detailed designer	HKBCF	Design Stage	

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements or standards for the measures to achieve?
<b>Landscape &amp; Visual (Detailed Design Phase)</b>							
S14.3.3.3	LV2	<u>Mitigate both Landscape and Visual Impacts</u>  G1. Grass-hydroseed bare soil surface and stock pile areas.  G2. Add planting strip and automatic irrigation system if appropriate at some portions of bridge footbridge to screen bridge and traffic.  G4. For HKBCF, providing aesthetic architectural design on the related buildings (e.g. similar materials for PCB building facade to Airport buildings, roof planting and subtle materials for other facilities buildings and so on), and the related infrastructure (e.g. parapet planting and transparent cover for elevated footbridges) to provide harmonious atmosphere of the HKBCF  G5. Vegetation reinstatement and upgrading to disturbed areas  G6. Maximizing new tree shrub and other vegetation planting to compensate tree felled and vegetation removed  G7. Providing planting area around peripheral of HKBCF for tree planting screening effect;  G8. Plant salt-tolerant native and shrubs etc along the planter strip at affected seawall.  G9. Reserve of loose natural granite rocks for re-use, Provide new coastline to adopt "natural-look" by means of using armour rocks in the form of natural rock materials and planting strip area accommodating screen buffer to enhance "natural-look" of the new coastline.	Minimise visual and landscape impact	Contractor	HKBCF	Construction Stage	
S14.3.3.3	LV3	<u>Mitigate Visual Impacts</u>  V1.Minimize time for construction activities during construction period.  V2. Provide screen hoarding at the portion of the project site / works areas / storage areas near VSRs who have close low-level views to the Project during HKBCF construction.	Minimise visual and landscape impact	Contractor	HKBCF	Construction Stage	

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Objectives of the Recommended Measures & Main Concerns to address	Who to implement the measures?	Location of the measures	When to implement the measures?	What requirements o standards for the measures to achieve?
<b>Landscape &amp; Visual (Detailed Design Phase)</b>							
S14.3.3.3	LV4	<u>Mitigate both Landscape and Visual Impacts</u>  G10. Provide proper planting maintenance on the new planting areas to enhance the aesthetic degree.	Minimise visual and landscape Impact	Project Proponent	HKBCF	Operation Stage	
S14.3.3.3	LV4	<u>Mitigate both Landscape and Visual Impacts</u>  V3. Lighting design to minimize glare at night, Decorative road lighting to be considered during detailed design stage.					
<b>EM&amp;A</b>							
S15.5.2.2	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual	Control EM&A Performance	Project Proponent	All construction sites	Construction Stage	
S15.5 – S15.6	EM2	1) An Environmental Team needs to be employed as per the EM&A Manual.  2) Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures.  3) An environmental impact monitoring needs to be implementing by the Environmental Team to ensure all the requirements given in the EM&A Manual are fully complied with.	Perform environmental monitoring and auditing	Contractor	All construction sites	Construction Stage	

## **MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

**MaterialLab**

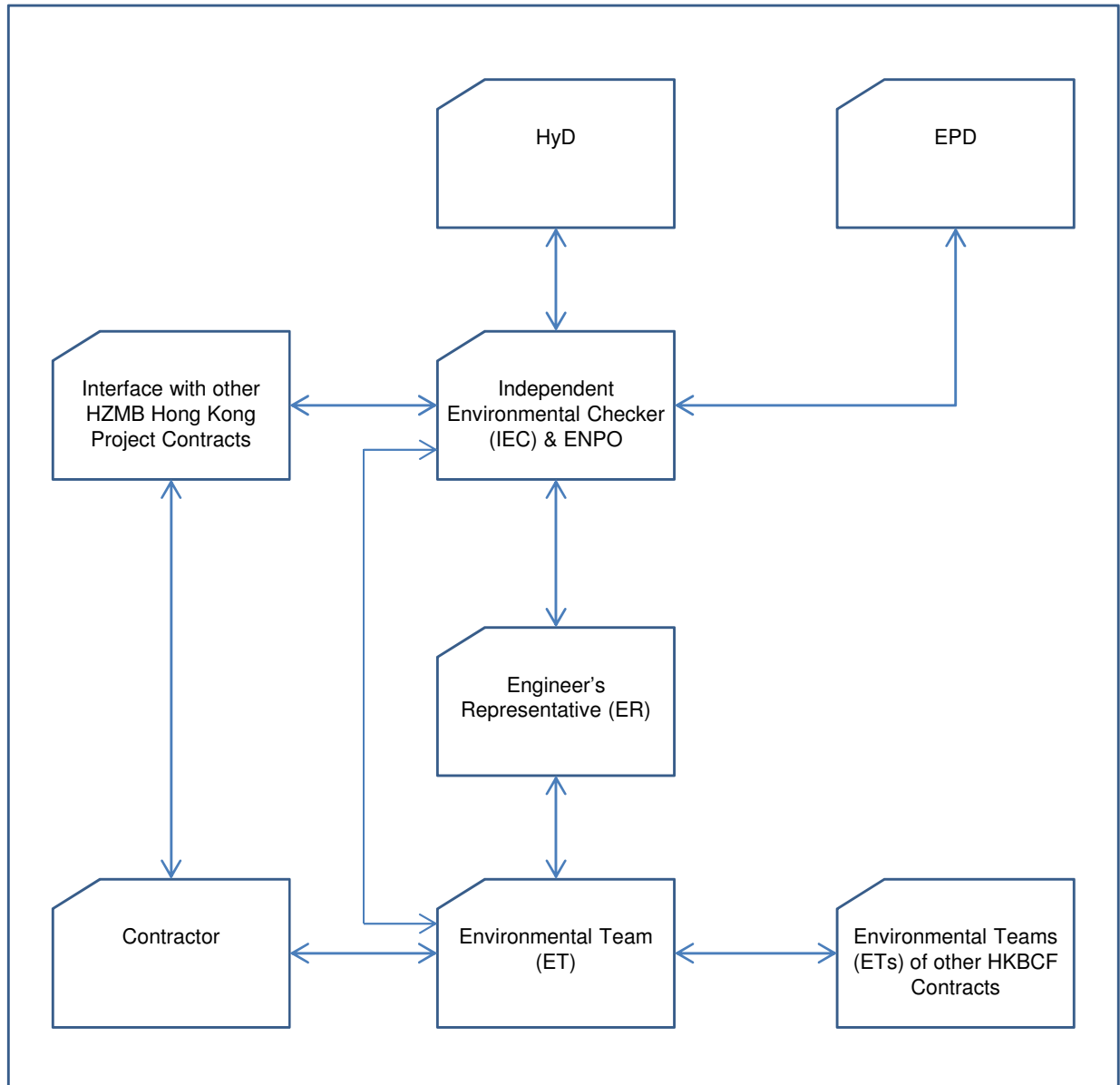
Report No.: 0165/15/ED/0046

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### **Appendix C**

#### **Contract Organisation for Environmental Works**

## Project Organisation for Environmental Works



↔ Line of Communication

## **MATERIALAB CONSULTANTS LIMITED**

Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

**MaterialLab**

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### **Appendix D**

#### **Sample Data Sheets for Monitoring**

### Data Sheet for TSP Monitoring

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

Name & Designation

Signature

Date

Field Operator :

Laboratory Staff :

Checked by :



### 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 <sub>90</sub> (dB(A))	
	L <sub>10</sub> (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 :

### Water Quality Monitoring Data Record Sheet

Location		Surface	Middle	Bottom
Monitoring Station				
Date				
Weather Conditions		Sunny / Fine / Cloudy / Rainy		
Sea Conditions		Calm / Moderate / Rough		
Tide Mode		High Tide / Low Tide		
Start Time	(hh:mm)			
Water Depth	(m)			
pH				
Temperature	(oC)			
Salinity	(ppt)			
Turbidity	(NTU)			
Sample Identification				
SS	(mg/l)			
DO	(mg/l)			
DO Saturation (%)				
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 entered once they are available from the laboratory.
- In-situ measurements shall be deployed at the designated location for 2 times. The difference between the two consecutive measurements of DO or turbidity parameters shall be within the range of 25%. If the difference is larger than 25%, the measurement shall be carried out again until the two consecutive readings agree to within 25%.

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Room 723 & 725, 7/F, Block B,  
Profit Industrial Building,  
1-15 Kwai Fung Crescent, Kwai Fong,  
Hong Kong.

Tel : (852)-24508238  
Fax : (852)-24508032  
Email : mcl@fugro.com.hk

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### **Appendix E**

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

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 :

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