

Contract No. HY/2013/04 Hong Kong–Zhuhai–Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)

# **CONTRACTOR SUBMISSION FORM (CSF)**

	CONTRACTOR SUBMISSION FORM (CSI )				
То	Engineer's Representative	Attn.	Mr. Peter Lee		
Ref. No.	CDG/CSF/EN02.02/2019/9194	CSF No.	CSF/ 03183/A		
Subject	Monthly EM&A Report for March 201	9			
Item		Description			
1	In accordance with the PS 25.41, we Report for March 2019 for your approva		to submit herewith the Monthly EM&A		
	1) 1 copy of EM&A Report     2) a copy of full EM&A Report in CD Ro	m format	No.		
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Remarks	:				
			*		
*					
Purpose	of Submission :				
For	Approval ☑ For Information	on 🗆	For Record Purposes □		
Expected Reply Date :					
From : Contractor's Representative					
Name :	Name: Jason Chung Date: 24-4-2019				
Signature					



Ramboll Hong Kong Limited 21st Floor, BEA Harbour View Centre 56 Gloucester Road Wan Chai, Hong Kong

Attn:

Mr. Ray Yan - Independent Environmental Checker

Our Reference TC/GC/al/T355861/02/ 02/L118

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Monthly EM&A Report for March 2019

17 April 2019 **By Email** 

Dear Sir,

In accordance with Condition 5.4 of the Environmental Permit (EP-353/2009/K) covering the captioned contract, we are pleased to submit the certified Monthly EM&A Report for March 2019 for your verification.

Yours faithfully For MOTT MACDONALD HONG KONG LIMITED

Gary Chow

Environmental Team Leader

Encl.

CC.

AECOM – Mr. Peter Lee (By Email) China State Construction Engineering (Hong Kong) Ltd. – Mr. Xavier Lam / Mr. Ng Ka Po (By Email)



Ref.: HYDHZMBEEM00\_0\_7348L.19

17 April 2019

By Fax (3468 2076) and By Post

AECOM Asia Co. Ltd.
The PRE's Office
550 Cheung Tung Road, Lantau, Hong Kong

Attention: Mr. Peter Lee

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/2013/04

HZMB HKBCF - Infrastructure Works Stage II (Southern Portion)

Monthly Environmental Monitoring & Audit Report for March 2019

Reference is made to the Environmental Team's submission of the Monthly EM&A Report for March 2019 certified by the ET Leader (ET's ref.: "TC/GC/al/T355861/02/02/L118" dated 17 April 2019) and provided to us via e-mail on 17 April 2019.

We are pleased to inform you that we have no adverse comments on the captioned submission. We write to verify the captioned submission in accordance with Condition 5.4 of the Environmental Permit No. EP-353/2009/K (the EP).

The ET Leader is reminded that it is the ET's responsibility to ensure the report be timely submitted to the Director of Environmental Protection and the reported information be true, valid and correct as per Conditions 5.4 and 5.5 of the EP respectively.

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 Hong Kong Limited

Rav Yan

Independent Environmental Checker

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Internal: DY, YH, DF, HW, ENPO Site



Contract No. HY/2013/04 HZMB HKBCF – Infrastructure Works Stage II (Southern Portion)

Monthly EM&A Report for March 2019

April 2019

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# **Executive summary**

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. HY/2013/04 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)" (hereafter referred to as "the Contract") for the Highways Department of Hong Kong Special Administrative Region (HKSAR). The Contract was awarded to China State Construction Engineering (Hong Kong) Limited (hereafter referred to as "the Contractor") and Mott MacDonald Hong Kong Limited (MMHK) was appointed as the Environmental Team (ET) by the Contractor.

The Contract is part of the "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities" (HZMB HKBCF) Project which is a "Designated Project" under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015.

Mott MacDonald Hong Kong Limited has been appointed by the Contractor to implement the Environmental Monitoring & Audit (EM&A) programme for the Contract in accordance with the Updated EM&A Manual for HKBCF (Version 1.0) and will be providing environmental team services for the Contract.

This is the 45<sup>th</sup> Monthly EM&A Report for the Contract which summaries findings of the EM&A works during the reporting period from 1 to 31 March 2019 (the "reporting period").

# **Environmental Monitoring and Audit Progress**

The monthly EM&A programme was undertaken in accordance with the Updated EM&A Manual for HKBCF (Version 1.0).

The remaining air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 "HZMB HKBCF – Passenger Clearance Building" were temporarily suspended from 1 October 2018. The ET of Contract No. HY/2013/04 is required and continues the full implementation of environmental monitoring commencing on 1 October 2018.

Air quality monitoring stations AMS2, AMS3C and AMS7B are covered by this Contract. It should be noted that the air quality monitoring station AMS6 is covered by Contract No. HY/2011/03 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF". If the impact air quality monitoring at AMS6 is no longer covered under Contract No. HY/2011/03, it is required to continue such monitoring at AMS6 as part of EM&A programme However, this is subject to ENPO's final decision on which ET should carry out the monitoring work at these stations.

Noise monitoring stations NMS2 and NMS3C, water quality monitoring works and dolphin monitoring works under HZMB HKBCF are covered by this Contract.

A summary of the monitoring activities during the reporting period are listed below:

1-hour TSP Monitoring: 5, 11, 16, 21 and 27 March 2019

- 24-hour TSP Monitoring: 5, 11, 16, 21 and 27 March 2019
- Noise Monitoring:
   5, 11, 21 and 27 March 2019
- Water Quality Monitoring: not conducted during the reporting period^
- Chinese White Dolphin Monitoring: 4, 11, 13 and 18 March 2019\*
- Environmental Site Inspection: 7, 13, 18 and 27 March 2019

### Remarks:

- ^ The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted.
- \* Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF commenced during the reporting month.

# **Breaches of Action and Limit Levels**

A summary of environmental exceedances for the reporting period as recorded by the Environmental Team of this Contract are listed below:

<b>Environmental Monitoring</b>	Parameters	Action Level	Limit Level
AirQuality	1-hourTSP	-	-
	24-hourTSP	-	-
Noise	L <sub>eq (30 min)</sub>	-	-
Water Quality	Suspended Solids (SS)	-	-
	Turbidity	-	-
	Dissolved Oxygen (DO)	-	-

## **Complaint Log**

There were no complaints received in relation to the environmental impact during the reporting period.

### Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during this reporting period.

## **Reporting Changes**

There was no reporting change during the reporting period.

### **Future Key Issues**

The future key issues to be undertaken in the upcoming month are:

- Erection of sign gantries (land-based)
- Construction of parapets for bridge structures (land-based)
- Construction of Retaining Wall RW16N and RW16S (land-based)
- Construction of Bridge Deck D16 in-situ deck (land-based)
- Construction of utilities cross-over frame under Bridge D9c (land-based)
- Backfilling of retaining walls and formation of fill slopes and road embankment (land-based)
- Drainage works and watermains laying (land-based)
- Roadworks and road furniture (land-based)
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and Tuen Mun – Chek Lap Kok Link Southern Connection (TM-CLKL-SC) (landbased)

# 1 Introduction

### 1.1 Background

On 13 March 2015, Mott MacDonald Hong Kong Limited (MMHK) was commissioned by China State Construction Engineering (Hong Kong) Limited (also referred to as "the Contractor") to undertake the Environmental Team (ET) services (including environmental monitoring and audit (EM&A)) for Contract No. HY/2013/04 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion)" ("the Contract") for the Highways Department of Hong Kong Special Administrative Region (HKSAR).

The Contract is part of the "Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities" (HZMB HKBCF) Project which is a "Designated Project" under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499) and for which an EIA Report (Register No. AEIAR-145/2009) was prepared and approved. The current Environmental Permit (EP) for HKBCF, namely No. EP-353/2009/K, was issued on 11 April 2016. These documents are available through the EIA Ordinance Register. Commencement of the Contract took place on 13 March 2015 and the construction works commenced on 13 July 2015. The works areas of the contract are shown in **Appendix A**.

This is the 45<sup>th</sup> Monthly EM&A Report summarising the findings of EM&A activities conducted under the Contract from 1 to 31 March 2019 (the "reporting period") and is submitted to fulfil Condition 5.4 of the EP.

### 1.2 Project Description

The Proposed works under this Contract comprise the following:

- Construction of vehicular bridge and at-grade roads at the southern portion of Hong Kong Boundary Crossing Facilities;
- Construction of associated street lighting, street furniture, road marking, road signage, box culverts and outfalls, drainage, sewerage, fresh water and flushing water supply, irrigation, landscape, electrical and mechanical (E&M), utilities and services works;
- Provisioning of civil engineering works and power supply for Traffic Control and Surveillance System (TCSS); and
- Other works in accordance with the Contract.

## 1.3 Project Organisation

The organisation chart and lines of communication with respect to the on-site environmental management structure together with the contact information of the key personnel are shown in **Appendix B**. The key personnel contact names and numbers are summarized in **Table 1.1**.

**Table 1.1: Contact Information of Key Personnel** 

Party	Position	Nam e	Telephone	Fax
Engineer or Engineer's Representative (AECOM Asia Co. Ltd.)	Senior Resident Engineer	PeterLee	3958 7465	3748 8900
Environmental Project Office / Independent Environmental Checker	Environmental Project Office Leader	Y H Hui	3465 2888	3465 2899
(Ramboll Hong Kong Limited)	Independent Environmental Checker	Ray Yan	3465 2836 / 5181 8401	3465 2899
	Environmental Site Supervisor	Harris Wong	3465 2805 / 5181 8709	3465 2899
Contractor	Site Agent	Jason Chung	9127 8369	2459 4336
(China State Construction Engineering	Environmental Officer	XavierLam	9493 2944	2459 4336
(Hong Kong) Limited)		K P Ng	9626 9961	2459 4336
Environmental Team (Mott MacDonald Hong Kong Limited)	Environmental Team Leader	Gary Chow	2828 5874	2827 1823
24-hour Complaint Hotline	-	-	5236 7111	-

# 1.4 Construction Programme

The Construction Works Programme of the Project is provided in **Appendix C**.

# 1.5 Construction Works undertaken during the Reporting Period

A summary of the construction activities undertaken during this reporting period is shown below.

- Erection of sign gantries
- Construction of parapets for bridge structures
- Construction of Retaining Wall RW16N and RW16S
- Construction of Bridge Deck D16 in-situ deck
- Construction of utilities cross-over frame under Bridge D9c
- Backfilling of retaining walls and formation of fill slopes and road embankment
- Drainage works and watermains laying
- Roadworks and road furniture
- Maintenance of temporary traffic arrangements (TTA) associated with the commissioning of HKBCF and TM-CLKL-SC
- No marine-based segment delivery (all segments stored at segment storage yard on HKBCF island site)
- No generation of excavated marine sediment

During this reporting period, temporary soft landscaping works were conducted and marine-based outfall works had not commenced.

# 2 Air Quality Monitoring

### 2.1 Introduction

In accordance with the Contract Specific EM&A Manual, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS6 and AMS7 were established. Also, baseline 1-hour and 24-hour Total Suspended Particulates (TSP) levels at air quality monitoring stations AMS2 and AMS3 were established under other HKBCF contracts. Impact 1-hour TSP monitoring was conducted for at least three times every 6 days, while impact 24-hour TSP monitoring was carried out for at least once every 6 days.

# 2.2 Monitoring Locations

Monitoring locations AMS2, AMS3, AMS6 and AMS7 were set up at the proposed locations in accordance with the relevant Contract Specific EM&A Manual. For monitoring location AMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, approval for carrying out impact monitoring could not be obtained from the principal of the school. Permission on setting up and carrying out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact air quality monitoring was conducted at site boundary of the site office area in Works Area WA2 (AMS3B) before being relocated to Ying Tung Estate Market Rooftop (AMS3C) on 20 August 2018 under this Contract. The same baseline and Action Level for air quality, as derived from the baseline monitoring data recorded at Ho Yu College, was adopted for this alternative air quality location.

It should be noted that the air quality monitoring works for the Contract at AMS6 (Dragonair/CNAC (Group) Building) are covered by Contract No. HY/2011/03 "Hong Kong-Zhuhai-Macao Bridge Hong Kong Link Road (HZMB HKLR) – Section between Scenic Hill and HKBCF".

The ET of the Contract or another ET of the HZMB project is required to conduct impact air quality monitoring at AMS6 as part of EM&A programme if this air quality monitoring station is no longer covered under Contract No. HY/2011/03.

**Table 2.1** describes the details of the monitoring stations and **Figure 2.1** shows the locations of air monitoring stations.

**Table 2.1: Construction Dust Monitoring Locations** 

Identification No.	Location Description
AMS2	Tung Chung Development Pier
AMS3C	Ying Tung Estate Market Rooftop
AMS6 <sup>(1)</sup>	Dragonair/CNAC (Group) Building
AMS7B	3RS Site Offices

Remarks: (1) The ET of this Contract should conduct impact air quality monitoring at station AMS6 listed in the table as part of EM&A programme according to latest notification from ENPO when the monitoring station(s) is/are no longer covered by another ET of the HZMB project.

### 2.3 Monitoring Action and Limit Levels

The Action and Limit Levels for 1-hr TSP and 24-hr TSP are provided in **Table 2.2** and **Table 2.3** respectively. The same baseline and Action/Limit Levels for air quality, as derived from the baseline monitoring data recorded at and AMS3 and AMS7, apply with the abovementioned relocations to AMS3C and AMS7B respectively.

Table 2.2: Action and Limit Levels for 1-hour TSP

Monitoring Station	Action Level, µg/m <sup>3</sup>	Limit Level, µg/m <sup>3</sup>
AMS2 – Tung Chung Development Pier	374	500
AMS3C – Ying Tung Estate Market Rooftop	368	500
AMS6 – Dragonair / CNAC (Group) Building (HKIA)	360	500
AMS7B – 3RS Site Offices	370	500

Table 2.3: Action and Limit Levels for 24-hour TSP

Monitoring Station	Action Level, µg/m <sup>3</sup>	Limit Level, µg/m³
AMS2 – Tung Chung Development Pier	176	260
AMS3C – Ying Tung Estate Market Rooftop	167	260
AMS6 - Dragonair / CNAC (Group) Building (HKIA)	173	260
AMS7B – 3RS Site Offices	183	260

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

# 2.4 Monitoring Station AMS6

The monitoring requirements, monitoring equipment, monitoring parameters, frequency and duration, monitoring methodology and monitoring schedule for air quality monitoring station AMS6 are detailed in the monthly EM&A Reports prepared for Contract No. HY/2011/03.

### 2.5 Monitoring Schedule for the Reporting Period

The schedule for air quality monitoring at AMS2, AMS3C and AMS7B in the reporting period is presented in **Appendix I**.

# 2.6 Monitoring Equipment

24-hour TSP air quality monitoring was performed using High Volume Sampler (HVS) located at each designated monitoring station. The HVS meets all the requirements of the Contract Specific EM&A Manual. Portable direct reading dust meters were used to carry out the 1-hour TSP monitoring. Brand and model of the equipment used for air quality monitoring stations AMS2, AMS3C and AMS7B under this Contract is given in **Table 2.4**.

**Table 2.4: Air Quality Monitoring Equipment** 

Equipment	Brand	Model No.
Portable direct reading dust meter (1-hour TSP)	Sibata Digital Dust Monitor	LD-3B
High Volume Sampler (24-hour TSP)	Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Sampler	TE-5170

## 2.7 Monitoring Methodology

## 24-hour TSP Monitoring

- a. The HVS was installed in the vicinity of the air sensitive receivers. The following criteria were considered in the installation of the HVS.
  - i. A horizontal platform with appropriate support to secure the sampler against gusty wind was provided.
  - ii. The distance between the HVS and any obstacles, such as buildings, was at least twice the height that the obstacle protrudes above the HVS.
  - iii. A minimum of 2 meters separation from walls, parapets and penthouse for rooftop sampler was provided.
  - iv. No furnace or incinerator flues are nearby.
  - v. Airflow around the sampler was unrestricted.
  - vi. Permission was obtained to set up the samplers and access to the monitoring stations.
  - vii. A secured supply of electricity was obtained to operate the samplers.
  - viii. The sampler was located more than 20 meters from any dripline.
  - ix. Any wire fence and gate, required to protect the sampler, did not obstruct the monitoring process.
  - x. Flow control accuracy was kept within ±2.5% deviation over 24-hour sampling period.

### b. Preparation of Filter Papers

- Glass fibre filters, G810 were labelled and sufficient filters that were clean and without pinholes were selected.
- ii. All filters were equilibrated in the conditioning environment for 24 hours before weighing. The conditioning environment temperature was around 25 °C and not variable by more than ±3 °C; the relative humidity (RH) was < 50% and not variable by more than ±5%. A convenient working RH was 40%.
- iii. All filter papers were prepared and analysed by ALS Technichem (HK) Pty Ltd., which is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes.

### c. Field Monitoring

- i. The power supply was checked to ensure the HVS works properly.
- ii. The filter holder and the area surrounding the filter were cleaned.
- iii. The filter holder was removed by loosening the four bolts and a new filter, with stamped number upward, on a supporting screen was aligned carefully.
- iv. The filter was properly aligned on the screen so that the gasket formed an airtight seal on the outer edges of the filter.
- v. The swing bolts were fastened to hold the filter holder down to the frame. The pressure applied was sufficient to avoid air leakage at the edges.
- vi. Then the shelter lid was closed and was secured with the aluminium strip.
- vii. The HVS was warmed-up for about 5 minutes to establish run-temperature conditions.
- viii. A new flow rate record sheet was set into the flow recorder.
- ix. On site temperature and atmospheric pressure readings were taken and the flow rate of the HVS was checked and adjusted at around 1.1 m<sup>3</sup>/min, and complied with

the range specified in the Updated EM&A Manual for HKBCF (Version 1.0) (i.e. 0.6-1.7 m<sup>3</sup>/min).

- x. The programmable digital timer was set for a sampling period of 24 hours, and the starting time, weather condition and the filter number were recorded.
- xi. The initial elapsed time was recorded.
- xii. At the end of sampling, on site temperature and atmospheric pressure readings were taken and the final flow rate of the HVS was checked and recorded.
- xiii. The final elapsed time was recorded.
- xiv. The sampled filter was removed carefully and folded in half length so that only surfaces with collected particulate matter were in contact.
- xv. It was then placed in a clean plastic envelope and sealed.
- xvi. All monitoring information was recorded on a standard data sheet.
- xvii. Filters were then sent to ALS Technichem (HK) Pty Ltd. for analysis.

### d. Maintenance and Calibration

- The HVS and its accessories were maintained in good working condition, such as replacing motor brushes routinely and checking electrical wiring to ensure a continuous power supply.
- 5-point calibration of the HVS was conducted using TE-5025A Calibration Kit prior to the commencement of baseline monitoring. Bi-monthly 5-point calibration of the HVS will be carried out during impact monitoring.
- iii. Calibration certificate of the HVSs are provided in **Appendix J**.

### 1-hour TSP Monitoring

a. Measuring Procedures

The measuring procedures of the 1-hour dust meter were in accordance with the Manufacturer's Instruction Manual as follows:

- i. Turn the power on.
- ii. Close the air collecting opening cover.
- iii. Push the "TIME SETTING" switch to [BG].
- iv. Push "START/STOP" switch to perform background measurement for 6 seconds.
- Turn the knob at SENSI ADJ position to insert the light scattering plate.
- vi. Leave the equipment for 1 minute upon "SPAN CHECK" is indicated in the display.
- vii. Push "START/STOP" switch to perform automatic sensitivity adjustment. This measurement takes 1 minute.
- viii. Pull out the knob and return it to MEASURE position.
- ix. Push the "TIME SETTING" switch the time set in the display to 3 hours.
- x. Lower down the air collection opening cover.
- xi. Push "START/STOP" switch to start measurement.

### b. Maintenance and Calibration

 The 1-hour TSP meter was calibrated at 1-year intervals against a Tisch Environmental Mass Flow Controlled Total Suspended Particulate (TSP) High Volume Air Sampler. Calibration certificates of the Laser Dust Monitors are provided in Appendix J.

# 2.8 Monitoring Results

The monitoring results for 1-hour and 24-hour TSP at AMS2, AMS3C and AMS7B are summarized in **Table 2.5 and Table 2.6** respectively. Detailed impact air quality monitoring results are presented in **Appendix K**.

Table 2.5: Summary of 1-hour TSP Monitoring Results During the Reporting Period

Monitoring Station	Average, μg/m <sup>3</sup>	Range, μg/m <sup>3</sup>	Action Level, µg/m <sup>3</sup>	Limit Level, µg/m³
AMS2	38	20 – 49	374	500
AMS3C	43	21 – 100	368	500
AMS7B	41	20 – 55	370	500

Table 2.6: Summary of 24-hour TSP Monitoring Results During the Reporting Period

Monitoring Station	Average, µg/m³	Range, µg/m <sup>3</sup>	Action Level, µg/m³	Limit Level, µg/m <sup>3</sup>
AMS2	57	35 – 88	176	260
AMS3C	56	36 – 78	167	260
AMS7B	71	49 – 97	183	260

There was no Action and Limit Level exceedance of 1-hr TSP level and 24-hr TSP level recorded at station AMS2, AMS3C and AMS7B by the Environmental Team of this Contract during the reporting period.

The monitoring results for AMS6 are reported in the monthly EM&A Reports prepared for Contract No. HY/2011/03.

Summary of Action and Limit Level exceedance of 1-hr TSP level and 24-hr TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

The wind data obtained from the on-site wind station (as shown in **Figure 2.1**) during the reporting period is provided in **Appendix M**.

# 3 Noise Monitoring

### 3.1 Introduction

In accordance with the Contract Specific EM&A Manual, impact noise monitoring was conducted at least once per week for each noise monitoring location during the construction phase of the Contract.

# 3.2 Monitoring Locations

Approval for carrying out impact monitoring at NMS3 (Ho Yu College), as proposed in the Contract Specific EM&A Manual, could not be obtained from the principal of school. Permission on setting up and carry out impact monitoring works at nearby sensitive receivers, like Caribbean Coast and Coastal Skyline, was also sought. However, approvals for carrying out impact monitoring works within their premises were not obtained. Impact noise monitoring was conducted at site boundary of the site office area in Works Area WA2 (NMS3B) before being relocated to Ying Tung Estate Market Rooftop (NMS3C) on 20 August 2018 under this Contract. The same baseline noise level (as derived from the baseline monitoring data recorded at Ho Yu College) and Limit Level were adopted for this alternative noise monitoring location.

**Table 3.1** describes the details of the monitoring stations and **Figure 3.1** shows the locations of noise monitoring stations.

**Table 3.1: Construction Noise Monitoring Locations** 

Identifica	ation No. Location Description
NMS2	Seaview Crescent
NMS3C <sup>(1)</sup>	Ying Tung Estate Refuse Collection Point
Remarks:	(1) The Action and Limit Levels for schools will be applied for this alternative monitoring location.

### 3.3 Monitoring Parameters, Frequency and Duration

**Table 3.2** summarises the monitoring parameters, frequency and duration of impact TSP monitoring.

### Table 3.2: Noise Monitoring Parameters, Frequency and Duration

Parameter	Frequency and Duration
30-minutes measurement at each monitoring station between 0700 and 1900 on normal weekdays (Monday to Saturday). $L_{\text{eq}}$ , $L_{\text{10}}$ and $L_{\text{90}}$ would be recorded.	At least once per week

### 3.4 Action and Limit Levels

The Action and Limit Levels for construction noise are defined in Table 3.3.

Table 3.3: Action and Limit Level for Construction Noise

Monitori	ng Station	Time Period	Action Level	Limit Level
NMS2		07:00 – 19:00 hourson	When one documented complaint is received	70 dB(A)
NMS3C		normal weekdays	when one documented complaint is received	70/65 dB(A)*
Remark		vel for schools will be applied for NMS3C. Day time noise Limit Level of 70 dB(A) applies to an institutions, while 65 dB(A) applies during the school examination period.		

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

# 3.5 Monitoring Schedule for the Reporting Period

The schedule for noise monitoring in the reporting period is presented in **Appendix I**.

# 3.6 Monitoring Equipment

Noise monitoring was performed using sound level meters at each designed monitoring station. The sound level meters deployed comply with the International Electrotechnical Commission Publications (IEC) 651:1979 (Type 1) and 804:1985 (Type 1) specifications. Acoustic calibrator was deployed to check the sound level meters at a known sound pressure level. Brand and model of the equipment used for noise monitoring under this Contract is given in **Table 3.4**.

**Table 3.4: Noise Monitoring Equipment** 

Equipment	Brand	Model No.
Integrated Sound Level Meter	Rion	NL-52
Acoustic Calibrator	Larson Davis	CAL200

# 3.7 Monitoring Methodology

### 1. Monitoring Procedure

- a. The measurement at NMS3C was free-field measurement and NMS2 was façade measurement. A correction of +3dB(A) shall be made to the free-field measurement.
- b. The battery condition was checked to ensure the correct functioning of the meter.
- c. Parameters such as frequency weighting, the time weighting and the measurement time were set as follows:
  - i. frequency weighting: A
  - ii. time weighting: Fast
  - iii. time measurement:  $L_{eq}$  (30-minutes) during non-restricted hours i.e. 0700-1900 on normal workdays.
- d. Prior to and after each noise measurement, the meter was calibrated using the acoustic calibrator for 94dB(A) at 1000 Hz. If the difference in the calibration level before and after measurement was more than 1 dB(A), the measurement would be considered invalid and repeat of noise measurement would be required after re-calibration or repair of the equipment.
- e. During the monitoring period, the L<sub>eq</sub>, L<sub>10</sub> and L<sub>90</sub> were recorded. In addition, site conditions and noise sources were recorded on a standard record sheet.

- f. Noise measurement was paused during periods of high intrusive noise (e.g. dog barking, helicopter noise) if possible. Observations were recorded when intrusive noise was unavoidable.
- g. Noise monitoring was cancelled in the presence of fog, rain, wind with a steady speed exceeding 5m/s, or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

### 2. Maintenance and Calibration

- a. The microphone head of the sound level meter was cleaned with soft cloth at regular intervals.
- b. The meter and calibrator were sent to the supplier or HOKLAS laboratory to check and calibrate at yearly intervals.
- Calibration certificates of the sound level meters and acoustic calibrators are provided in Appendix J.

### 3.8 Monitoring Results

The monitoring results for construction noise are summarized in **Table 3.5**. Detailed impact noise monitoring results and relevant graphical plots are presented in **Appendix K**.

Table 3.5: Summary of Construction Noise Monitoring Results During the Reporting Period

Monitoring Station	Average, dB(A) L <sub>eq (30 mins)</sub>	Range, dB(A) L <sub>eq (30 mins)</sub>	Lim it Level, dB(A) Leq (30 mins)
NMS2	64	62 – 66	75
NMS3C	66	63 – 68	70/65*

Remark: (\*) The Limit Level for schools will be applied for NMS3C. Daytime noise Limit Level of 70 dB(A) applies to education in stitutions, while 65 dB(A) applies during the school examination period.

No noise exceedances were recorded at stations NMS2 and NMS3C by the ET of this Contract during the reporting period.

# 4 Water Quality Monitoring

### 4.1 Introduction

Impact water quality monitoring was carried out to ensure that any deterioration of water quality was detected, and that timely action was taken to rectify the situation. For impact water quality monitoring, measurement were taken in accordance with the Contract Specific EM&A Manual.

# 4.2 Monitoring Locations

During the reporting period, the water quality monitoring works are covered by this Contract. A total of twenty-one stations (nine Impact Stations, seven Sensitive Receiver Stations and five Control/Far Field Stations) are covered by the current EM&A programme.

The nine Impact Stations (IS) were chosen on the basis of their proximity to the reclamation and thus the greatest potential for water quality impacts, the seven Sensitive Receiver Stations (SR) were chosen as they are close to the key sensitive receives and the five Control/ Far Field Stations (CS) were chosen to facilitate comparison of the water quality of the IS stations with less influence by the Project/ambient water quality conditions.

The water quality monitoring stations at CS(Mf)3 (Coordinate: 809989E, 821117N), IS10 (Coordinate: 812577E, 820670N) and SR5 (811489E, 820455N) have been occupied by the marine work of a designated project – "Expansion of Hong Kong International Airport into a Three-Runway System" (3RS Project). The alternative water quality monitoring station at CS(Mf)3(N) (Coordinate: 808814E, 822355N), IS10(N) (Coordinate: 812942E, 820881N) and SR5(N) (812569E, 8201475N) were justified and verified by the ET Leader of Contract No. HY/2010/02 and the IEC respectively on 24 March 2017 and it was approved by EPD on 12 May 2017.

The water quality monitoring stations at SR3, SR10A and SR10B(N) were not available for water sampling due to safety reason, thus, monitoring stations were changed to SR3(N) (Coordinate: 810689E, 816591N); SR10A(N) (Coordinate: 823644E, 823484N) and SR10B(N2) (Coordinate: 823689E, 823159N) were justified by the ET Leader of Contract No. HY/2013/01 on 8 November 2017 and the IEC verified on 13 November 2017; and submitted to EPD on 29 November 2017 and it was approved by EPD on 22 December 2017.

**Table 4.1** and **Figure 4.1** shows the locations of water quality monitoring stations.

**Table 4.1: Impact Water Quality Monitoring Stations** 

Station	Description	East	North
IS5	Impact Station (Close to HKBCF construction site)	811579	817106
IS(Mf)6	Impact Station (Close to HKBCF construction site)	812101	817873
IS7	Impact Station (Close to HKBCF construction site)	812244	818777
IS8	Impact Station (Close to HKBCF construction site)	814251	818412
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850
IS10(N)	Impact Station (Close to HKBCF construction site)	812942	820881
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716
IS(Mf)16	Impact Station (Close to HKBCF construction site)	814328	819497

Station	Description	East	North
IS17	Impact Station (Close to HKBCF construction site)	814539	820391
SR3(N)	Sensitive receivers (San Tau SSSI)	810689	816591
SR4(N)	Sensitive receivers (Tai Ho)	814705	817859
SR5(N)	Sensitive receivers (Artificial Reef in NE Airport)	812569	821475
SR6	Sensitive receivers (Sha Chau and Lung Kwu Chau Marine Park)	805837	821818
SR7	Sensitive receivers (Tai Mo Do)	814293	821431
SR10A(N)	Sensitive receivers (Ma Wan FCZ) 1	823644	823484
SR10B(N2)	Sensitive receivers (Ma Wan FCZ) 2	823689	823159
CS(Mf)3(N)	Control Station	808814	822355
CS(Mf)5	Control Station	817990	821129
CS4	Control Station	810025	824004
CS6	Control Station	817028	823992
CSA	Control Station	818103	823064

If exceedance(s) at these stations is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

# 4.3 Monitoring Parameters, Frequency and Duration

**Table 4.2** summarizes the monitoring parameters, frequency and monitoring depths of impact water quality monitoring in the Contract Specific EM&A Manual.

Table 4.2: Impact Water Quality Monitoring Parameters and Frequency

Monitoring Stations	Parameter, Unit	Frequency	No. of Depths Measured
Impact Stations: IS5, IS(Mf)6, IS7, IS8, IS(Mf)9, IS10(N), IS(Mf)11, IS(Mf)16, IS17  Control/Far Field Stations: CS(Mf)3(N), CS(Mf)5, CS4, CS6, CSA  Sensitive Receiver Stations: SR3(N), SR4(N), SR5(N), SR6, SR7, SR10A(N) & SR10B(N2)	<ul> <li>Depth, m</li> <li>Temperature, °C</li> <li>Salinity, ppt</li> <li>Dissolved Oxygen (DO), mg/L</li> <li>DO Saturation, %</li> <li>Turbidity, NTU</li> <li>pH</li> <li>Suspended Solids (SS), mg/L</li> </ul>	Three timesper week during mid-ebb and mid-flood tides (within ±1.75 hour of the predicted time)	3 (1m below water surface, middepth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored.)

# 4.4 Monitoring Action and Limit Levels

The Action and Limit Levels for water quality are provided in **Table 4.3**.

Table 4.3: Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO in mg L <sup>-1</sup>	Surface and Middle	Surface and Middle
(Surface, Middle & Bottom)	5.0	4.2 (except 5 mg/L for FCZ)
	Bottom	Bottom
	4.7	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*

Parameters	Action	Limit
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

#### Remarks:

#### 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.
- The 1%-ile of baseline data for dissolved oxygen (surface and middle) and dissolved oxygen (bottom) are 4.2 mg/L and 3.6 mg/L respectively.

The event and action plan is provided in **Appendix D**.

## 4.5 Monitoring Schedule for the Reporting Period

The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted, therefore no water quality monitoring was conducted.

### 4.6 Monitoring Equipment

**Table 4.4** summaries the equipment used in the impact water quality monitoring programme.

## **Table 4.4: Water Quality Monitoring Equipment**

Equipment	Brand and Model	Serial Number
DO and Temperature Meter, Salinity Meter, Turbidity Meter & pH Meter	Not applicable – no water quality monitoring was conducted during the reporting period since no marine works were scheduled or conducted	Not applicable – no water quality monitoring was conducted during the reporting period since no marine works were scheduled or conducted

## 4.7 Monitoring Methodology

### 4.7.1 Instrumentation

a. The in-situ water quality parameters, viz. dissolved oxygen, temperature, salinity, turbidity and pH, were measured by multi-parameter meters and pH meter.

### 4.7.2 Operating/Analytical Procedures

- a. Digital Differential Global Positioning Systems (DGPS) were used to ensure that the correct location was selected prior to sample collection.
- b. Portable, battery-operated echo sounders were used for the determination of water depth at each designated monitoring station.
- c. All in-situ measurements were taken at 3 water depths, 1m below water surface, middepth and 1m above sea bed, except where the water depth was less than 6m, in which case the mid-depth station was omitted. Should the water depth be less than 3m, only the mid-depth station was monitored.
- d. At each measurement/sampling depth, two consecutive in-situ monitoring (DO concentration and saturation, temperature, turbidity, pH, salinity) and water sample for SS. The probes were retrieved out of the water after the first measurement and then re-

<sup>\*</sup> Reference is made to EPD approval of adjustment of water quality assessment criteria issued and became effective on 18 February 2013.

- deployed for the second measurement. Where the difference in the value between the first and second readings of DO or turbidity parameters was more than 25% of the value of the first reading, the reading was discarded and further readings were taken.
- e. Duplicate samples from each independent sampling event were collected for SS measurement. Water samples were collected using the water samplers and the samples were stored in high density polythene bottles. Water samples collected were well-mixed in the water sampler prior to pre-rinsing and transferring to sample bottles. Sample bottles were pre-rinsed with the same water samples. The sample bottles were then be packed in cool-boxes (cooled at 4°C without being frozen), and delivered to ALS Technichem (HK) Pty Ltd. for the analysis of suspended solids concentrations. The laboratory determination work would be started within 24 hours after collection of the water samples. ALS Technichem (HK) Pty Ltd. is a HOKLAS accredited laboratory and has comprehensive quality assurance and quality control programmes. For QA/QC procedures, one duplicate samples of every batch of 20 samples was analyzed.
- f. The analysis method and reporting and detection limit for SS is shown in **Table 4.5**.

### Table 4.5: Laboratory Analysis for Suspended Solids

Parameters	Instrumentation	<b>Analytical Method</b>	<b>Reporting Limit</b>	<b>Detection Limit</b>
Suspended Solids (SS)	Weighting	APHA 2540-D	0.5 mg/L	0.5 mg/L

g. Other relevant data were recorded, including monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena or work underway at the construction site in the field log sheet for information.

### 4.7.3 Maintenance and Calibration

- All in situ monitoring instruments would be calibrated and calibrated by ALS Technichem (HK) Pty Ltd. before use and at 3-monthly intervals throughout all stages of the water quality monitoring programme. Calibration details are provided in **Appendix J**.
- b. The dissolved oxygen probe of YSI 6820 was calibrated by wet bulb method. Before the calibration routine, the sensor for dissolved oxygen was thermally equilibrated in water-saturated air. Calibration cup is served as a calibration chamber and it was loosened from airtight condition before it is used for the calibration. Calibration at ALS Technichem (HK) Pty Ltd. was carried out once every three months in a water sample with a known concentration of dissolved oxygen. The sensor was immersed in the water and after thermal equilibration, the known mg/L value was keyed in and the calibration was carried out automatically.
- c. The turbidity probe of YSI 6820 is calibrated two times a month. A zero check in distilled water was performed with the turbidity probe of YSI 6820 once per monitoring day. The probe will be calibrated with a solution of known NTU at ALS Technichem (HK) Pty Ltd. once every three months.

### 4.8 Monitoring Results and Exceedance Investigations

The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted, therefore no water quality monitoring results are presented in this report.

# 5 Dolphin Monitoring

### 5.1 Introduction

Vessel based surveys for the Chinese White Dolphin (CWD), Sousa chinensis, are to be conducted by a dedicated team comprising a qualified marine mammal ecologist and experienced marine mammal observers (MMOs). The purpose of the surveys is to evaluate the impact of the HKCBF reclamation and, if deemed detrimental, to take appropriate action as per the EM&A Manual.

### 5.2 Monitoring Locations

### 5.2.1 Vessel-based Line-transect Survey

According to the requirement of the updated EM&A Manual, the dolphin monitoring programme should adopt line-transect vessel survey method. The survey follows pre-set and fixed transect lines in the two areas defined by AFCD as: Northeast Lantau (NEL) survey area; and Northwest Lantau (NWL) survey area.

**Table 5.1** shows the co-ordinates for the transect lines and layout map. The layout map showing the transect lines have been provided by AFCD and are shown in **Figure 5.1**.

Table 5.1: Impact Dolphin Monitoring Line Transect Co-ordinates (Provided by AFCD)

Transect	HK Grid	System	Long Lat	in WGS84
	Х	Υ	Long	Lat
1#	804671	815456	113.870287	22.277678
	804671	831404	113.869975	22.421696
2*^	805476	820800	113.877995	22.325951
	805476	826654	113.877882	22.378815
3^	806464	821150	114.030267	22.196697
	806464	822911	114.047344	22.196712
4^	807518	821500	114.033651	22.206219
	807518	829230	114.108618	22.206267
5^	808504	821850	114.037037	22.215126
	808504	828602	114.102523	22.215169
6^	809490	822150	114.039938	22.224033
	809490	825352	114.070995	22.224056
7*^	810499	822000	114.038474	22.233143
	810499	824613	114.063820	22.233163
8#	811508	821123	113.936539	22.328966
	811508	824254	113.936486	22.357241
9#	812516	821303	113.946320	22.330606
	812516	824254	113.946279	22.357255
10*	813525	820827	113.956112	22.326321
	813525	824657	113.956066	22.360908
11#	814556	818853	113.966155	22.304858

Transect	HK Grid	System	Long Lat	in WGS84
	814556	820992	113.966125	22.327820
12	815542	818807	113.975726	22.308109
	815542	824882	113.975647	22.362962
13	816506	819480	113.985072	22.314192
	816506	824859	113.985005	22.362771
14	817537	820220	113.995070	22.320883
	817537	824613	113.995018	22.360556
15	818568	820735	114.005071	22.325550
	818568	824433	114.005030	22.358947
16	819532	821420	114.014420	22.331747
	819532	824209	114.014390	22.356933
17	820451	822125	114.023333	22.338117
	820451	823671	114.023317	22.352084
18	821504	822371	114.033556	22.340353
	821504	823761	114.033544	22.352903
19	822513	823268	114.043340	22.348458
	822513	824321	114.043331	22.357971
20	823477	823402	114.052695	22.349680
	823477	824613	114.052686	22.360610
21	805476	827081	113.877878	22.382668
	805476	830562	113.877811	22.414103
22	806464	824033	113.887520	22.355164
	806464	829598	113.887416	22.405423
23	814559	821739	113.966142	22.334574
	814559	824768	113.966101	22.361920
24^	805476	815900	113.979368	22.187721
	805476	819100	114.010398	22.187756

### Remarks:

- (a) \* Due to the presence of deployed silt curtain systems at the site boundaries of the Contract, some of the transect lines shown in Figure 5.1 could not be fully surveyed during the regular survey. Transect 10 is reduced from 6.4km to approximately 3.6km in length due to the HKBCF construction site. Therefore the total transect length for both NEL and NWL combined is reduced to approximately 108km.
- (b) # 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.
- (c) ^ Due to marine works of the Expansion of Hong Kong International Airport into a Three-Runway System (3RS Project), the change of transect lines 2, 3, 4, 5, 6 and 7 and new transect line 24 were justified and verified by the ET Leader for Contract No. HY/2010/02 and the IEC respectively on 24 March 2017 and it was approved by EPD on 12 May 2017.

The survey team used standard line-transect methods (Buckland *et al.*, 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung, 2017, 2018). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.

Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets,

while the primary observer searched for dolphins and porpoises continuously through 7 x 50 Fuinon marine binoculars.

Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.

During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility), and distance travelled in each series (a continuous period of search effort) with the assistance of a handheld GPS (Garmin eTrex Legend).

Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.

When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.

Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines was labelled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labelled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese white dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.

Encounter rates of Chinese white dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

### 5.2.2 Photo-identification Work

When a group of Chinese White Dolphins were sighted during the line-transect survey, the survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.

A professional digital camera (Canon EOS 7D model), equipped with long telephoto lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater

detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.

Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson, 2000).

All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

### 5.3 Action and Limit Levels for Dolphin Monitoring

The Action and Limit Levels for Chinese White Dolphin Monitoring are provided in **Table 5.2** and **Table 5.3**, respectively.

Table 5.2: Action and Limit Levels for Chinese White Dolphin Monitoring - Approach to Define Action Level (AL) and Limit Level (LL)

	North Lantau	North Lantau Social Cluster		
	NEL	NWL		
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)]		

Table 5.3: Derived Value of Action Level (AL) and Limit Level (LL) for Chinese White Dolphin Monitoring

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

The event and action plan is provided in **Appendix D**.

If exceedance(s) at these survey transect(s) is/are recorded by the ET of the Contract or referred by the other ET under the HZMB project to the Contract, the ET of the Contract will carry out an investigation and findings will be reported in the monthly EM&A Report.

### 5.4 Monitoring Schedule for the Reporting Period

Post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF commenced during the reporting month.

The schedule for dolphin monitoring for the reporting period is provided in **Appendix I**.

# 5.5 Monitoring Results

### 5.5.1 Vessel-based Line-transect Survey

Two sets of systematic line-transect vessel surveys were conducted under the HKBCF dolphin monitoring programme on 4, 11, 13 and 18 March 2019, to cover all transect lines in NWL and NEL survey areas twice. The survey routes of each survey day are presented in **Figures 2 to 5** of **Appendix L.** 

A total of 259.07 km of survey effort was collected, with 95.6% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) during the reporting period's surveys (**Annex I of Appendix L**).

Among the two areas, 93.50 km and 165.57 km of survey effort were collected from NEL and NWL survey areas respectively. The total survey effort conducted on primary and secondary lines were 185.51 km and 73.56 km respectively (**Annex I of Appendix L**).

During the two sets of monitoring surveys in the reporting period, only three groups of six Chinese White Dolphins were sighted (**Annex II of Appendix L**). All three dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL. Notably, all three groups were sighted during on-effort search, with two of them being sighted on primary lines (**Appendix II of Appendix L**). None of them was associated with any operating fishing vessel.

Distribution of the dolphin sightings made in the reporting period is shown in **Figure 6 of Appendix L**. The three dolphin groups were sparsely sighted at the northwestern and southwestern corners of NWL survey area as well as near Black Point (**Figure 7 of Appendix L**). All sightings were also located far away from the HKBCF work site.

During the reporting period's surveys, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in **Table 5.4** and **Table 5.5**.

Table 5.4: Dolphin encounter rates deduced from the two sets of HKBCF surveys (two surveys in each set) during the reporting period in Northeast (NEL) and Northwest Lantau (NWL)

		Encounter rate (STG)	Encounter rate (ANI)
		(no. of on-effort dolphin sightings per 100 km of survey effort)	(no. of dolphins from all on-effort sightingsper 100 km of survey effort)
		Primary Lines Only	Primary Lines Only
NEL	Set 1: March 4 <sup>th</sup> / 11 <sup>th</sup>	0.0	0.0
	Set 2: March 13 <sup>th</sup> / 18 <sup>th</sup>	0.0	0.0
NWL	Set 1: March 4 <sup>th</sup> / 11 <sup>th</sup>	0.0	0.0
	Set 2: March 13 <sup>th</sup> / 18 <sup>th</sup>	3.4	6.8

Table 5.5: Overall dolphin encounter rates (sightings per 100 km of survey effort) from all four HKBCF surveys conducted during the reporting period on primary lines only as well as both primary lines and secondary lines in NEL and NWL

	Encounte	Encounter rate (STG)  (no. of on-effort dolphin sightings per 100 km of survey effort)		Encounter rate (ANI)	
				all on-effort sightingsper survey effort)	
	Primary Lines Only	Both Primary and Secondary Lines	Primary Lines Only	Both Primary and Secondary Lines	
NEL	0.0	0.0	0.0	0.0	
NWL	1.7	1.8	3.4	3.6	

The average dolphin group size recorded during the reporting period's surveys was 2.0 individuals per group, with all three dolphin sightings composed of small groups of two animals only (**Annex II of Appendix L**). Such average was lower than the ones recorded in previous monitoring months during the construction phase.

### 5.5.2 Photo-identification Work

During the two sets of surveys conducted during the reporting period, three known individual dolphins were sighted three times in total (**Annex III and IV of Appendix L**).

Notably, one of the identified individuals (WL145) was sighted with her young calf during their re-sightings in the present monitoring month (**Annex III of Appendix L**).

# 6 Environmental Site and Audit

## 6.1 Site Inspection

Site Inspections were carried out on a weekly basis to monitor the implementation of proper environmental pollution control mitigation measures for the project. During the reporting period, site inspections were carried out on 7, 13, 18 and 27 March 2019.

When permanent soft landscaping works within the site boundaries of the Contract are commenced, construction phase landscape and visual mitigation measures would be implemented in accordance with the EP, EIA and EM&A Manual. Monitoring and audit of landscape and visual mitigation measures would be conducted bi-weekly in accordance with Section 14.2 of the Updated EM&A Manual for HKBCF (Version 1.0). Permanent soft landscaping works within the Contract site had not commenced during the reporting period.

Particular observations during the site inspections and corrective actions undertaken by the Contractor are described below.

### 7 March 2019

a. Stagnant water inside the site after rainfall was observed. Subsequently, the stagnant water was cleared. The observation was closed on 13 March 2019.

### 13 March 2019

- a. Parts of the haul road were observed dry and dusty. Subsequently, water spraying for dust suppression was provided. The observation was closed on 18 March 2019.
- b. General refuse was observed scattered on ground. Subsequently, the refuse was cleared. The observation was closed on 27 March 2019.
- c. Oil/chemical containers were observed on ground without secondary containment. Subsequently, the oil/chemical containers without drip tray were removed from site and drip tray was provided for other containers. The observation was closed on 18 March 2019.

### 18 March 2019

- a. Improper NRMM label was observed on the excavator under bridge no. 15. The contractor should provide proper NRMM label. Subsequently, the excavator was removed from the site. The observation was closed on 27 March 2019.
- b. Stagnant water near site office observed. Subsequently, the stagnant water was cleared. The observation was closed on 27 March 2019.

### 27 March 2019

a. General refuse was observed scattered on ground at the site's storage area. The Contractor should clean up the area and provide sufficient waste bin/skip for workers. Follow-up action for the outstanding observation will be inspected during the upcoming site inspections and reported in the coming reporting period.

# 6.2 Advice on the Solid and Liquid Waste Management Status

The Contractor registered as a chemical waste producer for the Contract. Sufficient numbers of receptacles were available for general refuse collection and sorting. As a practical means, the

disposal operation is managed by a single HKBCF contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from this Contract.

There was no generation of excavated sediment for treatment during this reporting period. Any treatment of excavated marine sediment will be conducted using cement solidification/ stabilization (Cement S/S) techniques and the treated sediment will be reused onsite for either backfilling or landscaping (e.g. berm material).

The monthly summary of waste flow table is detailed in **Appendix E**.

The Contractor was reminded that chemical waste containers should be properly treated and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packing, Labelling and Storage of Chemical Waste.

### 6.2.1 Disposal of Marine Sediment Extracted from Bored Piling Works

## 6.2.1.1 Background

After the acceptance of the review of the approved Sediment Quality Report (SQR) for this Project under EPD letter dated 19 August 2015, an approval to dispose the marine sediment extracted from bored piling for this Project was then approved under memo from Secretary, Marine Fill Committee of CEDD dated 20 August 2015 for the disposal of marine sediment extracted from bored piling works. The disposal sites allocated to this Project are the Mud Pit CMP2 of the Confined Marine Sediment Disposal Facility to the South of The Brothers (or at the East of Sha Chau). As advised by CEDD in the memo dated 19 February 2016, from 00:00 on 22 March 2016 onward, the disposal space at CMP2 of the South of The Brothers is closed and all disposal of contaminated sediment is to be carried out at CMP Vd to the East of Sha Chau (ESC).

As Contract No. HY/2013/01 has commenced treatment of the extracted marine sediment, treatment will continue and the treated marine sediment will be re-used within the HKBCF Island. On the other hand, Contract Nos. HY/2013/02, HY/2013/03 and HY/2013/04 have not commenced the treatment of extracted marine sediment. Therefore, the marine sediment extracted from these three Contracts will be disposed to the allocated disposal sites directly without treatment. As a practical means, the disposal operation is managed by one contractor who is also responsible for applying dumping permit and its subsequent extension applications from EPD. Contract No. HY/2013/03 has been assigned to coordinate and arrange for disposal of extracted marine sediment from all three Contracts.

The SQR was further reviewed in mid-2016. EPD has no comment to extend the validity of the SQR to August 2017 under letter dated 18 August 2016.

Based on the actual piling operation, the estimated quantity of marine sediment to be extracted has been revised from 85,000 m³ to 126,000 m³ (bulk volume). EPD has no comments on the request as in the letter dated 20 October 2016. The Secretary of Marine Fill Committee, CEDD approved the increasing quantity in the memo dated 10 November 2016.

During the course of reviewing the SQR, it was noted that the contamination level of the marine sediment extracted from the inner part of the HKBCF Island was not identified during the previous sampling and testing. As requested by EPD, sampling and testing are required. The Sediment Sampling and Testing Proposal (SSTP) for the inner area of the HKBCF Island was approved by EPD on 2 June 2016.

As in the agreed SSTP for the inner area of the HKBCF Island, samples were taken from the seventeen batches of stockpiled marine sediments and from five boreholes each in one of the five sampling grids. After conducting chemical tests on samples, six batches of stockpiled samples under Contract No. HY/2013/03 and all eight batches of stockpiled samples under Contract No. HY/20013/04 are classified as Category L sediment. The Secretary of Marine Fill Committee of CEDD allocated disposal sites under memo dated 24 October 2016 and dated 22 November 2016 for disposal of a total of 9,500 m³ in-situ volume of Category L sediment (using a bulk factor of 1.3). The Category L sediment was disposed in December 2016.

One sample from the batch of stockpiled marine sediment under Contract No. HY/2013/03 and samples from all five sampling grids had contamination levels exceeding the Lower Chemical Exceedance Levels (LCEL) and biological screenings were carried out. All samples passed the biological screenings and are classified as Category Mp sediment and to be disposed off site using Type II confined marine disposal method the same method used for marine sediment extracted from other part of the HKBCF Island.

# 6.2.1.2 Dumping Arrangements

The barge for disposal of marine sediment will morn at the temporary loading and unloading at the east shore of the HKBCF Island, which has been being used by reclamation contractor (Contract No. HY/2010/02) for reclamation activities. In terms of safety consideration, each dumping date will be allocated to one Contract. The quantity of marine sediment disposed on the date is from one Contract.

During dumping, each Contractor is responsible for transporting the marine sediment from his site area to the barge. The estimated quantity of marine sediment in each truck is confirmed by Resident Site Staff of each Contract. The trip tickets for transportation and disposal of marine sediment are collected and checked. Contract No. HY/2013/03 as the dumping permit holder is responsible for reporting to EPD the quantity disposed of as the condition stipulated in the dumping permit.

### 6.2.1.3 Reporting

AECOM has confirmed that the disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017. The total quantities disposed are presented in the following table (**Table 6.1**):

Table 6.1: Summary of Marine Sediment disposed to Dumping Site via Contract No. HY/2013/03

	Type of Sediment and Quantity Disposed (m <sup>3</sup> )	
	Cat. L (in Type I)	Type II
Total	3,570	39,814
Note:	For monthly breakdown of these quantities, please refer to the waste	flow table in <b>Appendix E</b> .

### 6.3 Environmental Licenses and Permits

The valid environmental licenses and permits during the reporting period are summarized in **Appendix F**.

### 6.4 Implementation Status of Environmental Mitigation Measures

In response to the site audit findings, the Contractor carried out corrective actions.

A summary of the Implementation Schedule of Environmental Mitigation Measures (EMIS) is presented in **Appendix G**. Most of the necessary mitigation measures were implemented properly.

Implementation status of the Regular Marine Travel Route Plan (RMTRP) was checked by ET. Training of marine travel route for marine vessel operator was given to relevant staff and relevant records were kept properly.

According to the Contractor of HY/2013/04, all marine-based segment deliveries were completed in January 2018 and no marine-based works were conducted under the contract during the reporting period. The localised silt curtains under this Contract were removed on 4 January 2019.

### 6.5 Summary of Exceedance of the Environmental Quality Performance Limit

### **Air Quality**

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2, AMS3C and AMS7B during the reporting period.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

### Noise

No Action and Limit Level exceedances were recorded at NMS2 and NMS3C during the reporting period.

### **Water Quality**

The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

### Chinese White Dolphin

For dolphin monitoring, dolphin surveys were conducted on 4, 11, 13 and 18 March 2019. A total of 259.07 km of survey effort was collected, with 95.6% of the total survey effort being conducted under favourable weather conditions. Only three groups of six Chinese White Dolphins were sighted. All three dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL.

# 6.6 Summary of Complaints, Notification of Summons and Successful Prosecution

### Complaints

There were no complaints received in relation to the environmental impact during the reporting period.

### Notification of Summons and Successful Prosecution

No notification of summons or prosecutions was received during the reporting period.

Statistics on notifications of summons and successful prosecutions are summarized in **Appendix H**.

## 7 Future Key Issues

#### 7.1 Construction Programme for the Coming Months

As informed by the Contractor, the major construction activities for April 2019 are summarized in **Table 7.1**.

#### **Table 7.1: Construction Activities for April 2019**

HKBCF  • Erection of sign gantries (land-based)  • Construction of parapets for bridge structures (land-based)	Site Area	Description of Activities
<ul> <li>Drainage works and watermains laying (land-based)</li> <li>Roadworks and road furniture (land-based)</li> <li>Maintenance of temporary traffic arrangements (TTA) associated with the commissioning</li> </ul>		<ul> <li>Erection of sign gantries (land-based)</li> <li>Construction of parapets for bridge structures (land-based)</li> <li>Construction of Retaining Wall RW16N and RW16S (land-based)</li> <li>Construction of Bridge DeckD16 in-situ deck (land-based)</li> <li>Construction of utilities cross-over frame under Bridge D9c (land-based)</li> <li>Backfilling of retaining walls and formation of fill slopes and road embankment (land-based)</li> <li>Drainage works and watermains laying (land-based)</li> </ul>

## 7.2 Environmental Site Inspection and Monitoring Schedule for the Coming Month

The tentative schedule for weekly site inspection and monitoring for air quality, noise, water quality and Chinese White Dolphin for April 2019 is provided in **Appendix I**.

### 8 Conclusions

#### 8.1 Conclusions

#### General

Commencement of the Contract took place on 13 March 2015 and the construction works of the Contract commenced on 13 July 2015.

The air quality, noise, water quality and dolphin monitoring works under Contract No. HY/2013/01 were suspended on 1 October 2018. From 1 October 2018 onwards, the ET of Contract No. HY/2013/04 has continued the same implementation of air quality, noise and water quality environmental monitoring (including air quality and noise monitoring already under its implementation) while the ET of Contract No. HY/2011/03 has continued the same implementation of dolphin monitoring, with the reporting of all environmental monitoring continued by the ET of Contract No. HY/2013/04.

The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

Moreover, post-construction dolphin monitoring in accordance with Section 10.7 of the Updated EM&A Manual for HKBCF commenced during the reporting month.

#### **Breaches of Action and Limit Levels**

#### Air Quality

No Action and Limit Level exceedances of 1-hour and 24-hour TSP level were recorded at AMS2, AMS3C and AMS7B during the reporting period.

Summary of Action and Limit Level exceedance of 1-hour TSP level and 24-hour TSP level at AMS6 shall be referred to the monthly EM&A report prepared by Contract No. HY/2011/03.

#### Noise

No Action and Limit Level exceedances were recorded at the NMS2 and NMS3C during the reporting period.

#### Water Quality

The water quality monitoring programme was temporarily suspended during the reporting period since no marine works were scheduled or conducted, therefore no water quality monitoring was conducted and no water quality monitoring results or exceedances are presented in this report.

#### Chinese White Dolphin

For dolphin monitoring, dolphin surveys were conducted on 4, 11, 13 and 18 March 2019. A total of 259.07 km of survey effort was collected, with 95.6% of the total survey effort being conducted under favourable weather conditions. Only three groups of six Chinese White Dolphins were sighted. All three dolphin groups were sighted in NWL, while no dolphin was sighted at all in NEL.

#### **Environmental Site Inspections**

Environmental site inspections were carried out on 7, 13, 18 and 27 March 2019. Recommendations on remedial actions were given to the Contractor for the deficiencies identified during the site inspections.

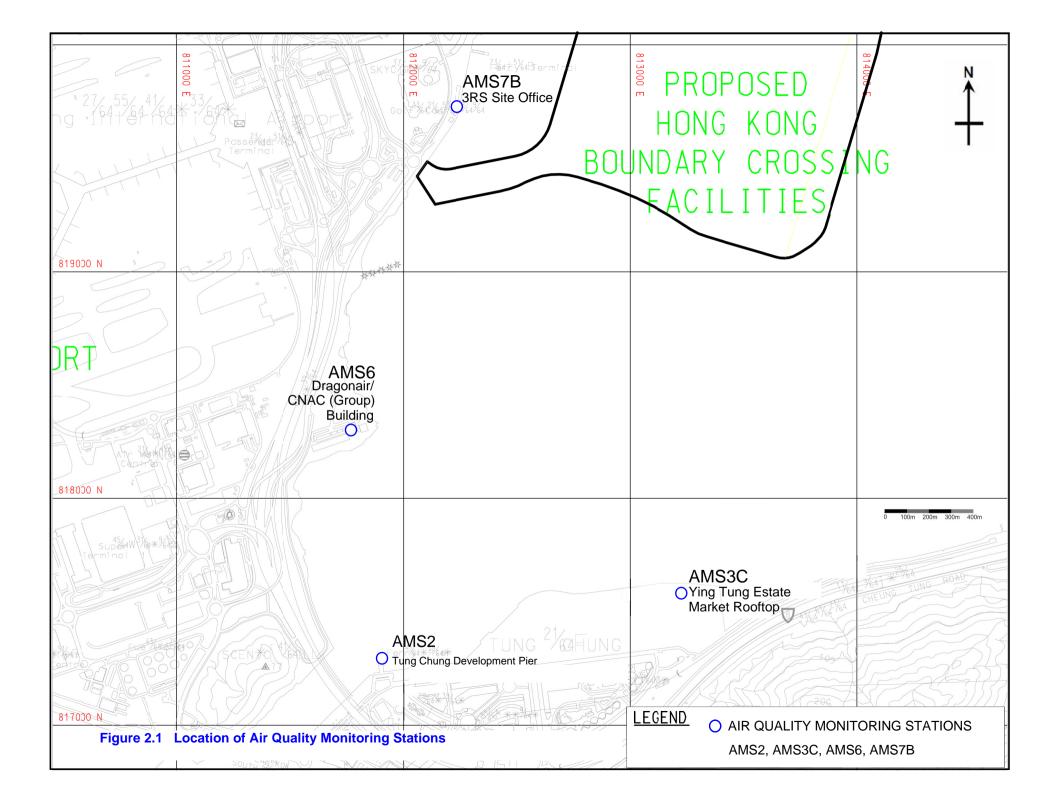
#### **Complaints**

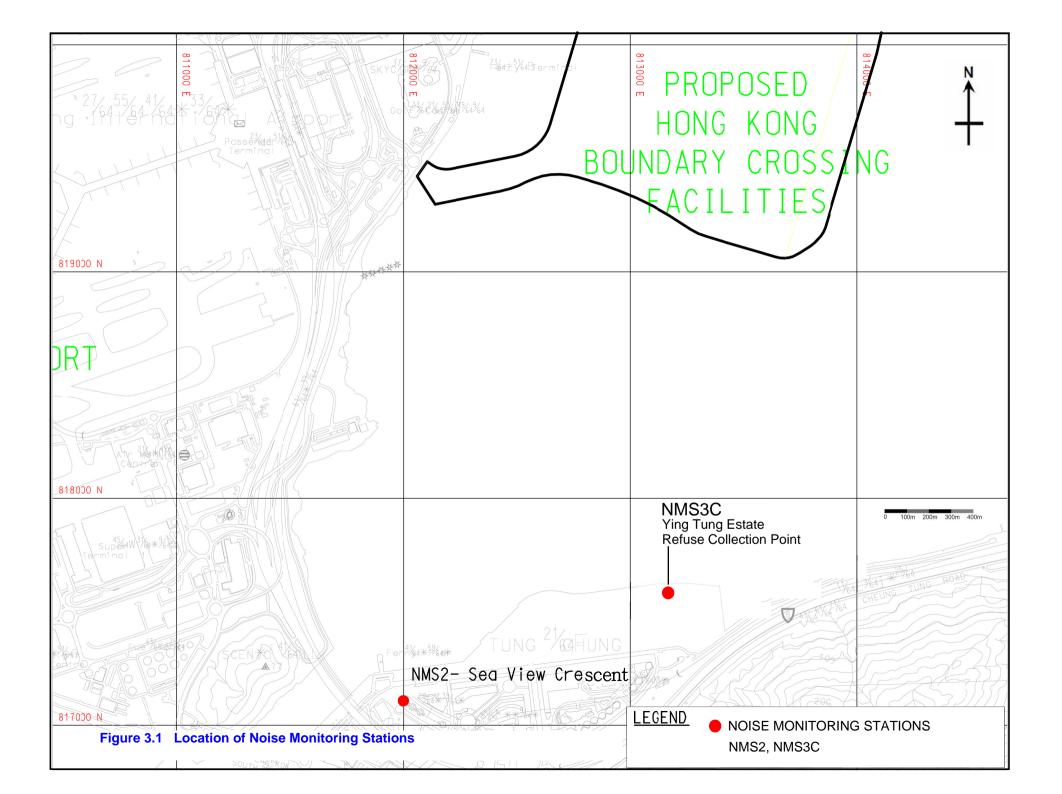
There were no complaints received in relation to the environmental impact during the reporting period.

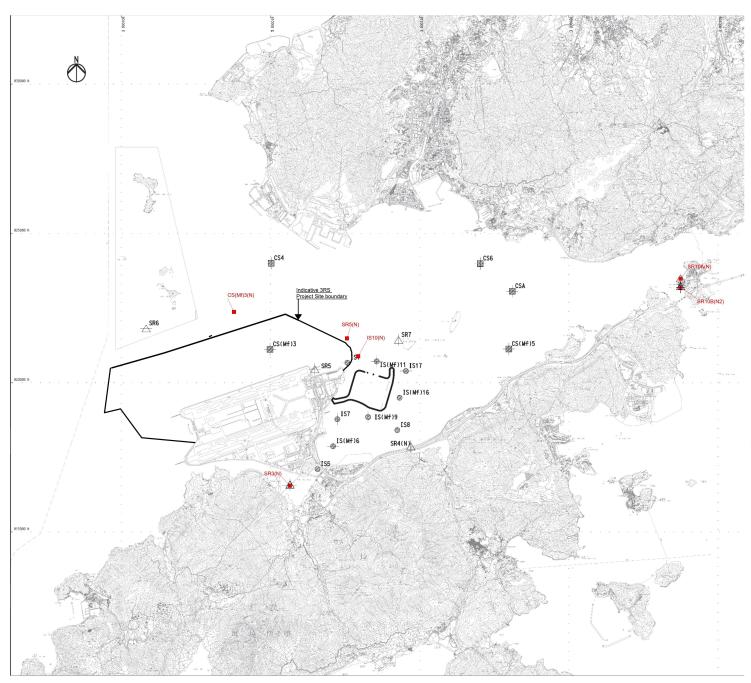
#### Notifications of Summons and Successful Prosecutions

There were no notifications of summons or prosecutions received during the reporting period.

## **Figures**







Station	East	North	
IS5	811579	9 817106	
IS(Mf)6	812101	817873	
IS7	812244	818777	
IS8	814251	818412	
IS(Mf)9	813273	818850	
IS10(N)	812942	820881	
IS(Mf)11	813562	820716	
IS(Mf)16	814328	819497	
IS17	814539	820391	
SR3(N)	810689	816591	
SR4(N)	814705	817859	
SR5(N)	812569	821475	
SR6	805837	821818	
SR7	814293	821431	
SR10A(N)	823644	823484	
SR10B(N2)	823689	823159	
CS(Mf)3(N)	808814	822355	
CS(Mf)5	817990	821129	
CS4	810025	25 824004	
CS6	817028	7028 823992	
CSA	818103	823064	

#### FIGURE 4.1— LOCATION OF WATER QUALITY MONITORING STATIONS

LEGEND

● IS

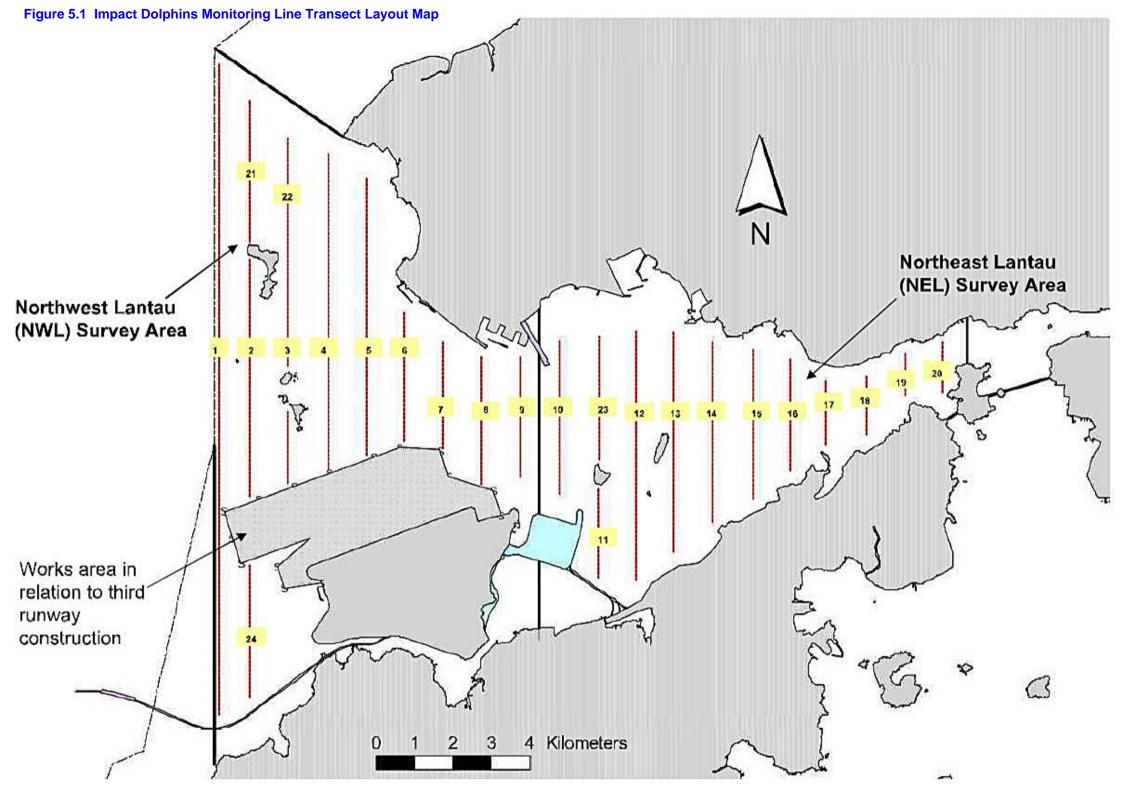
IMPACT STATIONS

CS

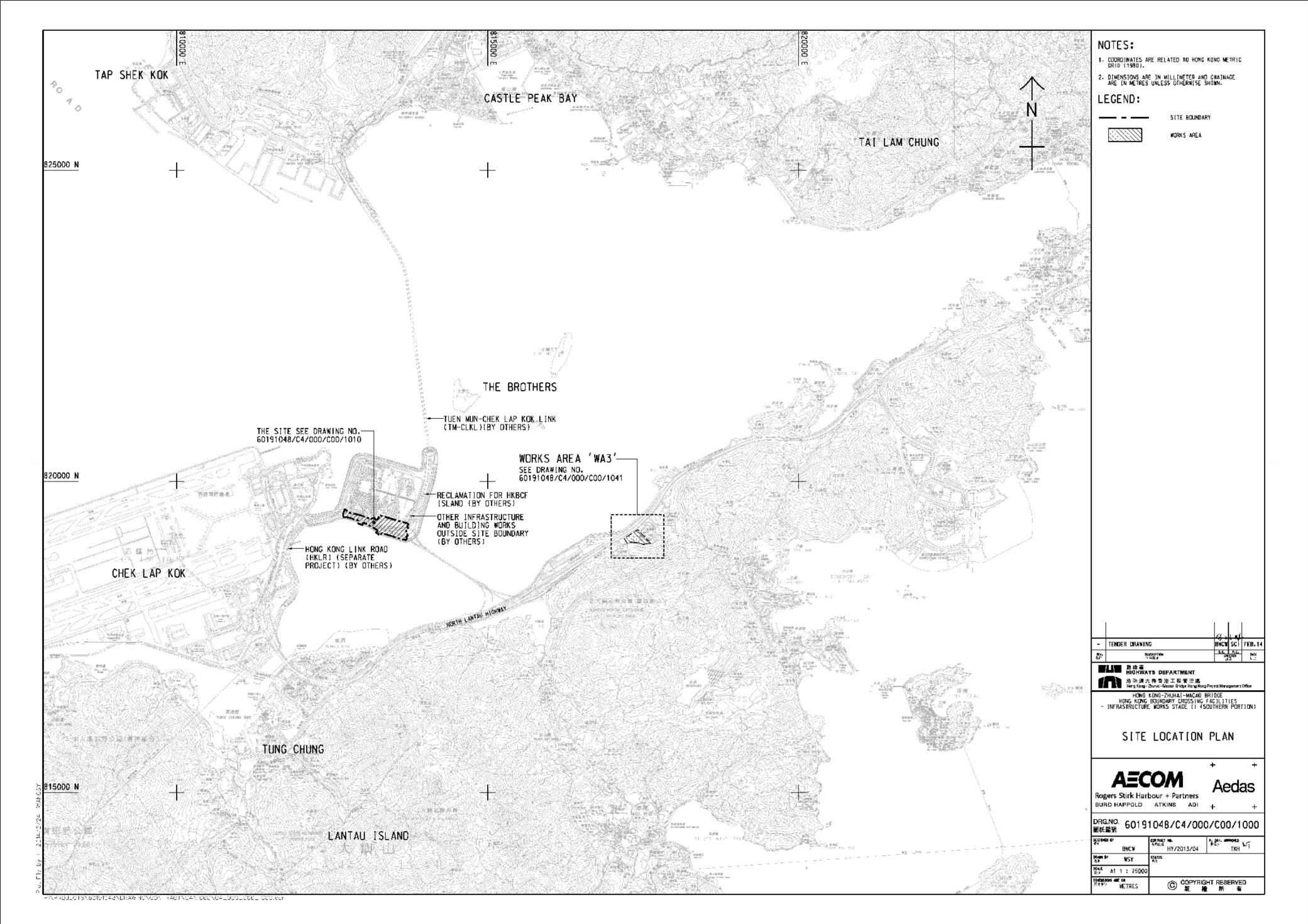
CONTROL / FAR FIELD STATIONS

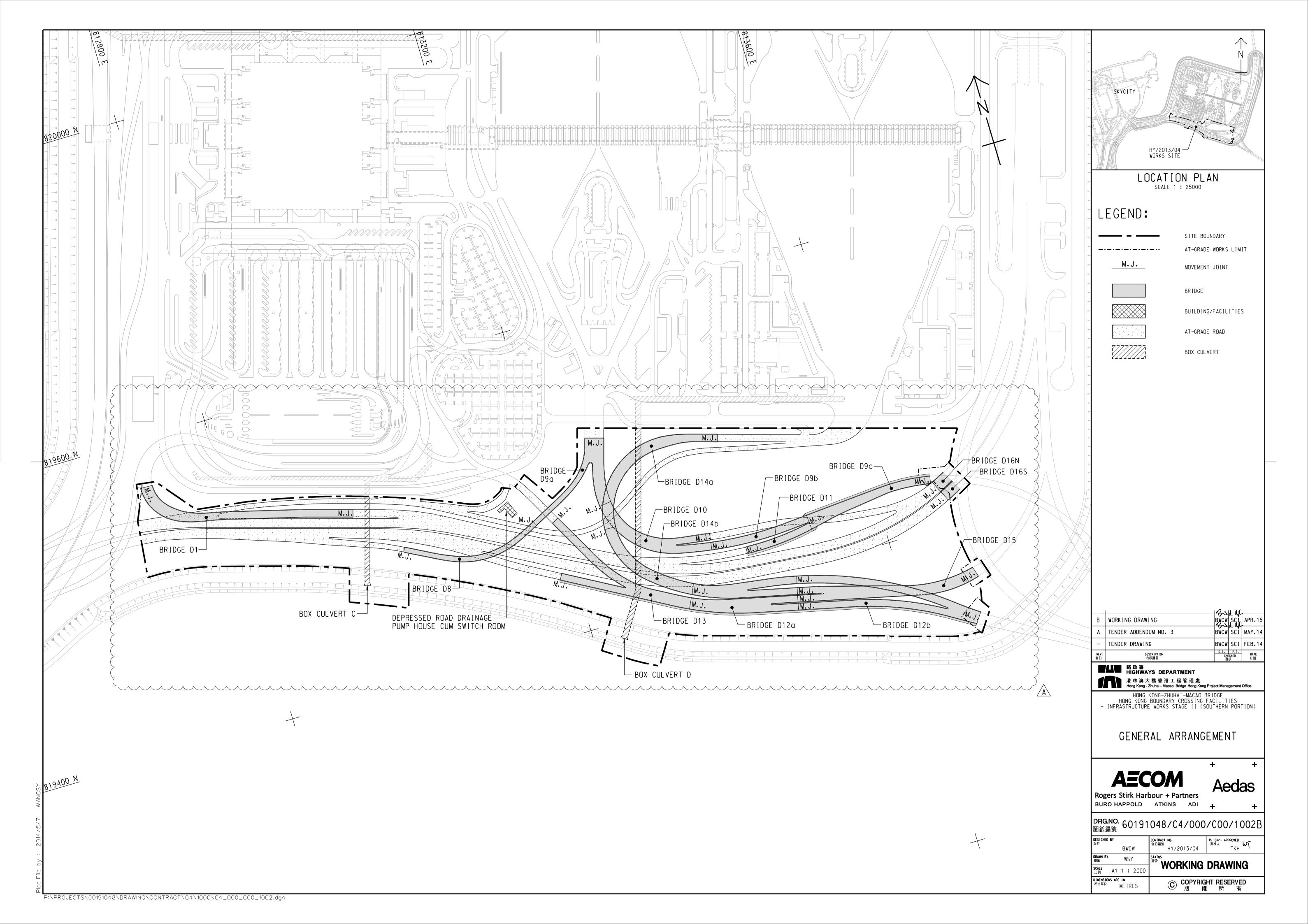
SR

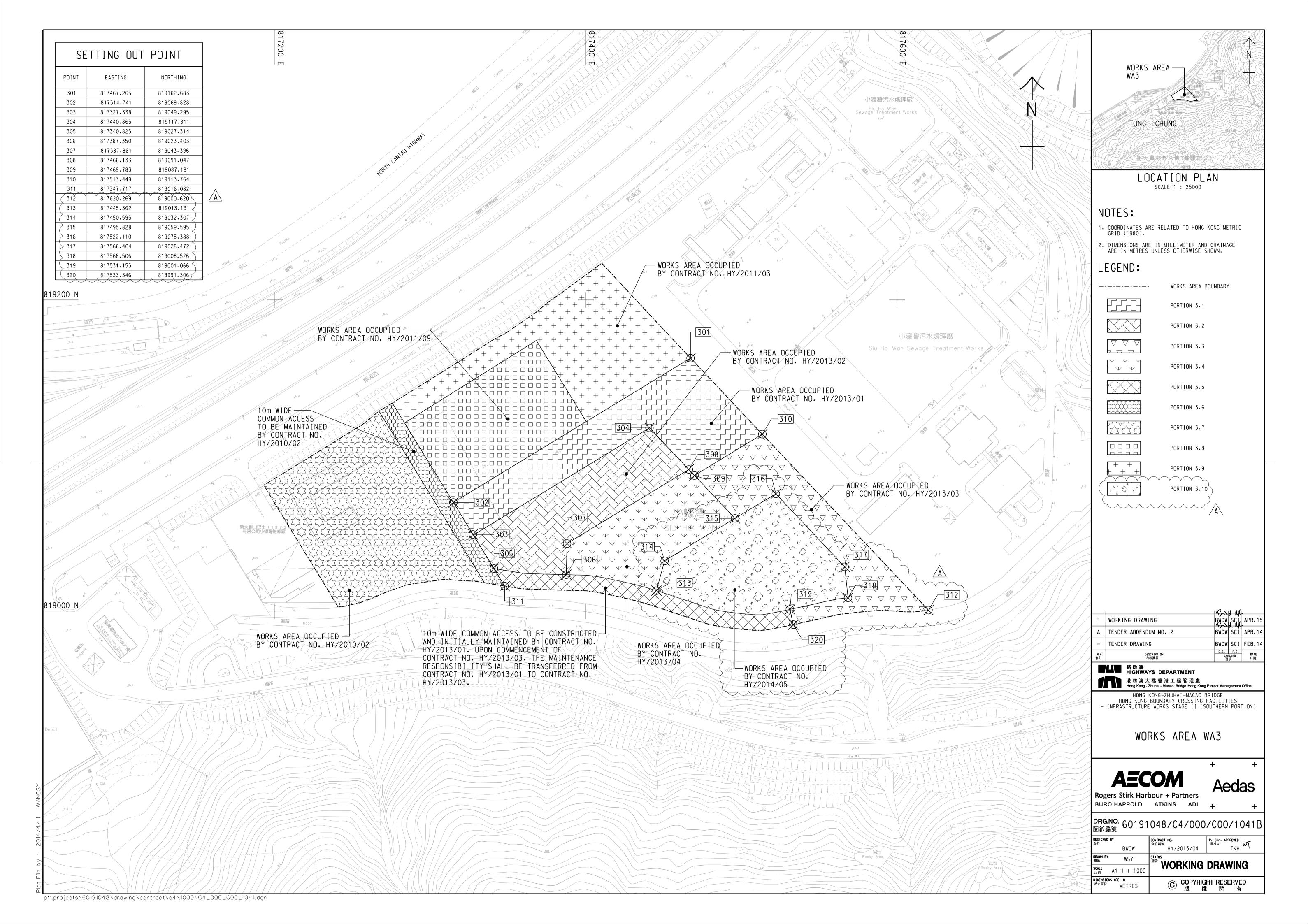
SENSITIVE RECEIVERS STATIONS



# **Appendix A. Location of Works Areas**

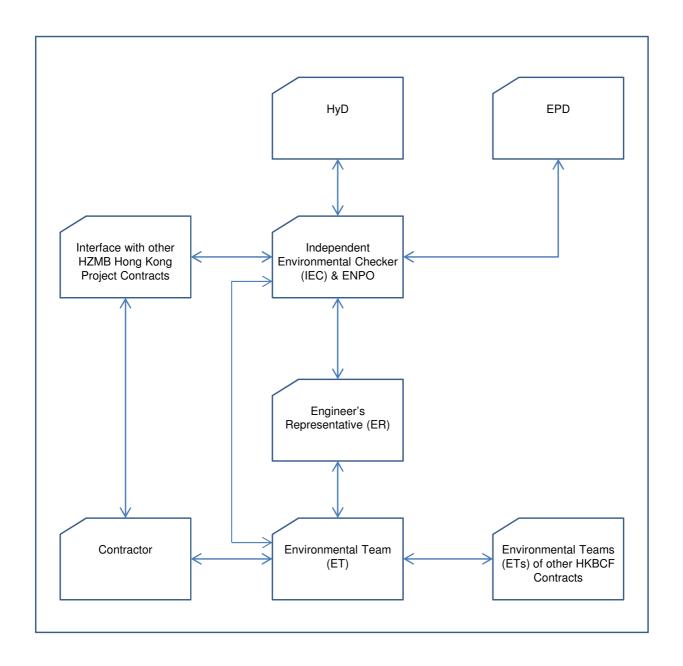






# **Appendix B. Project Organization for Environmental Works**

## **Project Organisation for Environmental Works**



## **Appendix C. Construction Programme**

| A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D Essential Works Updates - Tier 1 - 26 C **Contract Key Dates** CON KD 0005 Letter of Acceptance (LOA) etter of Acceptance (LOA) CON.KD.0010 ent Date Commencement Date CON.KD.0020 Completion of the whole of the Works (1520) 11-May-19, Completion of the whole of the Works (1520) Possession Dates CON.PD.1010 Site Possession of Portion A1 (61) - 8 sion of Portion A1 (61) CON.PD.1020 Site Possession of Portion A2 (61) Site Poss sion of Portion A2 (61) CON.PD.1050 Site Possession of Portion A5 (61) Site Possession of Portion Site Possession of Portion A6 (61) on of Portion A6 (61) CON.PD.1060 CON PD 1070 e Possession of Portion B1-5 (92) Site Possession of Portion B1-5 (92) CON.PD.1080 sion of Portioh B2 (123) Site Possession of Portion B2 (123) Site Possession of Portion B5 (123) CON.PD.1130 Site Possession of Portion B5 (123) CON.PD.1140 Site Possession of Portion C1 (184) 06-Oct-16 Site Pos CON.PD.1150 Site Possession of Portion C2 (184) Site Possession of Port Site Pos sion of Portion D1 (183) CON.PD.1160 Site Possession of Portion D1 (183) CON.PD.1180 Site Possession of Portion D3 (183) Site Po sion of Portion D3 (183) CON.PD.1190 Site Possession of Portion A1 (61) - 2 Site Possession of Portion A1 (61) CON.PD.1200 Site Possession of Portion A1 (61) - 5 Site Passessian of Partian A1 (61) - 5 CON.PD.1210 Site Possession of Portion A1 (61) Site Possession of Portion A1 (61) - 1 ssion of Portion C1; 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HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion)



Data Date: 06-Oct-16

Print Date: 14-Dec-16 09:46



Detailed Works Programme (IWP) Rev. 04				
Date	Revision	Chec	Approved	
09-Sep-15	Detailed Works Programme	WN/WC	ET	
17-Oct-15	Detailed Works Programme	WN/WC	ET	
29-Oct-15	Detailed Works Programme	WN/WC	ET	
25-Nov-15	Detailed Works Programme	WN/WC	ET	

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Print Date: 14-Dec-16 09:46 Page: 2 / 23 CON.HD.1250 Handover of Portion A6 (KD14+28 days) CON.HD.1260 Handover of Portion B1 (KD8+28 days) of Portion B1 (KD8+28 days) Handover of Portion B2 (KD8+28 days) ♦ 13-Jun-17, Handover of Portion B2 (KD8+28 davs) CON.HD.1270 of Portion B3 (KD11+28 days) CON.HD.1280 Handover of Portion B3 (KD11+28 days) CON.HD.1290 Handover of Portion B4 (KD12+28 days) 21-Jun-17, Handover of Portion B4 (KD12+28 days) CON.HD.1300 Handover of Portion B5 (KD14+28days) ♦ 08-Jun-18. Had B5 (KD14+28days CON.HD.1310 Handover of Portion C1 (KD8+28 days) ♦ 13-Jun 17 Handover of Portion C1 (KD8+28 days) CON.HD.1320 Handover of Portion C2 (KD13+0 days) 06-Oct-16, Hand f Portion C2 (KD13+0 days CON.HD.1330 Handover of Portion D1 (KD8+28 days) of Portion D1: (KD8+28 days) CON.HD.1340 🔷 13-Jun-17, Handov er of Portion D2 (KD8+28 days) Handover of Portion D2 (KD8+28 days) 13-Jun-17, Handov CON.HD.1350 Handover of Portion D3 (KD8+28 days) er of Portion D3 (KD8+28 days) Contractor Planned Completion: Key Dat ◆ 19-Jun-18, KD01 - Achievement of Stage 1A (525) CON.SC.KD01 KD01 - Achievement of Stage 1A (525) nent of \$tage 1B (650) KD02 - Achievement of Stage 1B (650) CON.SC.KD02 03-May-18, KD02 - Achie CON.SC.KD03 KD03 - Achievement of Stage 2 (525) 19-Jun-18, KD03 - Achievement of Stage 2 (525) ♦ 12-Jun-17, KD04 - Achie CON.SC.KD04 KD04 - Achievement of Stage 3 (465) nt of Stage 3 (465) CON.SC.KD05 KD05 - Achievement of Stage 4 (615) ◆ 20-Aug-18, KD05 -CON.SC.KD06 03-Aug-17, KD06 - Achievement of Stage 5 (615) KD06 - Achievement of Stage 5 (615) CON.SC.KD07 KD07 - Achievement of Stage 6 (270) nent of Stage 6 (270) ♦ 04-Jul-18, KD08 tion of Section I of the Works (795 CON.SC.KD08 KD08 - Completion of Section I of the Works CON.SC.KD09 21-Aug-18, KD09 - Completion of Section II of the Works (803) KD09 - Completion of Section II of the Works (803) CON.SC.KD10 KD10 - Completion of Section III of the Works 21-Aug-18, KD10 - Completion of Section III of the Works (803) CON.SC.KD11 10-Apr 18 KD11 Completion of Section (V of the Works (565) KD11 - Completion of Section IV of the Works (565)◆ 21-Aug-18, KD12 - Completion of Section V of the Works (803) CON.SC.KD12 KD12 - Completion of Section V of the Works KD13 - Completion of Section VI of the Works CON.SC.KD13 🔷 29-Jun-17, KD13 tion of Section VI of the Works (465) ♦ 28-Aug-19, KD14 - Comp CON.SC.KD14 KD14 - Completion of Section VII of the Works CON SC KD15 KD15 - Completion of Section VIIIA of the 03-Aug-18, KD15 - Completion of Section VIIIA of the Works (795) Works (795) 28-Aug-19, KD16 - Completion of Section VIIIB of the CON.SC.KD16 KD16 - Completion of Section VIIIB of the Works (1155) O3-Jul-18, KD17 - Achievement of Stage 7 (718) CON.SC.KD17 KD17 - Achievement of Stage 7 (718) KD17A - Completion of Section VIIIC of the Works (795) CON.SC.KD17A d3-Aug-18, KDI 7A - Completion of Section VII IC of the Works (795) CON.SC.KD18 KD18 - Completion of Section VIIID of the 28-Aug-19, KD18 - Completion of Section VIIID of the Works (1155) CON.SC.KD19 KD19 - Completion of Section IXA of the Works 0/3-Aug-19, KD19 - Completion of Section IXA of the World CON.SC.KD20 KD20 - Completion of Section IXB of the Works ♦ 27-Aug-20, KD20 (1520)Preliminaries and General Requiremer Insurance CON.PR.1010 Arrange and Secure Professional Indemnity Insurances and submit copy to Engineer **Initial Works Programme** CON.PR.1020.10 Prepare & Submit Initial Works Programme (IWP) Enginéer's Approval CON.PR.1020.20 Engineer's Approval **Provisional Programme for Piling Works** CON.PR.1030.10 Prepare Detailed Piling Schedule (refer to IWP) repare Detailed Piling S CON.PR.1030.20 Engineer's Approval Engineer's Approval 3 Months Rolling Programme Prepare 3 Months Rolling Progra CON.PR.1040.10 Prepare 3 Months Rolling Programme CON.PR.1040.20 Engineer's Approval Engineer's Appro **Detailed Works Programme** CON.PR.1050.10 Prepare Detailed Works Programme (DWP) Prepare Detailed Works Programme (DWP) Engineer's Approval CON.PR.1050.20 Engineer's Approval Safety & Health CON.PR.1060.10 Draft Safety Plan Draft Safety Plan Finalized Safety Plan CON.PR.1060.20 Finalized Safety Plan **Environmental Management Plan** CON.PR.1080.10 Draft Envirionmental Management Plan Draft Envirionm Finalized EMP CON.PR.1080.20 Finalized EMP **Sub-Contractor Management Plan** CON.PR.1080.50 Draft Subcontractor Management Plan Engineer's Approval CON.PR.1080.60 Engineer's Approval **Temporary Facilities** ession / Access to W CON.PR.0130 Site Possession / Access to Works Area WA3 CON.PR.0140 Survey / Setting Out Survey / Setting Out CON.PR.0150.10 Site Formation / Site Clearing Site Formation / Site Clearing CON.PR.0160 Contractor's Site Office 💄 ¢ontractor's Site Øffice CON.PR.0170 External Works - Paving, Drainage and Fencing External Works: - Paving, Drainage and Fencing **Contractors Design & Procurement Bridge Bearings** 

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A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D Detailed Design / Shop Drawings and Materials PROC.MA.1610 PROC.MA.1615 Engineer's Review / Approval Engineer's Review / Approva PROC.MA.1650 Production / Manufacturing / Facbrication Production / Manufacturing / Facbrid 6 ♦ Materials Delivery (first delivery) PROC.MA.1670 Materials Delivery (first delivery) **Precast Concrete - Segments** PROC.MA.1760 Moulds Detailed Design Preparation / Engineer's Review / Appr PROC.MA.1765 Engineer's Review / Approval Mould Fabri PROC.MA.1770 Mould Fabrication Cast Prototype / Ir PROC.MA.1780 Cast Prototype / Inspection and Approval ection and Approva PROC.MA.2570 Production of Precast Segments 14-Nov-16 ♦ Materials Delivery (First Delivery) PROC.MA.2590 Materials Delivery (First Delivery) Segment Fabrication and Post Pouring Segment Fabrication Type A Segment Fabrication for Bridge D1 (96 nos) tion for Bridge D1 (96 nos) Segment Fabrication Type C1 Fab.TC1.0010 Segment Fabrication for Bridge D12b (91-106) 16 nos. Segment Fabrication for Bridge D12b (91-106) 16 nos Fab.TC1.0020 rication for Bridge D9c (1-3) 3 nos. Segment Fabrication for Bridge D9c (1-3) 3 nt Fabrication for Bridge D14a (1-30) 30 nos Fab.TC1.0030 Segment Fabrication for Bridge D14a (1-30) 30 Fab.TC1.0040 Segment Fabrication for Bridge D12a (66-80) Segment Fabrication for Bridge D12a (66-80) 15 nds Segment Fabrication for Bridge D14b (14-27) 14 nos. Fab.TC1.0050 Segment Fabrication for Bridge D14b (14-27) Segment Fabrication for Bridge D14c (1-15) 15 nos. Fab.TC1.0060 Segment Fabrication for Bridge D14c (1-15) 1 Fab.TC1.0080 Segment Fabrication for Bridge D9c (4-14) 11 abrication for Bridge D9c (4-14) 11 nos Segment Fabrication for Bridge D15 (48-64) 17 nos. Fab.TC2.00060 | Segment Fabrication for Bridge D15 (48-64) 1 Segment Fabrication for Bridge D15 (31-47) 17 nos Fab.TC3.0060 Segment Fabrication for Bridge D15 (31-47) 1 Segment Fabrication for Bridge D13 (103-129) 27 nos. Fab.TC4.0030 ment Fabridation for Bridge D13 (103-129) 27 nos egment Fabrication for Bridge D14c (46-60) 15 nos Fab.TC4.0060 Segment Fabrication for Bridge D14c (46-60) 15 nos. Segment Fabrication Type C2 Segment Fabrication for Bridge D15 (1-15) 15 nos Fab.TC1.0070 Segment Fabrication for Bridge D15 (1-15) 15 Fab.TC2.00010 Segment Fabrication for Bridge D12b Segment Fabrication for Bridge D12b (112-127) 16 nos. (112-127) 16 nos. Fab.TC2.00020 Segment Fabrication for Bridge D14a (31-59) 29 nos. Segment Fabrication for Bridge D14a (31-59) 29 nos nt Fabrication for Bridge D9c (29-42) 14 nos Fab.TC2.00030 | Segment Fabrication for Bridge D9c (29-42) 14 Fab.TC2.00040 Segment Fabrication for Bridge D12a (48-65) \$egment Fabrication for Bridge D12a (48-65) 18 nos. Fab.TC2.00050 Segment Fabrication for Bridge D14c (16-30) 15 nos. Segment Fabrication for Bridge 014c (16-30) 15 nos. Segment Fabrication for Bridge D12b (4/4-8/4, 1/07-111) 46 nos Fab.TC3.0010 Segment Fabrication for Bridge D12b (44-84, 107-111) 46 nos. Segment Fabrication for Bridge D14c (31-45) 15 nos. Fab.TC3.0050 Segment Fabrication for Bridge D14¢ (31-45) 15 nos. Segment Fabrication for Bridge D15 (65-78) 14 no Fab.TC4.0070 Segment Fabrication for Bridge D15 (65-78) 1 Segment Fabrication Type C3 Fab.TC3.0020 Segment Fabrication for Bridge D9c (15-28) 14 nt Fabrication for Bridge D9c (15-28) 14 nos Segment Fabrication for Bridge D13 (43-70 & 100-102) 31 nos Fab.TC3.0030 Segment Fabrication for Bridge D13 (43-70 & 100-102) 31 nos. Fab.TC3.0040 Segment Fabrication for Bridge D14b (28-49) Segment Fabrication for Bridge D14b (28-49) 22 nos. Fab.TC4.0010 Segment Fabrication for Bridge D12b (1-43,85-90) 49 nos. nent Fabrication for Bridge D12b (1-43,85-90) 49 no abrication for Bridge D14a (60-75) 16 nos Fab.TC4.0020 Segment Fabrication for Bridge D14a (60-75) Segment Fabrication for Bridge D12a (81-95) 15 nos. Fab.TC4.0040 Segment Fabrication for Bridge 🛭 12a (81-95) 15 nos Segment Fabrication for Bridge D14b (1-13) 13 nos Fab.TC4.0050 Segment Fabrication for Bridge D14b (1-13) 13 Segment Fabrication Type D2 ment Fabrication for Bridge D9a (75-86 & nt Fabrication for Bridge D9a (75-86 & 92-104) 25 r Segment Fabrication for Bridge D13 (33-46) 14 nos. Fab.T1.0040 Segment Fabrication for Bridge D13 (33-46) 14 Segment Fabrication for Bridge D9a (1-15) 15 nos. ent Fabrication for Bridge D9a (1-15) 15 nos. Fab.T1.0050 Fab.T2.0010 Segment Fabrication for Bridge D9a (32-46) 15 ment Fabrication for Bridge D9a (32-46) 15 nos brication for Bridge D9b (1-15) 15 nos Fab.T2.0030 Segment Fabrication for Bridge D9b (1-15) 15 Fab.T2.0040 Segment Fabrication for Bridge D10 (33-47) 14 Segment Fabrication for Bridge D10 (33-47) 14 nos. Segment Fabrication for Bridge D13 (29-41) 13 nos. Fab.T2.0050 Segment Fabrication for Bridge D13 (29-41) 13 ment Fabrication for Bridge D9a (47-57, 70-74) 16 nos; Fab.T3.0030 Segment Fabrication for Bridge D9a (47-57, 70-74) 16 nos. Segment Fabrication for Bridge D10 (68-88 & 27-32) 27 nos. Fab.T3.0040 Segment Fabrication for Bridge D10 (68-88 & 27-32) 27 nos Segment Fabrication for Bridge D15 (1-14) 14 no Segment Fabrication for Bridge D15 (1-14) 14 Fab.T3.0070 Segment Fabrication for Bridge D10 (61-67 & 89-95) 14 nos. Fab.T4.0020 Segment Fabrication for Bridge D10 (61-67 & 89-95) 14 nos. Fab.T4.0040 Segment Fabrication for Bridge D8 (48-62) 15 Segment Fabrication for Bridge D8 (48-62) 15 nos Segment Fabrication for Bridge D13 (78-98) 21 nos Fab.T4.0050 Segment Fabrication for Bridge D13 (78-98) 21 Fab.T4.0060 Segment Fabrication for Bridge D10 (96-109) 14 nos. Segment Fabrication for Bridge D10 (96-109) 14 nos. Segment Fabrication Type D3 Fab.T1.0010 Segment Fabrication for Bridge D11 (17-31) 15 nos. Segment Fabrication for Bridge D11 (17-31) 15 nos egment Fabrication for Bridge D10 (1-26) 26 nos. Fab.T1.0030 Segment Fabrication for Bridge D10 (1-26) 26 Fab.T1.0060 Segment Fabrication for Bridge D8 (1-16) 16 abrication for Bridge D8 (1-16) 16 nos. Segment Fabrication for Bridge D12a (1-16) 16 nos. Segment Fabrication for Bridge D12a (1-16) 14 nos Fab.T1.0070 Fab.T2.0020 nt Fabrication for Bridge D11 (1-16) 16 no Segment Fabrication for Bridge D11 (1-16) 16 Segment Fabrication for Bridge D8 (17-31) 15 Segment Fabrication for Bridge D8 (17-31) 15 nos. Fab.T2.0060

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3 Nos Pier Segment for Bridge D13 - 4 Nos Fab.T3.00130 Pier Segment for Bridge D13 - 4 Nos ier Segment for Bridge D14b - 4 Fab.T3.00140 Pier Segment for Bridge D14b - 4 Nos Pier Segment for Bridge D12a - 4 Nos Fab.T3.00150 Pier Segment for Bridge D12a - 4 Nos Fab.T3.00160 Pier Segment for Bridge D14c - 4 Nos ■ Pier Segment for Bridge D14c - 4 Nos Pier Segment for Bridge D12b - 4 Nos Fab.T3.00170 Pier Segment for Bridge D12b - 4 Nos Pier Segment for Bridge D15 - 4 Nos Fab.T3.00180 Pier Segment for Bridge D15 - 4 Nos Fab.T3.00260 Pier Segment for Bridge D15 - 4 Nos Pler Segment for Bridge D15 - 4 Nos Fab.T3.0090 Pier Segment for Bridge D14a - 6 Nos Segment for Bridge D14a - 6 Nos Pier Segment - Type D- 1 Fab.T2.0070 Segment Fabrication for Bridge D12a (18-31) Fab.T3.00100 Pier Seament for Bridge D9b - 4 Nos Pier Segment for Bridge D9b - 4 Nos Pier Segment for Bridge D9a - 5 Nos Fab.T3.00190 Pier Segment for Bridge D9a - 5 Nos Pier Segment for Bridge D11 - 3 Nos Fab.T3.00200 Pier Segment for Bridge D11 - 3 Nos Fab.T3.00210 Pier Segment for Bridge D10 - 5 Nos Pier Segment for Bridge D10 - 5 No Fab.T3.00220 Pier Segment for Bridge D8 - 5 Nos Pier Segment for Bridge D8 - 5 No Pier Segment for Bridge D13 - 6 Nos Fab.T3.00230 Pier Segment for Bridge D13 - 6 Nos Fab.T3.00240 Pier Segment for Bridge D12a - 4 Nos Pier Segment for Bridge D12a + 4 Nos ■ Pier Segment for Bridge D15 - 1 Nos Pier Segment for Bridge D15 - 1 Nos Fab.T3.00250 Fab.T3.00280 Pier Segment for Bridge D10 - 5 Nos Pier Segment for Bridge D10 - 5 Nbs Fab.T3.00290 Pier Segment for Bridge D9a - 5 Nos Pier Segment for Bridge D9a - 5 Nos Segment Fabrication for Bridge D12a (33-46) 14 no Segment Fabrication for Bridge D12a (33-46) Fab.T3.0060 &M Works and Building Services for Pu Detailed Design and Material/ Equipment Submisison & Statutory Approval (FSD/EMSD) PROC.SC.1285 Engineer's Review / Approval PROC.SC.1287 Engineer's Review / Approval PROC.SC.1290 Procurement and Manufacturing of Materials nt and Manufacturing of Material PROC.SC.1300 Materials Delivery (first delivery) 29-Jun-17 • Materials Delivery (first delivery) Draft Operation and Maintenance (O&M) Manual PROC.SC.1310 Draft Operation and Maintenance (O&M) PROC.SC.1320 Engineer's Review on Draft O&M Manual Engineer's Review on Draft O&M Manual Draft Testing and Commissioning (T&C) Procedure PROC.SC.1330 Draft Testing and Commissioning (T&C) Final T&C Procedure PROC.SC.1340 Final T&C Procedure Engineer's Review on Draft T&C Procedure PROC.SC.1350 Engineer's Review on Draft T&C Procedure Engineer's Approval on Final T&C Procedure PROC.SC.1360 Engineer's Approval on Final T&C Procedure PROC.SC.2840 Final O&M Manual with as-fitted drawings Final O&M Manual with as-fitted drawings PROC.SC.2850 Engineer's Approval on Final O&M Manual with teel Structures for Sign Gantry / High N PROC.MA.1990 Detailed Design / Material Submission Detailed Design / Material Subr Engineer's Review / Approval PROC.MA.1995 Engineer's Review / Approval PROC.MA.2010 Manufacture of Steel Structures of Steel Structures PROC.MA.2020 Material Delivery (first delivery) 15-Sep-17 : ♦ Material Delivery (first delivery Roads and Bridge Lighting PROC.MA.2840 Lighting Arrangement Detailed Design / Material Submission and Approval (within 12 Lighting Arrangement Detailed Design / Material Submission and Approval (within 12 weeks) Engineer's Review / Approval PROC.MA.2845 Engineer's Review / Approval Manufacture of Road and Bridge Lighting PROC.MA.2850 Manufacture of Road and Bridge Lighting rv (first delivery) PROC.MA.2860 Material Delivery (first delivery) 27-Sep-17 🔷 Material Delive The Engineer confirm Landscape Works/ Irrigation Work (31 Dec 2015) PROC.SC.1178 The Engineer confirm Landscape Works/ 06-Oct-16 Irrigation Work (31 Dec 2015) PROC.SC.1180 Detailed Design / Material Submission Detailed Design / Material Submis Engineer's Review / Approval PROC.SC.1185 Engineer's Review / Approval PROC.SC.1190 Procurement and Shipment of Irrigation Materials/Equipment Soft Landscaping PROC.SC.2760 Propose Nursery for Landscape Materials Propose Nursery for Landscape Materials Joint Inspection and Engineer's appro PROC.SC.2780 Joint Inspection and Engineer's approval PROC.SC.2790 Landscape Materials Growing 02-Aug-17 A Materials Delivery (first delivery) PROC.SC.2810 Materials Delivery (first delivery) Construction / Installation Initial Works / Site Establishment & Mai

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Pile Curing CONS.A1.0210 Pile Curing CONS.A1.0220 Pile Load Testing & Submit Report Pile Load Testing & Submit Repor Replacement Preliminary Bored Pile and Load CONS.A1.0195.6 GI Report and Verification / Agreement to GI Report and Verification! Agreement to Founding Level CONS.A1.0195.7 Engineer's Representative confirmed the replacement bored pile at Pier P908-P1 Engineer's Representative confirmed the replace ement bored pile at Pier P908-P1 Commence Replacement Preliminary Bored Pile at Abutment A1004 CONS.A1.0280 Commence Replacement Preliminary Bored Pile at Abutment A1004 CONS.A1.0290 Mobilise Plant & Set-up Support ■ Mobilise Plant & Set-up Support Replacement Preliminary Bored Pil CONS.A1.0300 Replacement Preliminary Bored Piling - Pier Pile Curing CONS.A1.0310 Pile Curing CONS.A1.0320 Pile Load Testing & Submit Report Pile Load Testing & Submit Preliminary Bored Pile and Load Testing at Abı CONS.C1.0400 Commence Preliminary Bored Pile at Abutmer A106 06-Oct-16 Commence Préliminary Bored Pile at Abutment A106 CONS.C1.0410 Mobilise Plant & Set-up Support Mobilise Plant & Set-up Support Predrilling to Preliminary Bored Pile (D1) CONS.C1.0415.1 Predrilling to Preliminary Bored Pile (D1) CONS.C1.0415.2 GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agreement to Founding Level Preliminary Bored Piling - Abutment A106 (1 no. 2000mm dia x 52m CONS.C1.0420 Preliminary Bored Piling - Abutment A106 (1 no. 2000mm dia x 52m) Pile Curing CONS.C1.0430 Pile Curing CONS.C1.0440 Pile Load Testing and Submit Report Pile Load Testing and Submit Report **Prelimnary Driven H Piles and Load Testing** CONS.A1.4360 Test Pile approved, commence permanent driven h-pile 15-Oct-16 Test Pile approved, commence permanent driven select Preliminary Test Pile (Driven H Pile) CONS.C1.0510 Engineer select Preliminary Test Pile (Driven H e Plant & Set-up Support CONS.C1.0520 | Mobilise Plant & Set-up Support CONS.C1.0530.1 Pre-drilling (2 nos) (Sign Gantry - Preliminary Pile) Pre-drilling (2 nos) (Sign Gantry - Preliminary Pile) CONS.C1.0530.2 GI Report and Verification / Agreement to Founding Level Preliminary Driven H Pile (2 nos) CONS.C1.0540 Preliminary Driven H Pile (2 nos) Pile Load Testing and Submit Report CONS.C1.0550 Pile Load Testing and Submit Report Preliminary Pre-Bored H-Pile and Load Testing CONS.A1.0195.3 Predrilling to Preliminary Pre-Bored H-Pile - 1 Predrilling to Preliminary Pre-Bored H-Pile - 1 no ent ta Founding L CONS.A1.0195.4 GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agree Engineer select Preliminary Test Pile (Pre-Bored H-Pile) CONS.A1.0230 Engineer select Preliminary Test Pile (Pre-Bored H-Pile) Mobilise Plant & Set-up Support CONS.A1.0240 | Mobilise Plant & Set-up Support Preliminary Pre-Bored H-Piling - 1 no. CONS.A1.0250 Preliminary Pre-Bored H-Piling - 1 no. ile Load Testing & Submit Report CONS.A1.0270 Pile Load Testing & Submit Report **Treatment for Bored Piling Excavated Materials** Set-up Stockpile for Excavated Marine Mud CONS.EX.1010 Set-up Stockpile for Excavated Marine Mud Pilot Test for Marine Mud Treatmen CONS.EX.1020 Pilot Test for Marine Mud Treatment CONS.EX.1030 Solidification / Stabilisation / Approval Method Solidification / Stabilisation Set-up Treatment Facilities and Storage Yard CONS.EX.1040 Set-up Treatment Facilities and Storage Yard CONS.EX.1050 Full Scale Solidification / Stabilization Treatment and Verification Testing Full Scale Solidification CONS.EX.1060 Decommissioning of Treatment Facilities Site Set Up at Portion C1 CONS.C1.1010 Site Possession / Access to Portion C1 and C2 06-Oct-16 Site Possession / Access to Portion C1 and C2 06-Oct-16 Site Possession / Access to Portion D1 and D3 CONS.C1.1020 Site Possession / Access to Portion D1 and D3 Site Set-Up CONS.C1.1030 Site Set-Up Pump House cum Switch Room CONS.C1.5110 Commence Pump House Cum Switch Room mmence Pump House Cum Switch Room (2B+ GF) (2B+ GF)

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| A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D CONS.C1.5120 Mobilisation / Survey/ Setting Out CONS.C1.5125 Cofferdam - Sheet Piling Install Dewatering Wells + Pump Test CONS.C1.5130 Install Dewatering Wells + Pump Test ELS Works to Formation level (Base CONS.C1.5140 ELS Works to Formation level (Basement 2) Blinding, Waterproofing and Base Slab CONS.C1.5150 Blinding, Waterproofing and Base Slab Construct Walls and Slab to Upper Ba CONS.C1.5160 Construct Walls and Slab to Upper Basement CONS.C1.5170 Construct Walls and Slab to Ground Level CONS.C1.5200 Construct Walls and Roof Slab Construct Walls and Roof Slab ABWF & Building Service Works to Pump Hous / Switch Room ABWF & Building Service Works to Pump House / Switch CONS.C1.5205 vement of \$tage 5 (KD6) / Interfac ♦ 03-Aug-17, Achie CONS.C1.5210 Achievement of Stage 5 (KD6) / Interface with Pump House/ Switch Rm - Allow Access to 03-Aug-17, Pump House/Switch Rm - Allow Access to Contract HY/2013/03 CONS.C1.5215 Contract HY/2013/03 CONS.C1.5225 MEP installation for Pump House/Switch Room Testing and Commissioning and Statutory Permits / Certification by FSD / BD CONS.C1.5235 Testing and Commissioning and Statutory Permits / Certification by FSD / BD ABWF Works and External Works CONS.C1.5245 ABWF Works and External Works E&M Equipment Installation CONS.C1.5255 E&M Equipment Installation **Box Culvert D - Cost Savings Design Contractors Design** AD.A1.0001 Approval in Principle for Cost Savings Design 06-Oct-16 Approval in Principle for Cost Savings Design Detailed Design / Shop Drawings and AD.A1.0100 Detailed Design / Shop Drawings and Material AD.A1.0110 Engineer's Review / Approval Engineer's Review / Approva **Preliminary Driven Pile and Load Test** AD.A1.0470.30 Predrilling (1 nos) (Box Culvert D) Predrilling (1 nos) (Box Culvert D) GI Report and Verification / Agreement to Founding Level AD.A1.0470.40 GI Report and Verification / Agreement to Engineer advise Test Pile/ Preliminary Driven Pile at Box Culvert D Engineer advise AD.A1.0510 Test Pile/ Preliminary Driven H Pile at Box ( Mobilize Plant & Set-up Support AD.A1.0520 Mobilize Plant & Set-up Support AD.A1.0530 Preliminary Driven H Pile (2 nos) Preliminary Driven H Pile (2 nos) Pile Load Testing and Submit Report AD.A1.0540 Box Culvert D - 15 Bays drilling at Portion A1 (30 nos) (Box Culvert D) AD.A1.1055.30 Predrilling at Portion A1 (30 nos) (Box Culvert ■ GI Report and Verification / Agree AD.A1.1055.40 GI Report and Verification / Agreement to Founding Level AD.A1.1095.30 Box Culvert - Base Slab, Wall & Top Slab - Part Box Culvert - Base Slab, Wall & Top Slab - Part 1 (8 bays) AD.A1.1095.40 Box Culvert - Base Slab, Wall & Top Slab - Part Box Culvert - Base Slab, Wall & Top \$lab - Part 2 (7 bays) 2 (7 bays) Access to Portion A1 (Interface with Contract 03) 06-Oct-16 Access to Portion A1 (Interface with Contract AD.A1.1110 AD.A1.1120 Box Culvert D - Driven H-Pile Works ox Culvert D - Driven H-Pile Works AD.A1.1130 Install Dewatering Wells + Pump Test + Open Cut Excavation to formation ■ Backfill / Reinstate and Conhect UU and Road Works SOL101 AD.A1.1150 Backfill / Reinstate and Connect UU and Road Works SOL101 and SOL102 AD.A1.1160 Survey / Setting Out Survey / Setting Out AD.A1.1170 Pile Testing Mobilization and AD.A1.1180 Mobilization and Plant Set Up int Set Up Pile Trimming and Pile Caps (30 nos ) Pile Trimming and Pile Caps (30 nos.) AD.A1.2250 Box Culvert D - 3 Bays and Outfall AD.B1.1180.30 Predrilling (6 nos) (Box Culvert D along Seawall redrilling (6 nos) (Box Culvert D along Seawall Are AD.B1.1180.40 GI Report and Verification / Agreement to Founding Level Pile Trimming and Construction of Pile Caps AD.B1.2235 Pile Trimming and Construction of Pile Caps AD.B1.2250 Remove Piling Platform ve Piling Platform AD.B1.2260 Install Seawall Block & Rockfill near Seawall AD.B1.2270 General Fill General Fill AD.B1.2280 ELS Works ( 2 levels of Strut) ELS Works (2 levels of \$trut) Box Culvert D - Driven H Pile with Steel Plate AD.B1.2330 AD.B1.2350 Backfill, Remove Seawall Blocks & Reinstate Backfill, Remove Seawall Blocks & Reinstate Rock Armpur AD.B1.2360 ♦ 02-Mar-18, Complete Box Culvert D - based on CSD Complete Box Culvert D - based on CSD Construct Box Culvert Outfall & Connect Drainage AD.B1.2370 Construct Box Culvert Outfall & Connect Drainage Divert/Shift Haul Road ( on top of completed box culvert) AD.B1.2380 Divert/Shift Haul Road (lon to of completed box culvert) Sheet Piling Works AD.B1.2390 Install Dewatering Wells and Carry Out Pumping Test Install Dewatering Wells and Carry Out Pumping Test AD.B1.2400 AD.B1.2410 Commence Works on Box Culvert Outfall MDN Application for Marine Plants CONS.OF.1010 Prepare Documents for Statutory Submission to Marine Department MD Vetting, Site Inspection and Approva CONS.OF.1020 MD Vetting, Site Inspection and Approval 02-Dec-16. Marine Department Issues Permit / Cd CONS.OF.1030 Marine Department Issues Permit / Consent **Box Culvert C (Portion C1) Preliminary Driven Piles and Load Testing** CONS.C1.0450 Commence Preliminary Driven H Pile at Box Culvert C 06-Oct-16 Commence Preliminary Driven HiPile at Box Culvert C Mobilise Plant & Set-up Support CONS.C1.0460 Mobilise Plant & Set-up Support CONS.C1.0470. Predrilling (4 nos) (Box Culvert C) Predrilling (# nos) (Box Culvert C)

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CONS.C1.0470. GI Report and Verification / Agreement to Founding Level CONS.C1.0480 Preliminary Driven H Pile (4 nos) Preliminary Driven H Pile (4 nos) CONS.C1.0500 Pile Load Testing and Submit Report Pile Load Testing and Submit Report Box Culvert C - Bay 4-8 CONS.C1.1040 Commence Box Culvert C at Portion C1 05-Nov-Commence Box Culvert C at Portion C1 CONS.C1.1045 Survey / Setting Out Survey / Setting Out CONS.C1.1055. Predrilling (56 nos) (Box Culvert C) Predrilling (56 nos) (Box Culvert C) CONS.C1.1055. GI Report and Verification / Agreement to GIReport and Verification / Agreement to Founding Level CONS.C1.1060 Driven H Piling Works (56 nos x 6 days per Pile Driven H Piling Works (56 nos x 6 days per Pile / 3 rigs) CONS.C1.1070 Excavate and Install Dewatering Wells+ Pump Excavate and Install Dewatering Wells+ Pump Test Test CONS.C1.1090 Pile Trimming and Construction of Pile Caps Pile Trimming and Construction of Pile Caps CONS.C1.1100 Construct Box Culvert & Drainage Connection Construct Box Culvert & Drainage (5 bays) Backfill CONS.C1.1110 Backfill Box Culvert C - Bay 1-3 and Outfall CONS.C1.1120 Divert / Shift Haul Road to North Divert / Shift Haul Road to North Remove Rock Armour CONS.C1.1150 Remove Rock Armour CONS.C1.1160 Construct Piling Plaform Construct Piling Plaform CONS.C1.1170. Predrilling (36 nos) (Box culvert area in C1, Predrilling (36 nos) (Box culvert area in C1, along the GI Report and Verification / Agreement to Founding Leve CONS.C1.1170. GI Report and Verification / Agreement to Piling Driving Works - Driven H-Pile (36 nos) CONS.C1.1180 Piling Driving Works - Driven H-Pile (36 nos) 27-Feb-17. ♦ Commence Box Culvert C Outfall CONS.C1.8480 Commence Box Culvert C Outfall Divert /Shift Haul Road to North CONS.C1.8485 Divert /Shift Haul Road to North (on top of completed box culvert) CONS.C1.8490 Remove Piling Platform Remove Piling Platform CONS.C1.8500 Seawall Block Installation near Seawall Seawall Block Installation CONS.C1.8510 General Fill General Fill Sheet Piling CONS.C1.8530 Sheet Piling CONS.C1.8540 Dewatering Wells + Pump Test Dewatering Wells + Pump Test CONS.C1.8550 ELS Works (2 layers of Strut) ELS Works (2 layers of Strut) CONS.C1.8560 Pile Trimming and Construction of Pile Caps (9 Pile Trimming and Construction of Pile Caps (9:Pile CONS.C1.8570 Construct Box Culvert + Outfall & Drainage Connection (38m or 3 bays) Construct Box Culvert + Outfall & Drainage Connection (38m or 3 bays) CONS.C1.8580 Backfill & Remove Sea Wall Blocks and Backfill & Remove Sea Wall Blocks and Reinstate Rock Armour CONS.C1.8590 Complete Box Culvert C ◆ 28-Feb-18, Complete Box Cully **Bridge Works** Bridge D1 in Portion C1, D1 and D3 (Interface CONS.C1.1130 Access to Portion C1, D1 & D3 06-Oct-16 Access to Portion C1, D1 & D3 CONS.C1.1140 Survey / Setting Out Survey / Setting Out Pier Columns (P508) CONS.C1.2100 Pier Columns (P508) CONS.C1.2200 Pier Head (P508) Pier Head (P508) CONS.C1.2200.1 Predrilling (17 nos) (D1) CONS.C1.2200.2 GI Report and Verification / Agreement to GI Report and /erification / Agreement to Founding Level Founding Level CONS.C1.2210 D1 Bored Piling (18 nos. 1800-2000mm dia x 52m) ( 2 nos + 0.8m Rock Socket ) D1 Bared Piling (18 nos, 1800-2000m Pile Testing CONS.C1.2215 Pile Testing Pile Trimming CONS.C1.2220 Pile Trimming CONS.C1.2225.3 Bearing Installation, Final Inspection and ♦ 17-May-17, Achievement of KD4 (465) CONS.C1.2226 Achievement of KD4 (465) CONS.C1.2230 Construct Abutment A106 Construct Aboutm CONS.C1.2250 Bridge D1 - Erect Precast Segments + Bridge D1 Erect Precast Segments + Stitching + Stressing (6 spans) Stitching + Stressing (6 spans) D1 Bridge Ancillary Parapet/TCS\$, Railing, MJ, Drainage & Bridge Lighting CONS.C1.2260 D1 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting CONS.C1.2265 D1 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D1 Bridge Aricillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signa D1 Final Asphalt Paving + Road Mark CONS.C1.2270 D1 Final Asphalt Paving + Road Markings ♦ 02-Jan-18, Completion of Bridge D1 CONS.C1.2280 Completion of Bridge D1 Pier Columns (P101) CONS.C1.2299 Pier Columns (P101) Pier Columns (P102) CONS.C1.8850 Pier Columns (P102) CONS.C1.8860 Pier Columns (P103) Pier Columns (P103) Pier Columns (P104) CONS.C1.8870 Pier Columns (P104) Pier Columns (P105) CONS.C1.8880 Pier Columns (P105) CONS.C1.8950 Pile Cap (P103) Pile Cap (P103) Pile Cap (P104) CONS.C1.8960 Pile Cap (P104) CONS.C1.8970 Pile Cap (P105) Pile Cap (P105) Pile Cap (P101) CONS.C1.8980 Pile Cap (P101) Pile Cap (A106) CONS.C1.8990 Pile Cap (A106) CONS.C1.9000 Pile Cap (P508) Pile Cap (P508) CONS.C1.9010 Pile Cap (P102) Ple Cap (P102) CONS.C1.9020 Pier Head & Bearing (P101) Pier Head & Bearing (P101) Pier Head & Bearing (P102) CONS.C1.9030 Pier Head & Bearing (P102) Pier Head & Bearing (P103) CONS.C1.9040 Pier Head & Bearing (P103)

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1 A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J CONS.C1.9050 Pier Head & Bearing (P104) Pier Head & Bearing (P105) CONS.C1.9060 Pier Head & Bearing (P105) RW1 (51m / 4 bays) CONS.C2.3140 Commence RW1 Retaining Wall Survey / Setting Out CONS.C2.3150 Survey / Setting Out CONS.C2.3160 Excavate to formation level (open cut / slope) Excavate to formation level (ppen cut / slope) Cast Base & Wall Stem 4 bays (ribbed finish to 1m CONS.C2.3170 Cast Base & Wall Stem 4 bays (ribbed finish to 1m below F.G.L) Backfill to final ground level and Reinstate Roa CONS.C2.3180 Backfill to final ground level and Reinstate CONS.C2.3250 Install Railing for RW1 and RW1a Install Railing for RW1 and RW1a RW1a (176m / 11 bays) CONS.C2.3200 Commence RW1a Retaining Wall Commence RW1a Retaining Wal CONS.C2.3210 Survey / Setting Out ■ Survey / Setting Out Excavate to formation level (open cut / slope) - Bay 4 to Bay 11 CONS.C2.3220 Excavate to formation level (open cut / slope) Bay 4 to Bay 11 CONS.C2.3230 Cast Base & Wall Stem (ribbed finish to 1m below F.G.L) - Bay 4 to Bay 11 Cast Base & Wall Stem (ribbled finish to 1m below F.G.L) - Bay 4 to Bay 11 CONS.C2.3240 Backfill to final ground level and Reinstate Backfill to final ground level and Reinstate Roads - Bay 4 to Bay 1 Roads - Bay 4 to Bay 11 Excavate to formation level (open cut / slope) - Bay 1 to Bay : CONS.C2.3370 Excavate to formation level (open cut / slope) Bay 1 to Bay 3 CONS.C2.3380 Cast Base & Wall Stem (ribbed finish to 1m below F.G.L) - Bay 1 to Bay 3 Cast Base & Wall Stem (ribbed finish to 1m below F.G.L) - Bay 1 to Bay 3 CONS.C2.3390 Backfill to final ground level and Reinstate Roads - Bay 1 to Bay 3 Bridge D8 CONS.C1.2285 Site Possession / Access to Portion C1 CONS.C1.2288 Survey / Setting Out Survey / Setting Out CONS.C1.2290.1 Predrilling (10 nos) (D8) Predrilling (10 nos) (D8) CONS.C1.2290.2 GI Report and Verification / Agreement to GI Report and Verification / Agreement to Founding Leve Founding Level D8 Bored Piling (10 nos.2000mm dia x.52m) CONS.C1.2300 D8 Bored Piling (10 nos.2000mm dia x 52m) CONS.C1.2305 Pile Testing Pile Testing Pile Trimming CONS.C1.2310 Pile Trimming Construct Abutment A801 CONS.C1.2320 Construct Abutment A801 CONS.C1.2322 Pier Columns (P805) Pier Columns (P805) Bridge D8:- Erect Precast Segments + Stitching + Stressing (4 CONS.C1.2340 Bridge D8 - Erect Precast Segments + CONS.C1.2350 D8 Bridge Ancillary - Parapet/TCSS, Railing, MJ Drainage & Bridge Lighting D8 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting D8 Bridge Ancillary - Parapet + Railing, Mi, Drainage, Bridge Lighting, Signages CONS.C1.2355 D8 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages ■ D8 Final Asphalt Paving + Road Markings CONS.C1.2360 D8 Final Asphalt Paving + Road Markings O2-Nov-17, Completion of Bridge D8 CONS.C1.2370 Completion of Bridge D8 CONS.C1.8820 Pier Columns (P804) CONS.C1.8830 Pier Columns (P803) Pier Columns (P803) CONS.C1.8900 Pile Cap (A801) Pile Cap (A801) Pile Cap (P805) CONS.C1.8910 Pile Cap (P805) CONS.C1.8920 Pile Cap (P804) Pile Cap (P804) CONS.C1.8930 Pile Cap (P802) CONS.C1.9070 Pier Head & Bearing (P805) Pier Head & Bearing (P805) CONS.C1.9080 Pier Head & Bearing (P804) Pier Head & Bearing (P804) Pier Head & Bearing (P803) CONS.C1.9090 Pier Head & Bearing (P803) Pier Columns (P802) CONS.C2.3420 Pier Columns (P802) CONS.C2.3460 Pile Cap (P803) Pier Head & Bearing (P802) CONS.C2.3490 Pier Head & Bearing (P802) RW8 (35m / 3 bays) 08-Aug-17 ♦ Commence RW8 Retaining Wall CONS.C2.3320 Commence RW8 Retaining Wall ■ Survey / Setting Out CONS.C2.3330 Survey / Setting Out CONS.C2.3340 Excavate to formation level (open cut / slope) Excavate to formation level (open cut / slope) CONS.C2.3350 Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L) Backfill to final ground level & Reinstate Road CONS.C2.3360 Backfill to final ground level & Reinstate Road Bridge D9a in Portion A1 & A5 06-Oct-16 Site Possession / Access to Portion A1 & A5 (61 days) CONS.A5.2010 Site Possession / Access to Portion A1 & A5 (61 days) CONS.A5.2015 Suvey / Setting out Suvey / Setting out Predrilling - Portion A1 & A5 (12 nos) (09a) CONS.A5.2020.1 Predrilling - Portion A1 & A5 (12 nos) (D9a) ■ GI Report and Verification / Agreem CONS.A5.2020.2 GI Report and Verification / Agreement to to Founding Level Founding Level CONS.A5.2030 D9a Bored Piling (12 nos.1800-2200mm dia x 47m) Pilling (12 nos 1800-2200mm dia x 47m) D9a Bor CONS.A5.2035 Pile Testing CONS.A5.2040 Pile Trimming Bridge D9a - Erect Pr CONS.A5.2065 Bridge D9a - Erect Precast Segments + Stitching + Stressing (4 spans) D9a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.A5.2070 D9a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.A5.2080 D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages CONS.A5.2090 Pier Columns (P905 & P907) Pier Columns (P905 & P907) Pier Columns (P904 & P906) CONS.A5.2110 Pier Columns (P904 & P906) CONS.A5.2140 Pile Caps (P904) Pile Caps (P904) Pile Caps (P905) CONS.A5.2150 Pile Caps (P905)

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GI Report and Verification / Agreement to GI Report and Verification / Agree Founding Level D9a in Portion C1 & C2 Bored Piling (8 nos.1800-2200mm dia x 47m) CONS.C2.3030 D9a in Portion C1 & C2 Bored Piling (8 nos.1800-2200mm dia x 47m) CONS.C2.3035 Pile Testing CONS.C2.3040 Pile Trimming CONS.C2.3070 Construct Abutment A901 Construct Abutment A901 CONS.C2.3080 Bridge D9a (C1 & C2) - Erect Precast Bridge D9a (C1 & C2) - Erect P D9a (C1 & C2) Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.C2.3085 D9a (C1 & C2) Bridge Ancillary - Parapet/TCSS Railing, MJ, Drainage, Bridge Lighting, & Sign CONS.C2.3095 Completion of Works in Section VI (KD13) ♦ 14-Jun-17, Completion of Works in Section VI (KD13) CONS.C2.3100 Bridge D9a (C1 & C2) - Erect Precast Bridge D9a (C1 & C2) - Erect Precast Segments + Stitching Segments + Stitching + Stressing (1 span) iD9a Bridge Ancillary | Parapiet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.C2.3110 D9a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.C2.3115 D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D9a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signage CONS.C2.3120 D9a Final Asphalt Paving + Road Markings ■ D9a Final Asphalt Paving + Road Markings ♦ 28-Jul-17, Completion of Bridge D9a CONS.C2.3130 Completion of Bridge D9a CONS.C2.3400 Pier Columns (P902) Pier Columns (P902) Pier Calumns (P903) CONS.C2.3410 Pier Columns (P903) CONS.C2.3440 Pile Caps (P902) Pile Caps (P902) CONS.C2.3450 Pile Caps (P903) Pile Caps (P903) CONS.C2.3470 Pier Head & Bearing (P902) Pier Head & Bearing (P902) CONS.C2.3480 Pier Head & Bearing (P903) Pier Head & Bearing (P903) CONS.C2.3560 Pile Caps (A901) Pile Caps (A901) Bridge D9b CONS.A1.1105 Access to Portion A1 ccess to Portion A CONS.A1.1108 Survey / Setting Out Survey / Setting Out CONS.A1.1110.1 Predrilling (8 nos incl. 4 nos for P910) (D9b) drilling (8 nos incl. 4 nos for P910 CONS.A1.1110.2 GI Report and Verification / Agreement to GI Report and Verification / Agreement to Founding Leve Founding Level D9b Bored Piling (8 nos. 2000mm dia x 49m) including 4 for P910 CONS.A1.1120 D9b Bored Piling (8 nos. 2000mm dia x 49m) including 4 for P910 CONS.A1.1125 Pile Testing CONS.A1.1130 Pile Trimming CONS.A1.1160 Bridge D9b - Erect Precast Segments + Stitching + Stressing (3 spans) Bridge D9b - Erect Precast Segments + Stitching + \$tressing (3 spans) CONS.A1.1170 D9b Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting D9b Bridge Ancillary - Parapet/TC\$S, Railing, MJ Drainage & Bridge Lighting D9b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signage CONS.A1.1175 D9b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages CONS.A1.1180 D9b Final Asphalt Paving + Road Markings Þ9b Final Asphalt Paying + Road Markings ♦ 11-Aug-17, Bridge D9b complete CONS.A1.1190 Bridge D9b complete CONS.A1.8750 Pier Columns (P908) Pier Columns (P908) CONS.A1.8760 Pier Columns (P909) Pier Columns (P909) Pler Columns (P910) - A (Portal) CONS.A1.8770 Pier Columns (P910) - A (Portal) Per Columns (P910) B (Portal) CONS.A1.8780 Pier Columns (P910) - B (Portal) CONS.A1.9230 Pile Caps (P908) CONS.A1.9240 Pile Caps (P909) Pilė Caps (P909) CONS.A1.9250 Pile Caps (P910 - A) Pile Cap (P910 - A) CONS.A1.9260 Pile Caps (P910 - B) CONS.A1.9270 Pier Head & Bearing (P908) Pier Head & Bearing (P908) CONS.A1.9280 Pier Head & Bearing (P909) Pier Head & Bearing (P909) Bridge D9c CONS.A1.1192 Site Possession / Access to Portion A1 & A2 06-Oct-16 Site Possession / Access to Portion A1 & A2 CONS.A1.1194 Survey / Setting Out Survey / Setting Out CONS.A1.1200.1 Predrilling (8 nos) (D9c) Predrilling (8 nos) (D9c) CONS.A1.1200.2 GI Report and Verification / Agreement to Founding Level CONS.A1.1210 D9c Bored Piling (8 nos. 2000mm dia x 62m) CONS.A1.1215 Pile Testing CONS.A1.1220 Pile Trimming Construct Deck (Cast in Situ) (1 span, P910 to P911) CONS.A1.1240 Bridge D9c - Construct Deck (Cast in Situ) (1 Bridge D9c span, P910 to P911) CONS.A1.1250 Bridge D9c - Erect Precast Segments Pier P911 to Pier P913 + Stitching + Stressing (2 spans) Bridge D9¢ - Erect Precast Segments Pier P911 to Pier P913 + Stitching D9c Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting CONS.A1.1260 D9c Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting CONS.A1.1270 D9c Bridge Ancillary - Parapet + Railing, MJ, 💻 ;D9¢ Bridgė Aricillary į Parapet + Railing, MJ, Drainage, Bridge Lighting; Sigr Drainage, Bridge Lighting, Signages CONS.A1.8790 Pier Columns (P913) Pier Columns (P913) CONS.A1.8800 Pier Columns (P912) Pier Columns (P912) CONS.A1.8810 Pier Columns (P911) Pier Columns (P911) CONS.A1.9190 Pile Cap (P913) CONS.A1.9200 Pile Cap (P912) ap (P912)

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1 A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J CONS.A1.9210 Pile Cap (P911) CONS.A1.9310 Pier Head & Bearing (P913) Pier Head & Bearing (P912) CONS.A1.9320 Pier Head & Bearing (P912) CONS.A1.9330 Pier Head & Bearing (P911) Pier Head & Bearing (P911) Bridge D9c in Portion A3 (Interface with Cont CONS.A3.1010 Site Possession / Access to Portion A3 06-Oct-16 ♦ Site Possession / Access to Portion A3 CONS.A3.1020 Mob/ Survey / Setting Out Mob/ Survey / Setting Out CONS.A3.1030 Bridge D9c (A3) - Erect Precast Segments Pier ridge D9c (A3) - Erect Precast Segment: Pier P913 to Contract Interface + Stitchi P913 to Contract Interface + Stitching + CONS.A3.1040 D9c Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage & Bridge Lighting D9c Bridge Ancillary - Parapet/TC\$S, Railing, MJ, Drainage & Bridge Lighting CONS.A3.1045 D9c Bridge Ancillary - Parapet + Railing, MJ 📫 🛭 Þ9c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages Drainage, Bridge Lighting, Signages CONS.A3.1050 D9c Final Asphalt Paving + Road Markings D9c Final Asphalt Paving + Road Markings CONS.A3.1060 Completion of Works in Stage 1B (KD2) O3-May-18, Completion o Bridge D10 CONS.A1.10120 Pile Caps (A1004) Pile Caps (A1004) CONS.A1.1284 Site Possession / Access to Portion A1 Site Possession / Access to Portion A Survey / Setting Out CONS.A1.1286 Survey / Setting Out CONS.A1.1290.1 Predrilling (14 nos) (D10) drilling (14 hos) (D10) CONS.A1.1290.2 GI Report and Verification / Agreement to Founding Level CONS.A1.1300 D10 Bored Piling (14 nos 1800-2200mm dia x 57m) (42m for Abutment) D10 Bored Piling (14 nos 1800-2200mm dia x 57m) (42m for Abut CONS.A1.1305 Pile Testing CONS.A1.1310 Pile Trimming Construct Abultment A1004 CONS.A1.1315 Construct Abutment A1004 CONS.A1.1340 Bridge D10 - Erect Precast Segments + Bridge D10 - Erect Precast Segments + Stitching + Stressing (8 spans Stitching + Stressing (8 spans) CONS.A1.1350 D10 Bridge Ancillary - Parapet/TCSS, Railing, D10 Bridge Ancillary - Parapet/TCSS, Ralling, MJ, Drainage, Bridge Lighting, & Sign Gantry MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.A1.1355 D10 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D10 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, \$ignage D10 Final Asphalt Paving + Road Markings CONS.A1.1360 D10 Final Asphalt Paving + Road Markings ◆ 18-Oct-17, Bridge D10 complete CONS.A1.1370 Bridge D10 complete Pier Columns (P1003) CONS.A1.8830 Pier Columns (P1003) Pier Columns (P1002 & P1006) CONS.A1.8840 Pier Columns (P1002 & P1006) CONS.A1.8850 Pier Columns (P1008) Pier Columns (P1008) Pier Columns (P1001 & P1 CONS.A1.8860 Pier Columns (P1001 & P1005) Pier Columns (P1007) CONS.A1.8870 Pier Columns (P1007) CONS.A1.9110 Pile Caps (P1008) Pile Caps (P1008) Pile Caps (P1003) CONS.A1.9120 Pile Caps (P1003) CONS.A1.9130 Pile Caps (P1007) Pilė Caps (P1007) le Caps (P1002) CONS.A1.9140 Pile Caps (P1002) Pile Caps (P1001) CONS.A1.9160 Pile Caps (P1001) CONS.A1.9350 Pier Head & Bearing (P1003) Fier Head & Bearing (P1003) Pier Head & Bearing (P1007) CONS.A1.9360 Pier Head & Bearing (P1007) Pier Head & Bearing (P1008) CONS.A1.9370 Pier Head & Bearing (P1008) CONS.A1.9380 Pier Head & Bearing (P1002 & P1006) Pier Head & Bearing (P1002 & P1006) ■ Pier Head & Bearing (P1001 & 1005) CONS.A1.9400 Pier Head & Bearing (P1001 & 1005) Bridge D11 CONS.A1.1375 Site Possession / Access to Portion A1 (61d) Survey / Setting Out CONS.A1.1378 Survey / Setting Out CONS.A1.1380.1 Predrilling (3 nos) (D11) Predrilling (3 nos) (D11) GI Report and Verification / Agreem CONS.A1.1380.2 GI Report and Verification / Agreement to nt to Founding Level D11 Bored Piling (3 nos. 2000mm dia x 65) (52m for abutment CONS.A1.1390 D11 Bored Piling (3 nos. 2000mm dia x 65) (52m for abutment) CONS.A1.1395 Pile Testing Pile Te CONS.A1.1400 Pile Trimming CONS.A1.1405 Abutment A1101 nt A1101 CONS.A1.1430 Bridge D11 - Erect Precast Segments + Bridge D11 - Erect Precast Segments + Stitching + Stressing (2 spans) CONS.A1.1440 D11 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry D11 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.A1.1445 D11 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D11 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages Road Markings D11 Final Asphalt Paving CONS.A1.1450 D11 Final Asphalt Paving + Road Markings CONS.A1.1460 Bridge D11 complete CONS.A1.8900 Pier Columns (P1102) Pler Columns (P1102) Pile Caps (P1102) CONS.A1.9070 Pile Caps (P1102) CONS.A1.9080 Pile Caps (A1101) Pile Caps (A1101) CONS.A1.9420 Pier Head & Bearing (P1102) Pier Head & Bearing (P1102) RW11 (42m / 3 bays) CONS.A1.3320 Commence RW11 Retaining Wall (42m / 3 bays) 13-May-17 ♦ Commence RW11 Retaining Wall (42m / 3 bays) Survey / Setting Out CONS.A1.3330 Survey / Setting Out CONS.A1.3340 Excavate to formation level (open cut / slope) Excavate to formation level (open cut / slope) CONS.A1.3350 Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L) Cast Base & Wall Stem 3 bays (ribbed finish to 1m below Backfill to final ground level CONS.A1.3360 Backfill to final ground level

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Bridge D12a CONS.B1.1835 Site Possession / Access to Portion B1 Site Survey and Setting Out CONS.B1.1837 Site Survey and Setting Out CONS.B1.1840.1 Predrilling (17 nos) (D12a) Predrilling (17 nos) (D12a) GI Report and Verification / Agreement to Founding Leve CONS.B1.1840.2 GI Report and Verification / Agreement to Founding Level CONS.B1.1850 D12a Bored Piling (17 nos. 2000mm dia x 60m + 1.0m Rock Socket) D12a Bored Piling (17 nos, 2000mm dia x 60m + 1,0m Rock \$ocket) CONS.B1.1855 Pile Testing Pile Trimming CONS.B1.1860 Pile Trimming CONS.B1.1890 Bridge D12a - Erect Precast Segments + Stitching + Stressing (6 spans) Bridge D12a - Erect Precast Segr nents + Stitching + Stressing (6 spans) D12a Bridge Ancillary - Parapet/TCSS, Railing, M.), Drainage, Bridge Lighting, & Sig CONS.B1.1900 D12a Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.B1.1905 D12a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D12a Bridge Ancillary CONS.B1.1910 D12a Final Asphalt Paving + Road Markings aving + Road Markings O4-Jul-18, Bridge D12a complete CONS.B1.1920 Bridge D12a complete Pier Columns (P1201 & P1204) CONS.B1.2020 Pier Columns (P1201 & P1204) CONS.B1.2040 Pier Columns (P1202 & P1205) Pier Columns (P1202 & P1205) Pier Columns (P1203 & P1414) CONS.B1.2050 Pier Columns (P1203 & P1414) CONS.B1.2070 Pier Columns (P1206) Pier Columns (P1206) Pile Caps (P1206) CONS.B1.2440 Pile Caps (P1206) CONS.B1.2450 Pile Caps (P1201) Pile: Caps (P1201): CONS.B1.2460 Pile Caps (P1202) Pile Caps (P1202) CONS.B1.2470 Pile Caps (P1203) Pile Caps (P1203) CONS.B1.2480 Pier Head & Bearing (P1201 & P1204) Pier Head & Bearing (P1201 & P1204) Pier Head & Bearing (P1202 & P1205) CONS.B1.2500 Pier Head & Bearing (P1202 & P1205) CONS.B1.2520 Pier Head & Bearing (P1203 & P1414) Pier Head & Bearing (P1203 & P1414) Pier Head & Bearing (P1206) CONS.B1.2530 Pier Head & Bearing (P1206) Bridge D12b CONS.B2.2015 Site Possession / Access to Portion B2 & B5 06-Oct-16 Site Possession / Access to Portion B2 & B5 CONS.B2.2018 Site Survey / Setting out Site Survey / Setting ou Predrilling (18 nds) (D12b) CONS.B2.2020.1 Predrilling (18 nos) (D12b) CONS.B2.2020.2 GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agree D12b Bored Piling (18 nos. 2000mm da x 64m + 3.3m Rock Socket) CONS.B2.2030 D12b Bored Piling (18 nos. 2000mm dia x 64m 3.3m Rock Socket) CONS.B2.2035 Pile Testing Pile Testing Pile Trimming CONS.B2.2040 Pile Trimming D12b - Erect Precast Segments + Stitching + Stressing (4 spans) CONS.B2.2070 Bridge D12b - Erect Precast Segments + Stitching + Stressing (4 spans) ■ D12b Bridge Ancillary - Farapet/TCSS, Ralling, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.B2.2080 D12b Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry CONS.B2.2085 D12b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D12b Bridge Ancillary - Parapet + Railing MJ, Drainage Bridge Lighting, \$ignage Final Paving, Road CONS.B2.2090 Final Paving, Road Markings and Signages Markings and \$ignages CONS.B2.2100 Pier Columns (P1211) Pier Columns (P1211) CONS.B2.2110 Pier Columns (P1212) Pier Columns (P1214) CONS.B2.2120 Pier Columns (P1214) CONS.B2.2130 Pier Columns (P1213) - A (Portal) Pier Columns (P1213) - A (Porta Pier Columns (P1210) CONS.B2.2140 Pier Columns (P1210) CONS.B2.2150 Pier Columns (P1213) - B (Portal) Pier Columns (P1213) - B (Porta Pier Columns (P1208) CONS.B2.2160 Pier Columns (P1208) Pier Columns (P1209) CONS.B2.2170 Pier Columns (P1209) CONS.B2.2190 Pile Caps (P1211) Pile Caps (P1211) Pile Caps (P1212) CONS.B2.2200 Pile Caps (P1212) Pile Caps (P1213 - A) CONS.B2.2210 Pile Caps (P1213 - A) CONS.B2.2220 Pile Caps (P1213 - B) Pile Caps (P1213 - B) Pile Caps (P1214) CONS.B2.2230 Pile Caps (P1214) CONS.B2.2240 Pile Caps (P1207) Pile Caps (P1207) CONS.B2.2250 Pile Caps (P1208) Pile Caps (P1208) Pile Caps (P1209) CONS.B2.2260 Pile Caps (P1209) CONS.B2.2270 Pile Caps (P1210) Pile Caps (P1210) Pier Columns (P1207) CONS.B2.2280 Pier Columns (P1207) CONS.B2.2290 Pier Head & Bearing (P1211) Pier Head & Bearing (P1211) CONS.B2.2300 Pier Head & Bearing (P1214) Pier Head & Bearing (P1214) ■ Pier Head & Bearing (P1212) CONS.B2.2320 Pier Head & Bearing (P1212) CONS.B2.2340 Pier Head & Bearing (P1207) Pier Head & Bearing (P1207) Pier Head & Bearing (F CONS.B2.2350 Pier Head & Bearing (P1210) CONS.B2.2360 Pier Head & Bearing (P1208) Pier Head & Bearing (P1208) CONS.B2.2370 Pier Head & Bearing (P1209) Pier Head & Bearing (P1209 CONS.B2.2380 Bridge D12b - Erect Precast Segments + Stitching + Stressing (4 spans) Bridge D12b - Frect Preca Bridge D12b (cast in-situ) in Portion B3 (Inter CONS.B3.2110 Site Possession/Access to Portion B3 CONS.B3.2120 Survey / Setting Out Survey / Setting Out

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CONS.B3.2130 Bridge D12b (Portion B3) - Construct Deck (cast-in-situ) Pier P1210/P1214 interface with CONS.B3.2140 D12b Bridge Ancillary - Parapet/TCSS, Railing, TCSS, Railing, NJ, Drainage, Bridge Lighting, & Sign Gantry MJ, Drainage, Bridge Lighting, & Sign Gantry D 2b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages CONS.B3.2145 D12b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages CONS.B3.2150 D12b Final Paving, Road Markings and Signages 10-Apr-18, Completion of Section IV (KD11) Works within Portion \$3 including Bridge D12b CONS.B3.2160 | Completion of Section IV (KD11) Works within Portion B3 including Bridge D12b Bridge D13 in Portion B1 and Portion C1 CONS.B1.1925 Site Possession / Access to Portion B1 CONS.B1.1926 Site Possession / Access to Portion C1 06-Oct-16 Site Possession / Access to Portion C CONS.B1.1928 Site Survey / Setting out Portion B1 Site Survey / Setting out Portion B1 CONS.B1.1929 Site Survey / Setting out Portion C1 Site Survey / \$etting out Portion C1 CONS.B1.1930.1 Predrilling (15 nos) in Portion B1 (D13) Predrilling (15 nos) in Portion B1 (D13) GI Report and Verifica CONS.B1.1930.2 GI Report and Verification / Agreement to Founding Level - B1 Predrilling (6 nos) in Portion C1 (D13) CONS.B1.1932.1 Predrilling (6 nos) in Portion C1 (D13) CONS.B1.1932.2 GI Report and Verification / Agreement to Founding Level - C1 ■ GI:Report and Verification / Agreen nt to Founding D13 Bored Piling (15 nos 1800-2000mm dia x 52m) 4nos + 0.8m Rock Socket CONS.B1.1940 D13 Bored Piling (15 nos. 1800-2000mm dia x 52m) 4nos + 0.8m Rock Socket - Portion B1 Pile Testing B1 CONS.B1.1942 Pile Testing B1 CONS.B1.1946 D13 Bored Piling (6 nos. 1800-2000mm dia x 47m-52m) - Portion C1 D13 Bored Plling (6 nos. 1800-2000mm dia x 47m CONS.B1.1948 Pile Testing C1 CONS.B1.1950 Pile Trimming - Portion B1 Pile Trimming - Portion B1 Pile Trimming - Portion C1 CONS.B1.1952 Pile Trimming - Portion C1 CONS.B1.1960 Construct Abutment A1301 + A1307 - Portion Construct Abutment A1301 + A1307 - Portion C1 CONS.B1.1980 Bridge D13 - Erect Precast Segments + Stitching + Stressing (9 spans) g + Stressing (9 span Bridge D13 - Erect Precast Segments + Stitcl CONS.B1.1990 D13 Bridge Ancillary - Parapet/TCSS, Railing, D13 Bridge Ancillary - Parapet/TCSS, Railing, NU, Drainage, Bridge Lighting, & Sign Gantry MJ, Drainage, Bridge Lighting, & Sign Gantry D13; Bridge, Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages CONS.B1.1995 D13 Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting, Signages D13 Final Asphalt Paving, Road Markings & \$ignages CONS.B1.2000 D13 Final Asphalt Paving, Road Markings & Signages 24-Feb-18, Completion of Bridge D13 CONS.B1.2010 Completion of Bridge D13 CONS.B1.2190 Pier Columns (P1303) Pler Columns (P1303) Pier Columns (P1308) CONS.B1.2200 Pier Columns (P1308) CONS.B1.2210 Pier Columns (P1311 & P1306) Pier Calumns (P1311; & P1306) CONS.B1.2220 Pier Columns (P1310 & P1305) Pier Columns (P1310 & P1305 Pier Columns (P1309 & P1304) CONS.B1.2230 Pier Columns (P1309 & P1304) CONS.B1.2330 Pile Caps (P1311) Pile Caps (P1311) CONS.B1.2340 Pier Columns (P1302) Pier Columns (P1302) Pile Caps (P1310) CONS.B1.2350 Pile Caps (P1310) CONS.B1.2360 Pile Caps (P1309) Pile Caps (P1309) CONS.B1.2370 Pile Caps (A1307) Pile Caps (A1307) Pile Caps (A1301) CONS.B1.2380 Pile Caps (A1301) CONS.B1.2390 Pile Caps (P1308) Pile Caps (P1308) CONS.B1.2400 Pile Caps (P1303) Pile Caps (P1303) Pile Caps (P1302) CONS.B1.2410 Pile Caps (P1302) CONS.B1.2560 Pier Head & Bearing (P1311 & P1306) ■ Pier Head & Bearing (P1311 & P1306) Pier Head & Bearing (P1310 & P1305) CONS.B1.2580 Pier Head & Bearing (P1310 & P1305) CONS.B1.2600 Pier Head & Bearing (P1309 & P1304) Pier Head & Bearing (P1309 & P1304) Pier Head & Bearing (P130 CONS.B1.2610 Pier Head & Bearing (P1303) Pier Head & Bearing (P1308) CONS.B1.2620 Pier Head & Bearing (P1308) CONS.B1.2630 Pier Head & Bearing (P1302) Pier Head & Bearing (P1302) RW13 (40m / 3 bays) nence RW13 Retaining Wall CONS.C2.3260 Commence RW13 Retaining Wall 11-Oct-17 🔷 Comn CONS.C2.3270 Survey / Setting Out I Survey / Setting Out CONS.C2.3280 Excavate to formation level (open cut / slope) CONS.C2.3290 Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L) Cast Base & Wall Stem 3 bays (ribbed finish to 1m below F.G.L) CONS.C2.3300 Backfill to final ground level and Reinstate Backfill to final ground level and Reinstate Bridge D14a CONS.A1.1464 Commence Bridge D14a / Portion A1 06-Oct-16 nce Bridge D14a / Portion A1 Survey / Setting Out CONS.A1.1466 Survey / Setting Out CONS.A1.1470.1 Predrilling (12 nos) (D14a) Predrilling (12 nos) (D14a) CONS.A1.1470.2 GI Report and Verification / Agreement to Founding Level ■ G Report and Verification / Agr D14a Bored CONS.A1.1480 D14a Bored Piling (12 nos. 2000mm dia x 62m) 47m for Abutment Piling (12 nos. 2000mm dia x 62m) 47m for Abutment CONS.A1.1485 Pile Testing CONS.A1.1490 Pile Trimming CONS.A1.1515 Construct Abutment A1401 Construct Abutment A1401 CONS.A1.1520 Bridge D14a - Erect Precast Segments + Stitching + Stressing (5 spans) Bridge D14a - Erect Precast Segn CONS.A1.1530 D14a Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages Parapet + Ralling, MJ, Drainage, Bridge D14a Bridge Ancillary CONS.A1.1540 D14a Final Asphalt Paving + Road Markings D14a Final Asphalt Paving + Road Markings ♦ 09-Jun-17, Bridge D14a co CONS.A1.1550 Bridge D14a complete CONS.A1.8940 Pier Columns (P1402) Columns (P1402)

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CONS.A1.8950 Pier Columns (P1403) Pier Columns (P1404) CONS.A1.8960 Pier Columns (P1404) Pier Columns (P1405) CONS.A1.8970 Pier Columns (P1405) CONS.A1.8980 Pier Columns (P1406) Pier Columns (P1406 CONS.A1.9000 Pile Caps (A1401) Pile Caps (A1401) CONS.A1.9010 Pile Caps (P1402) Pile Caps (P1402) Pile Caps (P1403) CONS.A1.9020 Pile Caps (P1403) Pile Caps (P1404) CONS.A1.9030 Pile Caps (P1404) CONS.A1.9040 Pile Caps (P1405) Pile Caps (P1405) Pile Caps (P1406) CONS.A1.9050 Pile Caps (P1406) CONS.A1.9440 Pier Head & Bearing (P1402) Pier Head & Bearing (P1402) CONS.A1.9450 Pier Head & Bearing (P1403) Pier Head & Bearing (P1404) CONS.A1.9460 Pier Head & Bearing (P1404) CONS.A1.9470 Pier Head & Bearing (P1405) Pier Head & Bearing (P1405) Pier Head & Bearing (P1406) CONS.A1.9480 Pier Head & Bearing (P1406) RW14A (29m / 2 bays) CONS.A1.3380 Commence RW14a Retaining Wall (29m / 2 25-Jul-17 • Comr nce RW14a Retaining Wall (29m / 2 bays) Survey / Setting Out CONS.A1.3390 Survey / Setting Out Excavate to formation level (open cut / slope) CONS.A1.3400 Excavate to formation level (open cut / slope) CONS.A1.3410 Cast Base & Wall Stem 2 bays (ribbed finish to Cast Base & Wall Stem 2 bays (ribbed finish to 1 m 1m below F.G.L) CONS.A1.3420 Backfill to final ground level Backfill to final ground level Bridge D14b in Portion A1 and Portion B1 CONS.B1.1654 Access to Portion B1 Access to Portion B1 CONS.B1.1656 Survey / Setting Out Survey / Setting Out CONS.B1.1660.1 Predrilling (6 nos) (D14b) Predrilling (6 nos) (D14b) GI Report and Verification / Agreement to Founding Level CONS.B1.1660.2 GI Report and Verification / Agreement to Founding Level CONS.B1.1670 D14b Bored Piling (6 nos. 2000-2200mm dia x 62m) (2nos +2.3m Rock Socket) D14b Bored Piling (6 nos. 2000-2200mm dia x 62m) (2nos +2.3m Rock Socket) Pile Testing / Coring Test for Socket Bored Pile CONS.B1.1675 Pile Testing / Coring Test for Socket Bored Pile Pile Trimming CONS.B1.1680 Pile Trimming CONS.B1.1710 Bridge D14b - Erect Precast Segments + Stitching + Stressing (3 spans) CONS.B1.1720 D14b Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages D14b Bridge Ancillary - Parapet + Railing, MJ Drainage, Bridge Lighting & Signages D14b Final Asphalt Paving + Road Markings CONS.B1.1730 D14b Final Asphalt Paving + Road Markings ♦ 26-Sep-17, Bridge D14b complete CONS.B1.1740 Bridge D14b complete Pier Columns (P1407) CONS.B1.2090 Pier Columns (P1407) CONS.B1.2100 Pier Columns (P1408) Pier Columns (P1408) CONS.B1.2110 Pier Columns (P1409) Pier Columns (P1409) Pile Caps (P1407) CONS.B1.2290 Pile Caps (P1407) Pile Caps (P1408) CONS.B1.2300 Pile Caps (P1408) Pile Caps (P1409) CONS.B1.2310 Pile Caps (P1409) CONS.B1.2640 Pier Head & Bearing (P1407) Pier Head & Bearing (P1407) CONS.B1.2650 Pier Head & Bearing (P1408) Pier Head & Bearing (P1408) Pier Head & Bearing (P1409) CONS.B1.2660 Pier Head & Bearing (P1409) Bridge D14c CONS.B1.1744 Site Possession / Access to Portion B1 Survey / Setting Out CONS.B1.1746 Survey / Setting Out CONS.B1.1750.1 Predrilling (11 nos) (D14c) redrilling (11 nos) (D14c) CONS.B1.1750.2 GI Report and Verification / Agreement to GI Report and Verification / Agreement to Founding Level D) 4c Bored Pilling (11 nos; 2000-2200mm dia x 67m + 2.3m (Rock Socket) CONS.B1.1760 D14c Bored Piling (11 nos. 2000-2200mm dia x 67m + 2.3m Rock Socket) Pile Testing CONS.B1.1765 Pile Testing CONS.B1.1770 Pile Trimming CONS.B1.1795 Bridge D14c - Construct Deck (cast in-situ) Pier P1409 to P1410 Bridge D14c - Construct Deck (cast in-situ); Pier P1409 to P1410 Bridge D14c - Erect Precast Segments + Stitching + Stressing (4 spans) CONS.B1.1800 Bridge D14c - Erect Precast Segments + CONS.B1.1810 D14c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages D14c Bridge Ancillary - Parapet + Railing, MJ, Drainage, Bridge Lighting & Signages CONS.B1.1820 D14c Final Asphalt Paving + Road Markings D14c Final Asphalt Paving + Road Marking ♦ 14-Dec-17, Bridge D14c complete CONS.B1.1830 Bridge D14c complete CONS.B1.2120 Pier Columns (P1410) Pier Columns (P1410) CONS.B1.2130 Pier Columns (P1411 & P1413) Pier Columns (P1411 & P1413) Pier Columns (P1412) CONS.B1.2140 Pier Columns (P1412) CONS.B1.2250 Pile Caps (P1410) Pile Caps (P1410) CONS.B1.2260 Pile Caps (P1411) Pile Caps (P1411) CONS.B1.2270 Pile Caps (P1412) Pile Caps (P1412) CONS.B1.2670 Pier Head & Bearing (P1410) Pier Head & Bearing (P1410) CONS.B1.2680 Pier Head & Bearing (P1411 & P1413) Pier Head & Bearing (P1411 & P1413) Pier Head & Bearing (P1412): CONS.B1.2690 Pier Head & Bearing (P1412) Bridge D15 Site Possession/Access to Partion B5 CONS.B5.2104 Site Possession/Access to Portion B5 06-Oct-16

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| A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D CONS.B5.2106 Survey/ Site Setting Out edrilling (11 nos) (D15) CONS.B5.2110.1 Predrilling (11 nos) (D15) CONS.B5.2110.2 GI Report and Verification / Agreement to GI Report and Verification / Agreement to Founding Level D15 Bored Piling (11 nos. 2000mm dia x 65m CONS.B5.2120 D15 Bored Piling (11 nos. 2000mm dia x 65m 3.3m Rock Socket) CONS.B5.2125 Pile Testing Pile Testing CONS.B5.2130 Pile Trimming Pile Trimmino CONS.B5.2150 Bridge D15 - Construct Deck (cast in-situ) Pier P1501/P1502-1503 CONS.B5.2160 Bridge D15 - Erect Precast Segments + Bridge D15 - Erect Precast Segments Stitching + Stressing (2 spans Stitching + Stressing (2 spans) CONS.B5.2170 D15 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry :D15 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Ligh CONS.B5.2180 D15 Final Asphalt Paving, Road Markings and p15 Final Asphalt Paving, Road Markings and Signages Signages CONS.B5.2190 Pier Columns (P1501 & P1502) Pier Columns (P1501 & P1502) Pier Columns (P1503) CONS.B5.2210 Pier Columns (P1503) Pier Columns (P1504) CONS.B5.2220 Pier Columns (P1504) CONS.B5.2230 Pier Columns (P1505) Pier Columns (P1505) CONS.B5.2250 Pile Caps (P1501 & P1502) Pile Caps (P1501 & P1502) Pile Caps (P1503) CONS.B5.2260 Pile Caps (P1503) CONS.B5.2270 Pile Caps (P1504) Plle Caps (P1504) CONS.B5.2280 Pile Caps (P1505) Pile Caps (P1505) CONS.B5.2290 Pier Head & Bearing (P1501) Pier Head & Bearing (P1501) Pier Head & Bearing (P1503) CONS.B5.2310 Pier Head & Bearing (P1503) Pier Head & Bearing (P1504) CONS.B5.2320 Pier Head & Bearing (P1504) CONS.B5.2330 Pier Head & Bearing (P1505) Pier Head & Bearing (P1505) CONS.B5.2340 Bridge D15 - Erect Precast Segments + Bridge D15 - Erect Precast Segments + \$titching + Stressing (2 spans) Stitching + Stressing (2 spans) Bridge D15 in Portion B4 (Interface with Cont CONS.B4.2170 Site Possession/Access to Portion B4 ■ Survey / \$ite Setting Out CONS.B4.2180 Survey / Site Setting Out CONS.B4.2190 Bridge D15 - Erect Precast Segments on Falseworks at Portion B4 Interface (1 spa ■ Bridge D15 - Erect Precast Segments on Falseworks at Portion B4 Interface (1 span) orks at Portion B4 Interface (1 span) - Parapet/T¢SS, Railing, M.), Drainage, Bridge Lighting, & Sign G CONS.B4.2200 D15 Bridge Ancillary - Parapet/TCSS, Railing, MJ, Drainage, Bridge Lighting, & Sign Gantry D15 Final Asphalt Paving, Road Markings and Signages CONS.B4.2210 D15 Final Asphalt Paving, Road Markings and CONS.B4.2220 Inspection and Handover CONS.B4.2230 Completion of Section V (KD12) Works within Portion B4 including Bridge D15 mpletion of Section V (KD12) Works within Portion B4 including Bridge D15 ♦ 18-Aug-18, Co Bridge D16S and D16N and Abutment A1601 in CONS.A4.2230 Commence Works for Abutment A1601 06-Oct-16 ce Works for Abutment A1601 Survey / Site \$etting Out CONS.A4.2240 Survey / Site Setting Out CONS.A4.2250.1 Predrilling (2 nos) (D16) - BH 03 & BH 04 at Portion A6 Predrilling (2 nos) (D16) - BH 03 & BH 04 at Portion A6 CONS.A4.2250.2 GI Report and Verification / Agreement to Founding Level to BH 03 and BH 04 Predrilling (2 nos):(D16) + BH 01 & BH 02 at Portion A3 CONS.A4.2250.3 Predrilling (2 nos) (D16) - BH 01 & BH 02 at CONS.A4.2250.4 GI Report and Verification / Agreement to Founding Level to BH 01 and BH 02 CONS.A4.2260 D16S Bored Piling (2 nos x 1800mm dia) D16S Boried Piling (2 nos x 1800mm dia) CONS.A4.2265 Pile Testing - BH 03 & BH 04 Pile Testing - BH 03 & BH 04 Construct Abutment A1601 CONS.A4.2280 | Construct Abutment A1601 016N Bored Piling (2 nos x 1800mm dia) CONS.A4.2340 D16N Bored Piling (2 nos x 1800mm dia) CONS.A4.2350 Pile Testing - BH 01 & BH 02 Pile Testing - BH 01 & BH 02 CONS.A4.2360 Pile Trimming + Pile Caps Bridge D16S and D16N in Portion A4 CONS.A4.2285 Site Possession / Site Access to Portion A4 20-Mar 17 Site Po sion / Site Access Construct Deck (cast in-stu) CONS.A4.2290 Bridge D16S & D16N - Construct Deck (cast D16N & D16S Bridge Ancillary - Parapet, MJ, Drainage, Bridge Lighting, †CSS & Signage CONS.A4,2300 D16N & D16S Bridge Ancillary - Parapet, MJ Drainage, Bridge Lighting, TCSS & Signages CONS.A4.2310 D16 Final Asphalt Paving, Road Markings and D16 Final Asphalt Paving, Road Markings and Signages Signages CONS.A4.2320 Inspection and Handover of Bridge D16 Handover of Bridge D16 CONS.A4.2330 Completion of Bridge D16N and D16S 21-Aug-18, Completion of Bridge D16N and D16S RW16S (15m / 1 bay) in Portion A6 13-Feb-17 ♦ Commence RW16s Retaining Wall (29m / 2 bays) CONS.A1.3500 Commence RW16s Retaining Wall (29m / 2 bays) Survey / Setting Out CONS.A1.3510 Survey / Setting Out Excavate to formation level (open cut / slope) CONS.A1.3520 Excavate to formation level (open cut / slope) CONS.A1.3530 Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L) Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L) CONS.A1.3540 Install U/G Utilities - TCSS, ELV & LV Ducting & Draw Pits Install U/G Utilities - TCSS, ELV & LV Ducting & Draw Pits CONS.A1.3550 Backfill to final ground level Backfill to final ground level RW16N (15m / 1 bay) in Portion A6 ence RW16n Retaining Wall (29m / 2 bays) CONS.A1.3440 Commence RW16n Retaining Wall (29m / 2 bays) CONS.A1.3450 Survey / Setting Out : Survey / Setting Out: CONS.A1.3460 Excavate to formation level (open cut / slope) Excavate to formation level (open cut / slope) CONS.A1.3470 Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L) Cast Base & Wall Stem 1 bay (ribbed finish to 1m below F.G.L) Install U/G Utilities - TCSS, FLV & LV Ducting CONS.A1.3480 Install U/G Utilities - TCSS, ELV & LV Ducting Backfill to final ground leve CONS.A1.3490 Backfill to final ground level **Depressed Road RC Structure** 

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Print Date: 14-Dec-16 09:47 Page: 15 / 23 Stage 1- Depressed Road RC Structure (Bay 9 CONS.C1.8670 Commence Works on Depressed Road (after removal of falsework D10, D14a) Excavate to formation level (open cut) CONS.C1.8699 Excavate to formation level (open cut) CONS.C1.8720 Construct- base slab CONS.C1.8730 Construct - wall (Plan ad Ribbed Finishes) Construct - wall (Plan ad Ribbed Finishes) Backfill and Com CONS.C1.8740 Backfill and Compaction Stage 2 - Depressed Road RC Structure (Bay 1 CONS.C1.8671 | Commence Works on Depressed Road (after 19-Aug 17: 🔷 Commence Works on Depressed Road (after remova falseworks D13, D8, D9a) removal of falseworks D13, D8, D9a) CONS.C1.8690 Excavate to formation level (open cut) Excavate to formation level (open cut) CONS.C1.8721 Construct- base slab Construct - wall (Plan ad Ribbed Finishes) CONS.C1.8731 | Construct - wall (Plan ad Ribbed Finishes) CONS.C1.8741 Backfill and Compaction Backfill and Com Sign Gantry Sign Gantry Footings at Grade in Portion A1 DS303 (Driven H Pile) Predrilling (12 nos) (DS303) CONS.A1.4380. Predrilling (12 nos) (DS303) CONS.A1.4380. GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agreement to Fo CONS.A1.4390 Piling Works - Driven H Pile (12 nos) ing Works - Driven H Pile (12 nos) CONS.A1.4410 Excavation, Pile Trimming + Cast Pile Caps (3 Excavation, Pile Trimming + Cast Pile Caps (3 nos) CONS.A1.4420 Backfill Foundation ■ Backfill Foundation Sign Gantry Footing at Grade in Portion C1 & P DS302 (610mm dia. Prebored H Pile) CONS.D1.3380 Commence Foundation / Footing for Sign 06-Oct-16 🔷 Commence Foundation / Footing for Sign Gantry Gantry Mobilisation/Survey/Setting Out CONS.D1.3390 Mobilisation/ Survey / Setting Out CONS.D1.3400. Predrilling for Prebored H Pile (8 nos) (DS302) Predrilling for Prebored H Pile (8 nos) (DS302) CONS.D1.3400. GI Report and Verification / Agreement to GI Report and Verification / Agr Founding Level CONS.D1.3410 Pre-bored Socket H-Pile (8 nos) Pre-bored Socket H-Pile (8 nds) CONS.D1.3420 Pile Testing Pile Testing Excavation, Pile Trimming + Pile Caps ( 2 nos) CONS.D1.3430 Excavation, Pile Trimming + Pile Caps ( 2 nos) CONS.D1.3440 Backfill Foundation Backfill Foundation GT408 (Driven H Pile) Predrilling (8 nos) (GT408) CONS.C1.4030. Predrilling (8 nos) (GT408) CONS.C1.4030. GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agreement to Founding Level Piling Works - Driven H Pile (8 nos) CONS.C1.4040 Piling Works - Driven H Pile (8 nos) CONS.C1.4060 Excavation, Pile Trimming + Cast Pile Caps ( 2 nos) Excavation, Pile Trimming + Cast Pile Caps (2 nos) CONS.C1.4070 Backfill Foundation Backfill Foundation DS44 (Driven H Pile) CONS.C1.4100. Predrilling (8 nos) (DS44) Predrilling (8 nos) (DS44) GI Report and Verification / Agreement to Founding Level CONS.C1.4100. GI Report and Verification / Agreement to Founding Level ing Works - Driven H Pile (8 nos) CONS.C1.4110 Piling Works - Driven H Pile (8 nos) CONS.C1.4130 Excavation, Pile Trimming + Cast Pile Caps ( 2 Excavation, Pile Trimming + Cast Pile Caps (2 nos) Backfill Foundation CONS.C1.4140 Backfill Foundation DS261 (Driven H Pile) Predrilling (8 nos) (D\$261) CONS.C1.4170. Predrilling (8 nos) (DS261) ■ GI Report and Verification / Agreement to Founding Level CONS.C1.4170. GI Report and Verification / Agreement to Founding Level Piling Works - Driven H Pile (8 nos) CONS.C1.4180 Piling Works - Driven H Pile (8 nos) Excavation, Pile Trimming + Cast Rile Caps (2 nos) CONS.C1.4200 Excavation, Pile Trimming + Cast Pile Caps ( 2 nos) ■ Backfill Foundation CONS.C1.4210 Backfill Foundation ADS301 (Driven H Pile) Predrilling (12 nos) (ADS301) CONS.C1.4240. Predrilling (12 nos) (ADS301) GI Report and Verification / Agreement to Founding Level CONS.C1.4240. GI Report and Verification / Agreement to Founding Level Pillng Works - Driven H Pile (12 nos) CONS.C1.4250 Piling Works - Driven H Pile (12 nos) CONS.C1.4270 Excavation, Pile Trimming + Cast Pile Caps ( 3 nos) Excavation, Pile Trimming + Cast Pile Caps (3 nos) CONS.C1.4280 Backfill Foundation Backfill Foundation FADS303 (Driven H Pile) Predrilling (8 nos) (FADS303) CONS.C1.4310. Predrilling (8 nos) (FADS303) CONS.C1.4310. GI Report and Verification / Agreement to Founding Level GI Report and Verification / Agre Piling Works - Driven H Pile (8 nos) CONS.C1.4320 Piling Works - Driven H Pile (8 nos) CONS.C1.4340 Excavation, Pile Trimming + Cast Pile Caps ( 2 nos) Excavation, Pile Trimming + Cast Pile Caps ( ■ Backfill Foundation CONS.C1.4350 Backfill Foundation **Erection of Sign Gantry and High Mast for TCS!** CONS.C1.4360 Erection of Sign Gantry & High Mast Structure and Associated Conduits for TCSS Works and Associated Conduits for TCSS Works Drainage and U/G Utilities CONS.RW.2300 Handover area to CLP for HV Cable Laying and Install HV Cable Ducting on Ca CONS.RW.3870 Excavate and Install HV Cable Ducting on Carriageway (West of Pump House - Portion : Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion: A and C) CONS.RW.3880 Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion A

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CONS.RW.3890 Excavate and Install HV Cable Ducting on Carriageway (East of Pump House - Portion B CONS.RW.3900 Excavate and Install HV Cable Ducting on Carriageway (West of Pump House - Portion Drainage and U/G Utilities (West of Pump Hou Drainage & UU Road SOL 101 / 105 (Phase 1) **Drainage System** CONS.RW.22 Survey/ Road Setting Out Survey/ Road Setting Out CONS.RW.228 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RW.22 Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + **Installation of Underground Utilities** CONS.RW.23 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings; + Testing; Cleaning & Flushing and Interface Co fittings + Testing, Cleaning & Flushing and CONS.RW.23 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others elecom Ducting by Other Excavate and Install ELV/ LV Ducting and Pillar Box for CONS.RW.23 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Road SOL 101 / 105 (Phase 2) **Drainage System** CONS.RW.34 Survey/ Road Setting Out Survey/ Road Setting Out CONS.RW.34 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RW.34( Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + **Installation of Underground Utilities** CONS.RW.34( Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Fresh WM / Valves & fittings + To ng, Cleaning & Flushing a Excavate and Install Common Telecom Ducting and Telecom Ducting by Others CONS.RW.34 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others CONS.RW.34 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Excavate and Install ELV/ LV Ducting and Pillar Box for Road SOL 102 /106 /111 and the neigboring la **Drainage System** Survey/ Road Setting Out CONS.RW.24 Survey/ Road Setting Out Road Formation to Sub-grade (Cut & Fill) CONS.RW.241 Road Formation to Sub-grade (Cut & Fill) CONS.RW.24 Excavate to invert level and install Drainage Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) System (Drain Pipes & Catchpit/Manholes) + **Installation of Underground Utilities** Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection CONS.RW.29 Excavate and Install Fresh WM / Valves & Excavate and Install Common Telecom Ducting and Telecom Ducting; by Others fittings + Testing, Cleaning & Flushing and CONS.RW.29 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others Excavate and Install ELV/ LV Ducting and Pillar Box for TC\$S CONS.RW.29( Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Road SOL 102 /106 /111 and the neigboring la **Drainage System** Survey/ Road Setting Out CONS.RW.34 Survey/ Road Setting Out CONS.RW.34 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RW.34 Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + nd install Drainage System (Drain Pipes Installation of Underground Utilities CONS.RW.35( Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flush Excavate and Install Common Telecom Ducting and Telecom Ducting by Others CONS.RW.35 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others Excavate and Install ELV/ LV Ducting and Pillar Box for TC\$S CONS.RW.352 Excavate and Install ELV/ LV Ducting and Pilla Box for TCSS Road SOL 104 (Phase 1) **Drainage System** CONS.RW.24 Survey/ Road Setting Out ■ Survey/ Road Setting Out CONS.RW.24 Road Formation to Sub-grade (Cut & Fill) Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection CONS.RW.24( Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Installation of Underground Utilities CONS.RW.24 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection fittings + Testing, Cleaning & Flushing and Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (1 line) CONS.RW.24{ Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and CONS.RW.24 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Excavate and Install ELV/LV Ducting and Pillar Box for TCSS Road SOL 104 (Phase 2) **Drainage System** Survey/ Road Setting Out CONS.RW.35¢ Survey/ Road Setting Out Road Formation to Sub-grade (Cut & Fill): CONS.RW.35 Road Formation to Sub-grade (Cut & Fill) CONS.RW.35{ Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Installation of Underground Utilities CONS.RW.351 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connection (3 lines) fittings + Testing, Cleaning & Flushing and CONS.RW.35 Excavate and Install Flush WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Flush WM / Valves & fittings + Testing, Cla Excavate and Install ELV/LV Ducting and Pillar Box for TCSS CONS.RW.35! Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Undergound Utilties (ELV, Fresh WM & Teleco Work in Portion D1 and D2 Sewage Rising main at Portion D1 16-May-17 Commence Works on Rising Main CONS.RM.101 Commence Works on Rising Main ■ Site Survey / Setting Out Sewerage Alignment CONS.RM.102 Site Survey / Setting Out Sewerage Alignmen CONS.RM.103 Excavate to Invert Level & Install 2 Sewage Rising Main DN100 CHC & CHD Excavate to Invert Level & Install 2 Sewage Rising Main DN100 CHC & CHD Construct Thrust Block CONS.RM.104 Construct Thrust Block Gravity Flow Testing CONS.RM.105 Gravity Flow Testing

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Print Date: 14-Dec-16 09:47 Page: 17 / 23 CONS.RM.106 Backfill Telecom Crossing at Portion D2 and D1 Excavate and Install Common Telecom Ducting and Telecom Ducting by Telecom Com CONS.RW.28( Excavate and Install Common Telecom Ducting and Telecom Ducting by Telecom Companies Backfill and reinstate ground CONS.RW.282 Backfill and reinstate ground Drainage and U/G Utilities (East of Pump Hous Drainage & UU Road SOL 101 / 109 / 114 (Phase 1) **Drainage System** Survey/ Road Setting Out CONS.RE.101 Survey/ Road Setting Out CONS.RE.102 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RE.103 Excavate to invert level and install Drainage Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing Interface Connection System (Drain Pipes & Catchpit/Manholes) + **Installation of Underground Utilities** CONS.RE.106 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings: + Testing, Cleaning & Flushing and Interface Connection fittings + Testing, Cleaning & Flushing and CONS.RE.107 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others and Install Common Telecom Ducting a Telecom Ducting by Others Excavate and Install ELV/ LV Ducting and Pillar Box for TCS\$ and Road Lighting CONS.RE.108 Excavate and Install ELV/ LV Ducting and Pilla Box for TCSS and Road Lighting Road SOL 101 / 109 / 114 (Phase 2) **Drainage System** CONS.RE.420 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RE.421 Excavate to invert level and install Drainage Excavate to invert level and install [ inage System (Drain Pipes & Catchpit/ System (Drain Pipes & Catchpit/Manholes) + Survey/ Road Setting Out CONS.RE.422 Survey/ Road Setting Out **Installation of Underground Utilities** CONS.RE.423 Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Excavate and Install Common Telecom Ducting and Telecom Ducting by Others CONS.RE.424 Excavate and Install Common Telecom Ductin and Telecom Ducting by Others CONS.RE.425 Excavate and Install ELV/ LV Ducting and Pillar Excavate and Install ELV/ LV Ducting and Pillar Bdx for TCSS and Road Lighting Box for TCSS and Road Lighting Road SOL 102 and the area outside the carriage **Drainage System** CONS.RE.197 Survey/ Road Setting Out Survey/ Road Setting Out CONS.RE.198 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RE.199 Excavate to invert level and install Drainage Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connection System (Drain Pipes & Catchpit/Manholes) + Installation of Underground Utilities CONS.RE.289 Excavate and Install Fresh WM / Valves & l; Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interi fittings + Testing, Cleaning & Flushing and Excavate and Install Common Telecom Ducting and Telecom Ducting by Others CONS.RE.290 Excavate and Install Common Telecom Ductin and Telecom Ducting by Others CONS.RE.291 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting Road SOL 102 and the area outside the carriage **Drainage System** CONS.RE.426 Survey/ Road Setting Out Road Formation to Sub-grade (Cut & Fill) CONS.RE.427 Road Formation to Sub-grade (Cut & Fill) CONS.RE.428 Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + Excavate to invert level and install Dr em (Drain Pipes & Catchpit/Manholes) + Testing & Interface Connecti **Installation of Underground Utilities** CONS.RE.429 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Con fittings + Testing, Cleaning & Flushing and CONS.RE.430 Excavate and Install Common Telecom Ducting and Telecom Ducting by Others Telecom Ducting and Telecom Ducting by Others CONS.RE.431 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS and Road Lighting Road SOL 107 / 113 (Phase 1) **Drainage System** CONS.RE.200 Survey/ Road Setting Out Survey/ Road Setting Out CONS.RE.201 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RE.202 Excavate to invert level and install Drainage Excavate to invert level and install Drainage System (Drain Pipe System (Drain Pipes & Catchpit/Manholes) + **Installation of Underground Utilities** CONS.RE.204 Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Fresh WM / Valves & fittings + Testing Cleaning & Flushing and Interface Connection (3 lines) CONS.RE.205 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WIM / Valves & fittings + Testing, Cleaning & Flushing and Interface Cor fittings + Testing, Cleaning & Flushing and CONS.RE.206 Excavate and Install ELV/ LV Ducting and Pillar Box for TCSS Excavate and Install ELV/LV Ducting and Pillar Box for TOSS Road SOL 107 / 113 (Phase 2) **Drainage System** CONS.RE.432 Survey/ Road Setting Out CONS.RE.433 Road Formation to Sub-grade (Cut & Fill) Road Formation to Sub-grade (Cut & Fill) CONS.RE.434 Excavate to invert level and install Drainage Excavate to invert level and install Drainage System (Drain I System (Drain Pipes & Catchpit/Manholes) + Installation of Underground Utilities CONS.RE.435 Excavate and Install Fresh WM / Valves & Excavate and Install Fresh WM / Valves & fittings; + Testing, Cleaning & Flushing and Interface Connection (3 lines) Excavate and Install Fresh:WM / Valves & fittings +: Testing, Cleaning & Flushing and Interface Connection (1 line) fittings + Testing, Cleaning & Flushing and CONS.RE.436 Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and and Install ELV/LV Ducting and Pillar Box for TCSS CONS.RE.437 Excavate and Install ELV/ LV Ducting and Pilla Box for TCSS Road SOL 108 / 106 & SOL 110 Adjacent to Road SOL 108 / 106, Abutment A90 CONS.RE.207 Excavate and Install Common Telecom Ducting Common Telecom Ducting and Telecom and Telecom Ducting by Others + Backfilling CONS.RE.216 Road Formation to subgrade + Drainage Road Formation to subgrade + 'Drainage System' CONS.RE.219 Install TCSS/LV/ELV Ducting ■ Install TC\$S/LV/ELV Ducting Portion A1 and A2 - Sub-Base Area

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Page: 18 / 23 Print Date: 14-Dec-16 09:47 CONS.A1.4430 Demobilisation of Temporary Facilities on Site CONS.A1.4440 Site Survey / Site Clearing Area to Formation Level CONS.A1.4450 Area to Formation Level CONS.A1.4460 Sub-Base Material Topping (Area 29,963 m2 : 100mm thk Subbase) Sub-Base Material Topping (Area 29,963 m2 x 100r Area 3 (in Portion A6) **Drainage System** ■ Survey/ Road Setting Out CONS.RE.4660 Survey/ Road Setting Out Road Formation to Sub-grade (Cut & Fill) CONS.RE.4670 Road Formation to Sub-grade (Cut & Fill) CONS.RE.4680 Excavate to invert level and install Drainage System (Drain Pipes & Catchpit/Manholes) + ■ Excavate to invert leve and install Drainage System (Drain Pipe Installation of Underground Utilities CONS.RE.4690 Excavate and Install ELV/ LV Ducting and Pilla Excavate and Install ELV/, LV Ducting and Pillar Box for TCSS Box for TCSS Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Interface Connec CONS.RE.4700 Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flyshing and Interface Connection CONS.RE.4710 Excavate and Install Fresh WM / Valves & fittings + Testing, Cleaning & Flushing and Area 1 (West of Pump House) (Portion C1) **Road Works** Road SOL 101 / 105 (Phase 1) Kerbing and Footings for Railing, Fencing, Sign CONS.RW.30( Excavate and Construct Footings for Road and Construct Footings for Road Lightings / Railing / Fencing and Signage Lightings / Railing / Fencing and Signages oad Formation to Sub-base CONS.RW.30' Road Formation to Sub-base CONS.RW.301 Construct Precast Road Kerbings Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.30 Road Formation to Road Base CONS.RW.304 Road Formation to Base Course Road Formation to Base Course Installation of Railing and Fencing + Road Ligh Install Road Railing and Fencing CONS.RW.30! Install Road Railing and Fencing CONS.RW.30( Install Road Lighting and Signages Install Road Lighting and Signages **Final Paving and Road Markings** CONS.RW.29 Cleaning and Rectification Works ☐ Cleaning and Rectification Work CONS.RW.298 Final Road Paving (Wearing Course) Final Road Paving (Wearing C Road Markings and Road Sig CONS.RW.299 Road Markings and Road Signages Road SOL 101 / 105 (Phase 2) Kerbing and Footings for Railing, Fencing, Sign Road Formation to Sub-bas CONS.RW.36; Road Formation to Sub-base Construct Precast Road Kerbings CONS.RW.36 Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.36! Road Formation to Road Base Road Formation to Road Base Road Formation to Base Course CONS.RW.36¢ Road Formation to Base Course Installation of Railing and Fencing + Road Ligh CONS.RW.36 Install Road Railing and Fencing Install Road Railing and Fencing CONS.RW.36 Install Road Lighting and Signages Install Road Lighting and \$igna **Final Paving and Road Markings** CONS.RW.35 Cleaning and Rectification Works Cleaning and Rectification Work Final Road Paving (Wearing C CONS.RW.36( Final Road Paving (Wearing Course) Road Markings and Road Sigha CONS.RW.36 Road Markings and Road Signages Road SOL 102 /106 /111 (Phase 1) Kerbing and Footings for Railing, Fencing, Sign and Construct Footings for Road Lightings / Railing / Fencing and Signage CONS.RW.32 Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages Road Formation to Sub-base CONS.RW.328 Road Formation to Sub-base CONS.RW.32 Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.32 Road Formation to Road Base Road Formation to Base Course CONS.RW.32: Road Formation to Base Course Installation of Railing and Fencing + Road Ligh CONS.RW.32 Install Road Railing and Fencing nstall Road Railing and Fehcing CONS.RW.32 Install Road Lighting and Signages Install Road Lighting and Signage Final Paving and Road Markings CONS.RW.32 Final Road Paving (Wearing Course) Final Road Paving (Wearing Course) CONS.RW.32 Road Markings and Road Signages Road SOL 102 /106 /111 (Phase 2) Kerbing and Footings for Railing, Fencing, Sign CONS.RW.37 Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages / Railing / Fencing and Signages CONS.RW.37( Road Formation to Sub-base CONS.RW.37 Construct Precast Road Kerbings Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.36 Road Formation to Road Base Road Formation to Road Base

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Page: 19 / 23 Print Date: 14-Dec-16 09:47 CONS.RW.37( Road Formation to Base Course Installation of Railing and Fencing + Road Ligh Install Road Railing and Fencing CONS.RW.37 Install Road Railing and Fencing CONS.RW.37. Install Road Lighting and Signages Install Road Lighting and Signages **Final Paving and Road Markings** Final Road Paving (Wearing Course) CONS.RW.37 Final Road Paving (Wearing Course) Road Markings and Road Signages CONS.RW.37 Road Markings and Road Signages Road SOL 104 (Phase 1) Kerbing and Footings for Railing, Fencing, Sign CONS.RW.332 Excavate and Construct Footings for Road Excavate and Construct Footings for Road Lightings Lightings / Railing / Fencing and Signages CONS.RW.33: Road Formation to Sub-base Road Formation to Sub-base CONS.RW.33 Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.33 Road Formation to Road Base Road Formation to Road Base Road Formation to Base Course CONS.RW.33¢ Road Formation to Base Course Installation of Railing and Fencing + Road Ligh Install Road Railing and Fencing CONS.RW.33 Install Road Railing and Fencing CONS.RW.338 Install Road Lighting and Signages nstall Road Lighting and Signag **Final Paving and Road Markings** Final Road Paving (Wearing Course) CONS.RW.33( Final Road Paving (Wearing Course) CONS.RW.33 Road Markings and Road Signages Road Markings and Road Signages Road SOL 104 (Phase 2) Kerbing and Footings for Railing, Fencing, Sign CONS.RW.38( Excavate and Construct Footings for Road Excavate and Construct Footings for Road Lightings Lightings / Railing / Fencing and Signages CONS.RW.38 Road Formation to Sub-base Road Formation to Sub-base Construct Precast Road Kerbings CONS.RW.38: Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RW.38 Road Formation to Road Base Road Formation to Base Course CONS.RW.38 Road Formation to Base Course Installation of Railing and Fencing + Road Ligh Install Road Railing and Fencing CONS.RW.38! Install Road Railing and Fencing CONS.RW.38 Install Road Lighting and Signages Install Road Lighting and Signages **Final Paving and Road Markings** CONS.RW.378 Final Road Paving (Wearing Course) inal Road Paving (Wearing Course) CONS.RW.37 Road Markings and Road Signages ■ Road Markings and Road Signages Area 2 (East of Pump House Portion C1, A1, A2 **Road Works** Road SOL 101 / 109 / 114 (Phase 1) Kerbing and Footings for Railing, Fencing, Sign CONS.RE.384 Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages Excavate and Construct Footings for Road Lightings / Railing / Fencing and Sign CONS.RE.385 Road Formation to Sub-base Road Formation to Sub-base Construct Precast Road Kerbings CONS.RE.386 Construct Precast Road Kerbings Road Works to Road Base and Base Course CONS.RE.372 Road Formation to Road Base Road Formation to Base Course CONS.RE.373 Road Formation to Base Course Installation of Railing and Fencing + Road Ligh ■ Install Road Railing and Fencing CONS.RE.374 Install Road Railing and Fencing ■ Install Road Lighting and Signag CONS.RE.375 Install Road Lighting and Signages Road SOL 101 / 109 / 114 (Phase 2) Kerbing and Footings for Railing, Fencing, Sigr CONS.RE.442 Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages CONS.RE.443 Road Formation to Sub-base Road Formation to Sub-base CONS.RE.444 Construct Precast Road Kerbings Construct Precast Road Kerbing Road Works to Road Base and Base Course CONS.RE.438 Road Formation to Road Base CONS.RE.439 Road Formation to Base Course Road Formation to Base ( Installation of Railing and Fencing + Road Ligh CONS.RE.440 Install Road Railing and Fencing Install Road Railing and Fencing CONS.RE.441 Install Road Lighting and Signages Install Road Lighting Road SOL 102 (Phase 1) Kerbing and Footings for Railing, Fencing, Sign CONS.RE.415 Excavate and Construct Footings for Road Lightings / Railing / Fencing and Signages nd Construct Footings for Road Lightings / Railing / Fencing and Signages CONS.RE.416 Construct Precast Road Kerbings Construct Precast Road Kerbings CONS.RE.417 Road Formation to Sub-base ad Formation to Sub-base Road Works to Road Base and Base Course CONS.RE.410 Road Formation to Road Base Road Formation to Road Base

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+ Bearings BRG.ES.1030 Bridges in Portion A & B - Decking / Segments Erection + Stitching Decking / Segments Erection BRG.ES.1040 Bridges in Portion A & B - Parapet + Ancillary n Portion A & B - Parapet Works Bridges in Portion C & D ridges in Portion C & D - Bored Piling BRG.ES.2010 Bridges in Portion C & D - Bored Piling + Pilecaps BRG.ES.2020 Bridges in Portion C & D - Column, Pier Head + Bridges in Portion € & D - Column, Pier Head + Bearings Bearings

HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion)

Data Date: 06-Oct-16

Data Date: 06-Oct-16 HY/2013/04 - Hong Kong Boundary Crossing Facilities Infrastructure Works Stage II (Southern Portion) Print Date: 14-Dec-16 09:47 Page: 23 / 23 Bridges in Portion C & D - Decking / Segments Erection + Stitching BRG.ES.2030 BRG.ES.2040 Bridges in Portion C & D - Parapet + Ancillary Road Works - East of Pump House RDE.ES.1010 Road Works East of Pump House - Road Road Works East of Pump House Road Formation + Drainage Formation + Drainage RDE.ES.1020 Road Works East of Pump House - U/G Utilities Road Works East of Pump House - U/G Utilities RDE.ES.1030 Road Works East of Pump House - Road Formation to Sub-base + Kerbing Poad Works East of Pump House - Road Formation to Base Course + Fencing, Railing & Road Lighting RDE.ES.1040 Road Works East of Pump House - Road Formation to Base Course + Fencing, Railing & Road Works East of Pump House + Final Paving + Road Marking & Signage: RDE.ES.1050 Road Works East of Pump House - Final Paving + Road Marking & Signages Road Works - West of Pump House RDW.ES.2010 Road Works West of Pump House - Road Road Works West of Pump House - Road Formation + Drainage RDW.ES.2020 Road Works West of Pump House - U/G Road Works West of Pump House - U/G Utilities Utilities RDW.ES.2030 Road Works West of Pump House - Road Road Works West of Pump House Road Formation to Sub-base + Kerbing Formation to Sub-base + Kerbing RDW.ES.2040 Road Works West of Pump House - Road Formation to Base Course + Fencing, Railing & Road Works West of Rump House - Road Formation to Base Course + Fencing, Railing & Road Lighting Road Works West of Pump House - Final Paving + Road Marking & Signages RDW.ES.2050 Road Works West of Pump House - Final Paving + Road Marking & Signages SGW.ES.1010 Sign Gantry - Driven H-Pile Sign Gantry - Driven H-Pile Sign Gantry - Pile caps SGW.ES.1020 Sign Gantry - Pile caps SGW.ES.1030 Sign Gantry - Erection of Sign Gantry Sign Gantry - Erection of Sign Gantr **Retaining Walls** Retaining Walls in Portion A (East) Retaining Walls in Portion A - Excavation RWW.ES.1040 Retaining Walls in Portion A - Excavation RWW.ES.1050 Retaining Walls in Portion A - Construct Base Retaining Walls in Portion A - Construct Base + Wall Stem + Wall Stem RWW.ES.1060 Retaining Walls in Portion A - Backfill and Retaining Walls in Portion A - Backfill and Reinstate Road Reinstate Road Retaining Walls in Portion C (West) Retaining Walls in Portion C - Excavation RWW.ES.1010 Retaining Walls in Portion C - Excavation Retaining Walls in Portion C - Construct Base + Wall Stem RWW.ES.1020 Retaining Walls in Portion C - Construct Base RWW.ES.1030 Retaining Walls in Portion C - Backfill and Reinstate Road Retaining Walls in Portion 🤄 - Backfill a **Depressed Road** DRE.ES.1010 Construction of Depressed Road (Stage 1) Construction of Depressed Road DRW.ES.1010 Construction of Depressed Road (Stage 2) PHO.ES.1010 Construction of Pump House Irrigation and Landscape Landscape Works - Water Meter O4 LSW.ES.1010 Irrigation & Landscape Works WM04 - Top Soi ■ Irrigation & Landscape Works WM04 - Install Irrigation Lines (Main & Lateral LSW.ES.1020 Irrigation & Landscape Works WM04 - Install Irrigation Lines (Main & Lateral) LSW.ES.1030 Irrigation & Landscape Works WM04 - Soft Landscaping Works (AC4 to FC4) Irrigation & Landscape Works WM04 - Soft Landscaping Landscape Works - Water Meter 02 LSW.ES.2010 | Irrigation & Landscape Works WM02 - Top Soi Irrigation & Landscape Works WM02 - Top LSW.ES.2020 Irrigation & Landscape Works WM02 - Install Irrigation Lines (Main & Lateral) rrigation & Landscape Works WM02 - Install Irrigation Lines (Main & Lateral) LSW.ES.2030 Irrigation & Landscape Works WM02 - Soft Landscaping Works (BC4 to FC4)

### **Appendix D. Event and Action Plan**

#### **Event/Action Plan for Air Quality Monitoring**

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

EVENT		ACTIO	ON	
	ET	IEC	ER	CONTRACTOR
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.	Confirm receipt of notification of failure in writing;     Notify Contractor;     Ensure remedial measures properly implemented.	<ol> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Amend proposal if appropriate.</li> </ol>
2. Exceedance for two or more consecutive samples	<ol> <li>Notify IEC, ER,         Contractor and EPD;</li> <li>Identify source;</li> <li>Repeat measurement         to confirm findings;</li> <li>Increase monitoring         frequency to daily;</li> <li>Carry out analysis of         Contractor's working         procedures to         determine possible         mitigation to be         implemented;</li> <li>Arrange meeting with         IEC and ER to         discuss the remedial         actions to be taken;</li> <li>Assess effectiveness         of Contractor's         remedial actions and         keep IEC, EPD and         ER informed of the         results;</li> <li>If exceedance stops,         cease additional         monitoring.</li> </ol>	<ol> <li>Discuss amongst ER, ET, and Contractoron the potential remedial actions;</li> <li>Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>Supervise the implementation of remedial measures.</li> </ol>	<ol> <li>Confirmreceipt of notification of failure in writing;</li> <li>Notify Contractor;</li> <li>In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented;</li> <li>Ensure remedial measures properly implemented;</li> <li>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> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Resubmit proposals if problem still not under control;</li> <li>Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>

#### **Event / Action Plan for Construction Noise Monitoring**

EVENT	ACTION					
	ET	IEC	ER	CONTRACTOR		
Action Level	Contractor; 2. Identify source,		notification of failure in writing; 2. Notify Contractor;	1. Submit noise mitigation proposals to IEC; 2. Implement noise mitigation proposals.		
Limit Level	and Contractor;  2. Identify source;  3. Repeat measurements to confirm findings;  4. Increase monitoring frequency;  5. Carry out analysis of Contractor's working procedures to	<ol> <li>Discuss amongst ER, ET, and Contractor on the potential remedial actions;</li> <li>Review Contractors remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly;</li> <li>Supervise the implementation of remedial measures.</li> </ol>	to propose remedial measures for the analysed noise problem; 4. Ensure remedial measures properly implemented; 5. If exceedance continues, consider what portion of the work is responsible	<ol> <li>Take immediate action to avoid further exceedance;</li> <li>Submit proposals for remedial actions to IEC within 3 working days of notification;</li> <li>Implement the agreed proposals;</li> <li>Resubmit proposals if problem still not under control;</li> <li>Stop the relevant portion of works as determined by the ER until the exceedance is abated.</li> </ol>		

#### **Event / Action Plan for Water Quality Monitoring**

EVENT		ACT	TION	
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	<ol> <li>Repeat in situ measurement to confirm findings;</li> <li>Identify source(s) of impact;</li> <li>Inform IEC, contractor and ER;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor;</li> <li>Ensure mitigation measures are implemented;</li> <li>Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol> <li>Check monitoring data submitted by ET and Contractor's working methods;</li> <li>Discuss with ET and Contractor on possible remedial actions;</li> <li>Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol> <li>Confirm receipt of notification of noncompliance in writing;</li> <li>Discuss with IEC on the proposed mitigation measures;</li> <li>Make agreement on mitigation measures to be implemented;</li> <li>Ensure mitigation measures are properly implemented.</li> </ol>	<ol> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment and consider changes of working methods;</li> <li>Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER;</li> <li>Implement the agreed mitigation measures.</li> <li>Amend working methods if appropriate.</li> </ol>
Action level being exceeded by two or more consecutive sampling days	<ol> <li>Repeat in situ measurement to confirm findings;</li> <li>Identify source(s) of impact;</li> <li>Inform IEC, Contractor and ER;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor;</li> <li>Ensure mitigation measures are implemented;</li> <li>Increase the monitoring frequency to daily until no exceedance of Action level;</li> <li>Repeat measurement on next day of exceedance to confirm findings.</li> </ol>	<ol> <li>Check monitoring data submitted by ET and Contractor's working method;</li> <li>Discuss with ET and Contractor on possible remedial actions;</li> <li>Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol> <li>Confirm receipt of notification of noncompliance in writing;</li> <li>Discuss with IEC on the proposed mitigation measures;</li> <li>Make agreement on mitigation measures to be implemented;</li> <li>Ensure mitigation measures are properly implemented;</li> <li>Assess the effectiveness of the implemented mitigation measures.</li> </ol>	<ol> <li>Inform the Engineer and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment and consider changes of working methods;</li> <li>Discuss with ET and IEC on possible remedial actions and propose mitigation measures to IEC and ER within 3 working days of notification;</li> <li>Implement the agreed mitigation measures;</li> <li>Amend working methods if appropriate.</li> </ol>

EVENT		A	CTION	
	ET	IEC	ER	CONTRACTOR
Limit level being exceeded by one sampling day	<ol> <li>Repeat in-situ measurement to confirm findings;</li> <li>Identify source(s) of impact;</li> <li>Inform IEC, Contractor, ER and EPD;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor;</li> <li>Ensure mitigation measures are implemented;</li> <li>Increase the monitoring frequency to daily until no exceedance of Limit level.</li> </ol>	mitigation measures submitted by Contractor and advise	proposed mitigation measures; 3. Request Contractor to critically review the working methods; 4. Ensure mitigation	<ol> <li>Inform the ER and confirm notification of the non-compliance in writing;</li> <li>Rectify unacceptable practice;</li> <li>Check all plant and equipment and consider changes of working methods;</li> <li>Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER;</li> <li>Implement the agreed mitigation measures;</li> <li>Amend working methods if appropriate.</li> </ol>
Limit level being exceeded by two or more consecutive sampling days	<ol> <li>Repeat <i>in-situ</i> measurement to confirm findings;</li> <li>Identify source(s) of impact;</li> <li>Inform IEC, contractor, ER and EPD;</li> <li>Check monitoring data, all plant, equipment and Contractor's working methods;</li> <li>Discuss mitigation measures with IEC, ER and Contractor;</li> <li>Ensure mitigation measures are implemented;</li> <li>Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.</li> </ol>	Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly.	<ol> <li>Confirm receipt of notification of failure in writing;</li> <li>Discuss with IEC, ET and Contractor on the proposed mitigation measures;</li> <li>Request Contractor to critically review the working methods;</li> <li>Make agreement on the mitigation measures to be implemented;</li> <li>Ensure mitigation measures are properly implemented;</li> <li>Assess the effectiveness of the implemented mitigation measures;</li> <li>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>	avoid further exceedance; 3. Rectify unacceptable practice; 4. Check all plant and equipment and consider changes of working methods; 5. Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; 6. Implement the agreed mitigation measures; 7. Resubmit proposals of mitigation measures if problem still not under

**Event / Action Plan for Dolphin Monitoring** 

EVENT	ACTION						
	ET	IEC	ER	CONTRACTOR			
Action Level	<ol> <li>Repeat statistical data analysis to confirm findings;</li> <li>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>Identify source(s) of impact;</li> <li>Inform the IEC, ER/SOR and Contractor;</li> <li>Check monitoring data.</li> <li>Review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> </ol>	<ol> <li>Check monitoring data submitted by ET and Contractor;</li> <li>Discuss monitoring results and finding with the ET and the Contractor.</li> </ol>	1. Discuss monitoring with the IEC and any other measures proposed by the ET;  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.				

EVENT	ACTION						
	ET	IEC	ER	CONTRACTOR			
Limit Level	<ol> <li>Repeat statistical data analysis to confirm findings;</li> <li>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>Identify source(s) of impact;</li> <li>Inform the IEC, ER/SOR and Contractor of findings;</li> <li>Check monitoring data;</li> <li>Repeat review to ensure all the dolphin protective measures are fully and properly implemented and advise on additional measures if necessary.</li> <li>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>	Contractor the necessity of additional dolphin monitoring and any other potential mitigation measures.  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.  5. Supervise / Audit the implementation of additional monitoring and/or any other mitigation measures and advise ER/SOR the results and findings accordingly.	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	<ol> <li>Inform the ER/SOR and confirm notification of the non-compliance in writing;</li> <li>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>Jointly submit with ET to IEC a proposal of additional dolphin monitoring and/or any other mitigation measures when necessary.</li> <li>Implement the agreed additional dolphin monitoring and/or any other mitigation measures.</li> </ol>			

### **Appendix E. Waste Flow Table**

Name of Department: Highways Department

Contract No.: HY/2013/04

#### **Monthly Summary Waste Flow Table for 2019**

	Actual Quantities of Inert C&D Materials Generated Monthly  Actual Quantities of C&D Wastes Generated Monthly										
Month	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Transported to other Projects (Note 2)	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (Note 1)	Chemical Waste	Others, e.g. general refuse
	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000m <sup>3</sup> )	(in '000kg)	(in '000kg)	(in '000kg)	(in '000kg)	(in '000m <sup>3</sup> )
Jan	4.274	0	0	0	4.274	0	0	0	0	0	0.1046
Feb	0.000	0	0	0	0.000	0	0	0	0	0	0.0864
Mar	1.464	0	0	0	1.464	0	0	0	0	0	0.0843
Apr											
May											
Jun											
Sub-total	5.738	0	0	0.000	5.738	0	0	0	0	0	0.2753
Jul											
Aug											
Sep											
Oct											
Nov											
Dec											
Total	5.738	0	0	0.000	5.738	0	0	0	0	0	0.2753

Note:

<sup>(1)</sup> Plastics refer to plastic bottles / containers, plastic sheets / foam from packaging material

<sup>(2) &</sup>quot;Other Projects" refers to HKBCF Contract No. HY/2013/03

Name of Department: Highways Department Contract No.: HY/2013/04

#### **Monthly Summary of Excavated Marine Sediment for 2019**

Month	a. Estimated Volume of Excavated Marine Sediment Generated	b. Estimate Volume of Accumulated Excavated Marine Sediment Treated	c. Reused in the Contract	d. Estimated Volume of Excavated Marine Sediment Transported to Other Projects (Note 1)	e. Estimated Volume of Treated Excavated Marine Sediment Stored on Site (Unused)
	(in m³)	(in m³)	(in m³)	(in m³)	(in m³)
Jan	0	0	0	0	0
Feb	0	0	0	0	0
Mar	0	0	0	0	0
Apr					
May					
Jun					
Sub-total	0	0	0	0	0
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Total	0	0	0	0	0

Note:

<sup>(1) &</sup>quot;Other Projects" refers to HKBCF Contract No. HY/2013/03. The disposal of excavated marine sediments to allocated dumping site via Contract No. HY/2013/03 has been completed with the last batch disposal on 30 August 2017.

## **Appendix F. Environmental Licences and Permits**

#### **Environmental Licences and Permits**

Item No.	Type of Permit / Licence	Reference No.	Application Date	Valid from	Valid until	Remark
1	Environmental Permit under EIAO	EP-353/2009/K	24 Mar 2016	11 Apr 2016	N/A	Issued
2	Further Environmental Permit under EIAO	FEP-01/353/2009/K	29 Nov 2018	27 Dec 2018	N/A	Issued
3	Construction Dust Notification (HKBCF Southern Portion)	387156	26 Mar 2015	1 Apr 2015	N/A	Notified
4	Construction Waste Disposal Account	7022038	16 Mar 2015	1 Apr 2015	N/A	Account approved
5	Registration as a Chemical Waste Producer (HKBCF Southern Portion)	Waste Producer Number (WPN): 5213-951-C3952-01	27 Mar 2015	27 Apr 2015	N/A	Registration completed
6	Discharge Licence under WPCO (Works Area WA3)	WT00022316-2015	1 Jun 2015	14 Aug 2015	31 Aug 2020	Issued
7	Discharge Licence under WPCO (HKBCF Works Area)	WT00028782-2017	25 May 2017	19 Jul 2017	31 Jul 2022	Issued
8	Construction Noise Permit	GW-RS0974-18	10 Oct 2018	31 Oct 2018	29 Mar 2019	Expired during reporting period
9	Construction Noise Permit	GW-RS0181-19	19 Feb 2019	30 Mar 2019	29 Sep 2019	Issued

## **Appendix G. Implementation Schedule for Environmental Mitigation Measures (EMIS)**

#### Appendix G – Implementation Schedule of Environmental Mitigation Measures (EMIS)

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
Air Quality	/			
S5.5.6.1	A1	The Contractor shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation	All construction sites	V
S5.5.6.2	A2	2) Proper watering of exposed spoil should be undertaken throughout the construction phase:	All construction sites	V
		<ul> <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> </ul>		
		<ul> <li>Any dusty materials remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads;</li> </ul>		
		• A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones;		
		• 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;		
		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;		
S5.5.6.2	A2	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;	All construction sites	V
		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;		
		<ul> <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> </ul>		
		<ul> <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> </ul>		
		• Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting ornetting 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;		
		<ul> <li>Any skip hoist for material transport should be totally enclosed by impervious sheeting;</li> </ul>		
		<ul> <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 and the 3 sides</li> </ul>		
S5.5.6.2	A2	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;	All construction sites	V
		<ul> <li>Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed systemor facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system; and</li> </ul>		
		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.		
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.	All construction sites	V
S5.5.6.4	A4	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.	All construction sites	V
S5.5.6.4	A5	5) Implement regular dust monitoring under EM&A programme during the construction stage.	Selected representative dust monitoring station	V (covered by Contract No. HY/2013/04 (AMS2, AMS3C, AMS7B) & HY/2011/03 (AMS6)

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
S5.5.7.1	A6	The following mitigation measures should be adopted to prevent fugitive dust emissions for concrete batching plant:  • Loading, unloading, handling, transfer or storage of any dusty materials should be	Selected representative dust monitoring station	N/A
		carried out in totally encosed system;  • 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;  • Vents for all silos and cement/pulverised fuel ash (PFA) weighing scale should be		
		fitted with fabric filtering system;  • The materials which may generate airborne dusty emissions should be wetted by water spray system;		
		All receiving hoppers should be enclosed on three sides up to 3m above unloading point;		
		All conveyor transfer points should be totally enclosed;		
		All access and route roads within the premises should be paved and wetted; and		
		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.		
S5.5.2.7	A7	The following mitigation measures should be adopted to prevent fugitive dust emissions at barging point:	All construction sites	N/A
		<ul> <li>All road surface within the barging facilities will be paved;</li> </ul>		
		<ul> <li>Dust enclosures will be provided for the loading ramp;</li> </ul>		
		Vehicles will be required to pass through designated wheels wash facilities; and		
		Continuous water spray at the loading points.		
Construc	tion Noise (	Air borne)		
S6.4.10	N1	1) Use of good site practices to limit noise emissions by considering the following:	All construction sites	V
00.11.10		• only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme;		
		• 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;		
		$\bullet$ plant known to emit noise strongly in one direction, where possible, be orientated so that the noise is directed away from nearby NSRs;		
		silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;		
		<ul> <li>mobile plant should be sited as far away from NSRs as possible and practicable;</li> </ul>		
		<ul> <li>material stockpiles, mobile container site officer and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.</li> </ul>		
S6.4.11	N2	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.	All construction sites	V
S6.4.12	N3	3) Install movable noise barriers (typically density @ 14kg/m²), acoustic mat or full enclosure close to noisy plants including air compressor, generators, saw.	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.13	N4	4) Select "Quiet plants" which comply with the BS 5228 Part 1 or TM standards.	For plant items listed in Appendix 6D of the EIA report at all construction sites	V
S6.4.14	N5	5) Sequencing operation of construction plants where practicable.	All construction sites where practicable	V
	N6	6) Implement a noise monitoring under EM&A programme.	Selected representative noise monitoring station	V (covered by Contract No. HY/2013/04)
Sediment				·
S7.3	S1	The requirements as recommended in ETWB TC(W) 34/2002 Management of Dredged/Excavated Sediment shall be included in the Particular Specification as appropriate.	All construction sites	V

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
Waste Ma	nagement (	(Construction Noise)		
S8.3.8	WM1	Construction and Demolition Material  The following mitigation measures should be implemented in handling the waste:	All construction sites	V
		Maintain temporary stockpiles and reuse excavated fill material for backfilling and reinstatement;		
		<ul> <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> </ul>		
		Adopt 'Selective Demolition' technique to demolish the existing structures and facilities with a view to recovering broken concrete effectively for recycling purpose, where possible;		
		• Implement a trip-ticket system for each works contract to ensure that the disposal of C&D materials are properly documented and verified; and		
		<ul> <li>Implement an enhanced Waste Management Plan similar to ETWB TC(W) 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> </ul>		
		In addition, disposal of the C&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.		
S8.3.9- S8.3.11	WM2	C&D Waste  • Standard formwork or pre-fabrication should be used as far as practicable in order to minimise the arising of C&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.	All construction sites	V
		The Contractor should recycle as much of the C&D materials as possible on-site. Public fill and C&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.		
S8.2.12- S8.3.15	WM3	Chemical Waste  • 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.	All construction sites	V
		• 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.		
		<ul> <li>The storage area for chemical wastes should be clearly labelled 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</li> </ul>		
		the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible materials are adequately separated.		
		<ul> <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 a 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>		
S8.3.16	WM4	Sewage  • 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.	All construction sites	V
S8.3.17	WM5	General Refuse  • General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical wastes.	All construction sites	V
		• A reputable waste collector should be employed by the Centraster to remove general		

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

• 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

is prohibited by law.

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		deposit should be provided if feasible.  • 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. In addition, waste separation facilities for paper, aluminium cans, plastic bottles etc., should be provided.  • Training should be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including reduction, reuse and recycling of wastes.	:	
Water Qu	alitv (Const	ruction Phase)		
S9.11.1.1	- • •	Mitigation during the marine works to reduce impacts to within acceptable levels have been recommended and will comprise a series of measures that restrict the method and sequencing of dredging/backfilling, as well as protection measures. Details of the measures are provided below.  • Floating type perimeter silt curtains shall be around the HKBCF site before the commencement of marine works.  • Silt curtain shall be fully maintained throughout the works.		N/A
S9.11.1.7	W2	Land Works  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:	Land-based works areas	V
		<ul> <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 W PCO or collected for</li> </ul>		
		disposal offsite. The use of soakaways shall be avoided;  • 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;		
		<ul> <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> </ul>		
		<ul> <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> </ul>		
		$\bullet$ measures should be taken to prevent the washout of construction materials, soil, silt or debris into any drainage system;		
		<ul> <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</li> </ul>		
		covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent stormrun-off from getting into foul sewers;		
		• discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system;		
		<ul> <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 themon roads. A wheel washing bay should be provided at every site exit;</li> </ul>		
		<ul> <li>wheel wash overflow shall be directed to silt removal facilities before being discharged to the stormdrain;</li> <li>the section of construction road between the wheel washing bay and the public road</li> </ul>		
		should be surfaced with crushed stone or coarse gravel;  • wastewater generated from concreting, plastering, internal decoration, cleaning work		
		and other similar activities, shall be screened to remove large objects; • 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 W PCO or collected for off site disposal;		
		<ul> <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</li> </ul>		
		waste oil should be conecied and sinten intredyclind or disposal in accordance with		

• waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance;

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

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		<ul> <li>surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.</li> </ul>		
S9.14	W3	Implement a water quality monitoring programme	At identified monitoring locations	Temporarily suspended during reporting period since no marine works were scheduled or conducted
	Constructio	·		
S10.7	E2	<ul> <li>Install silt curtain during the construction.</li> <li>Limit dredging and works fronts.</li> <li>Good site practices.</li> <li>Site runoff control.</li> </ul>	Marine works and Land-based works areas	N/A
S10.7	E4	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	Land-based works areas	V
S10.7	E5	Good site practices, including strictly following the permitted works hours, using quieter machines where practicable, and avoiding excessive lightings during night time	Land-based works areas	V
S10.7	E6	Dolphin Exclusion Zone;     Dolphin watching plan	Marine works	N/A
S10.7	E7	Decouple compressors and other equipment on working vessels     Avoidance of percussive piling	Marine works	N/A
S10.7	E8	Control vessel speed     Skipper training     Predefined and regular routes for working vessels; avoid Brother Islands.	Marine Traffic	N/A
S10.10	E9	Dolphin vessel monitoring	North Lantau and West Lantau	V (covered by Contract No. HY/2013/04)
Fisheries				
S11.7	F4	<ul><li>Maritime Oil Spill Response Plan (MOSRP);</li><li>Contingency plan.</li></ul>	HKBCF	V
Landscap	e & Visual (	Detailed Design Phase)		
S14.3.3.1	LV1	General design measures include:	HKBCF	V
		<ul> <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 hydroseeding and planting;</li> </ul>		
		<ul> <li>Protection measures for the trees to be retained during construction activities;</li> <li>Optimizing the sizes and spacing of the bridge columns; Fine-tuning the location of the bridge columns to avoid visually-sensitive locations;</li> </ul>		
		Maximizing new tree, shrub and other vegetation planting to compensate tree felled and vegetation removed;  Providing a leaf-agency and a print and a fell WOCF for the advantage of the providing and a fell woch.		
		<ul> <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</li> </ul>		
		newly reclaimed coastline; • 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  • Fine-tuning the sizes of the structural members to minimize the bulkiness of buildings and adjustment of building arrangement to minimise disturbance to surrounding		
	0.15	vegetation in the HKBCF.		
•	•	Construction Phase)		
S14.3.3.3	LV2	Mitigate both Landscape and Visual Impacts G1. Grass-hydroseed bare soil surface and stock pile areas.	HKBCF	V
		G2. Add planting strip and automatic irrigation system if appropriate at some portions		

EIA Ref.	EM&A Log Ref.	Recommended Mitigation Measures	Location of the measures	Implementation Status
		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.		
S14.3.3.3	LV3	Mitigate Visual Impacts		V
		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.		
EM&A				
S15.2.2	EM1	An Independent Environmental Checker needs to be employed as per the EM&A Manual.	All construction sites	V
S15.5 -	EM2	1) An Environmental Team needs to be employed as per the EM&A Manual.	All construction sites	V
S15.6		Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures.		
		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.		
Legend:	V = implen	nented; x = not implemented; N/A = not applicable		

# Appendix H. Statistics on Environmental Complaints, Notification of Summons and Successful Prosecutions

### Statistics on Environmental Complaints, Notifications of Summons and Successful Prosecutions

Reporting Period	Complaints	Notifications of Summons	Successful Prosecutions
This reporting period	0	0	0
From commencement date of construction to end of reporting month	11	0	0

## **Appendix I. Environmental Site Inspection and Monitoring Schedule**

Sun	Mon	Schedule for March 2	Wed	Thu	Fri	nald monitoring tea Sat
					1	
3	4		6	7	8	
		AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C				
	Dolphin Monitoring		Weekly Site Audit			
10	11	12	13	14	15	
	AMS2 - 1 & 24 hr TSP					AMS2 - 1 & 24 hr TS
	AMS3C - 1 & 24 hr TSP					AMS3C - 1 & 24 hr TS
	AMS7B - 1 & 24 hr TSP NMS2 NMS3C					AMS7B - 1 & 24 hr TS
	Dolphin Monitoring		Dolphin Monitoring Weekly Site Audit			
17	18	19	20	21	22	
				AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP		
				AMS7B - 1 & 24 hr TSP		
				NMS2 NMS3C		
	Dolphin Monitoring					
	Weekly Site Audit					
24		26	27	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	28	29	
	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2	28	29	
24	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	28	29	
	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	28	29	
	Weekly Site Audit	26	AMS2 - 1 & 24 hr TSP AMS3C - 1 & 24 hr TSP AMS7B - 1 & 24 hr TSP NMS2 NMS3C	28	29	

#### Notes:

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B Noise Monitoring Station - NMS2, NMS3C WQ - Water Quality Monitoring: temporarily suspended CWD - Chinese White Dolphin

Weekly Site Audit

Sun	Mon	Schedule for April 20 Tue	Wed	Thu	Fri	Sat
Juli	1	2	3	4	5	Jai
		AMS2 - 1 & 24 hr TSP	3	4	5	
		AMS3C - 1 & 24 hr TSP				
		AMS7B - 1 & 24 hr TSP				
		NMS2				
		NMS3C				
			Maraldo Otta Acadia			
7	8	9	Weekly Site Audit	11	12	
,	AMS2 - 1 & 24 hr TSP	9	10	!!	12	AMS2 - 1 & 24 hr
	AMS3C - 1 & 24 hr TSP					AMS3C - 1 & 24 h
	AMS7B - 1 & 24 hr TSP NMS2					AMS7B - 1 & 24 h
	NMS3C					
	INIVISSC					
			Dolphin Monitoring	Dolphin Monitoring		
			Weekly Site Audit	Dolpriin Monitoring		
14	15	16	17	18	19	
	10	10		AMS2 - 1 & 24 hr TSP	10	
				AMS3C - 1 & 24 hr TSP		
				AMS7B - 1 & 24 hr TSP		
				NMS2		
				NMS3C		
				1411000		
			Dolphin Monitoring			
			Weekly Site Audit			
21	22	23	24	25	26	
			AMS2 - 1 & 24 hr TSP			
			AMS3C - 1 & 24 hr TSP			
			AMS7B - 1 & 24 hr TSP			
			NMS2			
			NMS3C			
		Dolphin Monitoring				
		Weekly Site Audit				
28	29	30 AMS2 - 1 & 24 hr TSP				
		AMS3C - 1 & 24 hr TSP				
		AMS7B - 1 & 24 hr TSP				
		NMS2 NMS3C				

#### Notes:

Air Quality Monitoring Station - AMS2, AMS3C, AMS7B Noise Monitoring Station - NMS2, NMS3C

WQ - Water Quality Monitoring: temporarily suspended

CWD - Chinese White Dolphin

Weekly Site Audit

### **Appendix J. Calibration Certificates**

#### **EQUIPMENT CALIBRATION RECORD**

Type:	Laser Dust Monitor
Manufacturer / Brand :	SIBATA
Model No.:	LD-3B
Equipment No.:	LD-3B-002
Serial No.:	974350
Sensitivity Adjustment Scale Setting:	622 CPM

#### Standard Equipment

Equipment :	MFC High Volume Air Sampler
Venue :	Tung Chung Pier
Model No.:	TE-5170 Total Suspended Particulate
Serial No.:	S/N3641
Previous Calibration Date:	12-Jul-2018

#### **Calibration Result**

Sensitivity Adjustment Scale Setting (Before Calibration) : 624 CPM Sensitivity Adjustment Scale Setting (After Calibration): 624 CPM

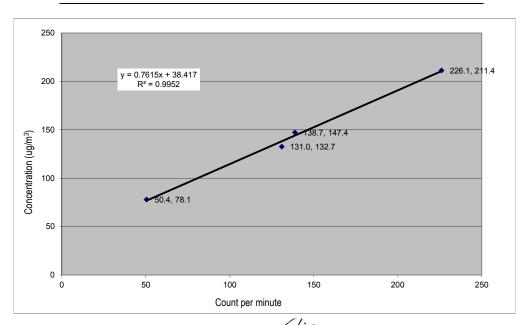
Hour	Date (dd-mm-yy)	lime (ua/m <sup>3</sup> )		(ug/m³) Total Count		Count/Minute X-axis		
				Temp (°C)	R.H. (%)	Y-axis		
1	24-Aug-18	09:07	09:37	29.4	80%	78.1	1513	50.4
2	24-Aug-18	10:00	11:00	30.5	76%	132.7	7857	131.0
3	24-Aug-18	11:12	12:42	30.6	76%	147.4	12486	138.7
4	24-Aug-18	13:21	15:21	31.0	71%	211 4	27133	226 1

Be Linear Regression of Y or  $\boldsymbol{X}$ 

Slope (K-factor): Intercept,b: 38.417

0.7615 0.9976 Correlation coefficient (R):

Remark.			



07-Sep-2018 Recorded by: Shing Mak Signature: Date: Checked by: Eva Keung Signature: Date: 07-Sep-2018

#### ALS Technichem (HK) Pty Ltd

#### ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### SUB-CONTRACTING REPORT

CONTACT : MR K.W. FAN WORK ORDER HK1864495

CLIENT : ENVIROTECH SERVICES CO.

ADDRESS : RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG SUB-BATCH : 1

KONG DATE RECEIVED : 11-DEC-2018

DATE OF ISSUE 28-DEC-2018

PROJECT : --- NO. OF SAMPLES : 1

CLIENT ORDER : ---

#### General Comments

Sample(s) were received in ambient condition.

Sample(s) analysed and reported on as received basis.

Calibration was subcontracted to and analysed by Action United Enviro Services.

#### Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories Position

Richard Fung General Manager

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd Part of the ALS Laboratory Group

11/F. Chung Shun Knitting Centre 1 - 3 Wing Yip Street Kwai Chung N.T. Hong Kong Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER

: HK1864495

SUB-BATCH

CLIENT PROJECT : 1 : ENVIROTECH SERVICES CO.



ALS Lab	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.	
HK1864495-001	S/N: 235780	Equipments	11-Dec-2018	S/N: 235780	

#### **Equipment Verification Report (TSP)**

#### **Equipment Calibrated:**

Type:

Laser Dust monitor

Manufacturer:

Sibata LD-3B

Serial No.

235780

Equipment Ref:

Nil

Job Order

HK1864495

#### Standard Equipment:

Standard Equipment:

Higher Volume Sampler

Location & Location ID:

AUES office (calibration room)

Equipment Ref:

HVS 018

Last Calibration Date:

21 September 2018

#### **Equipment Verification Results:**

**Testing Date:** 

17&18 December 2018

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m³ (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2557	20.9
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2891	21.6
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3379	25.3

#### Linear Regression of Y or X

Slope (K-factor):

0.0017

**Correlation Coefficient** 

Operator : \_\_\_\_\_

0.9678

Date of Issue

28 December 2018

#### Remarks:

- 1. Strong Correlation (R>0.8)
- 2. Factor 0.0017 should be applied for TSP monitoring

\*If R<0.5, repair or re-verification is required for the equipment

Fai So Signature : \_\_\_\_\_ Date : \_\_\_\_ 28 December 2018

0.045

0.035

0.025

0.02

0.015

0.01

y = 0.0017x - 0.0006

 $R^2 = 0.9366$ 

QC Reviewer : Ben Tam Signature : Date : 28 December 2018

#### TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location: Gold King Industrial Building, Kwai Chung Date of Calibration: 21-Sep-18
Location ID: Calibration Room Next Calibration Date: 21-Dec-18

#### CONDITIONS

Sea Level Pressure (hPa)
Temperature (°C)

1011.6 29.2

Corrected Pressure (mm Hg)
Temperature (K)

758.7 302

#### **CALIBRATION ORIFICE**

Make-> TISCH
Model-> 5025A
Calibration Date-> 13-Feb-18

Qstd Slope -> Qstd Intercept -> Expiry Date-> 2.02017 -0.03691 13-Feb-19

#### CALIBRATION

Plate	H20 (L)	H2O (R)	H20	Qstd	I	IC	LINEAR
No.	(in)	(in)	(in)	(m3/min)	(chart)	corrected	REGRESSION
18	5.4	5.4	10.8	1.632	56	55.56	Slope = $37.2548$
13	4.3	4.3	8.6	1.459	48	47.62	Intercept = -5.5606
10	3.3	3.3	6.6	1.280	43	42.66	Corr. coeff. $=$ 0.9970
8	2.1	2.1	4.2	1.025	34	33.73	
5	1.3	1.3	2.6	0.810	24	23.81	

#### Calculations:

Qstd = 1/m[Sqrt(H20(Pa/Pstd)(Tstd/Ta))-b]

IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate

IC = corrected chart respones

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K)

Pstd = actual pressure during calibration ( mm Hg )

#### For subsequent calculation of sampler flow:

1/m(( I )[Sqrt(298/Tav)(Pav/760)]-b)

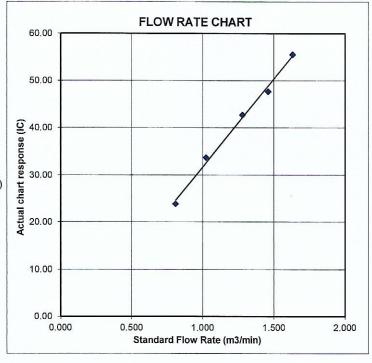
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure





#### RECALIBRATION **DUE DATE:**

February 13, 2019

## Pertificate of

**Calibration Certification Information** 

Cal. Date: February 13, 2018 Rootsmeter S/N: 438320

Ta: 293 Pa: 763.3 °K

Operator: Jim Tisch Calibration Model #:

TE-5025A

Calibrator S/N: 1612

mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

	Data Tabulation							
Vstd	Qstd	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$		Qa	√∆H(Ta/Pa)			
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)			
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762			
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392			
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854			
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530			
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524			
	m=	2.02017		m=	1.26500			
QSTD	b=	-0.03691	QA	b=	-0.02263			
	r=	0.99988	•	r=	0.99988			

	Calculation	S
Vstd=	ΔVoI((Pa-ΔP)/Pstd)(Tstd/Ta)	Va= ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/ΔTime	Qa= Va/ΔTime
	For subsequent flow rat	e calculations:
Qstd=	$1/m \left( \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b \right)$	$Qa = 1/m \left( \left( \sqrt{\Delta H \left( Ta/Pa \right)} \right) - b \right)$

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
Pa: actual bar	ometric pressure (mm Hg)
b: intercept	
m: slope	

#### RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

#### ALS Technichem (HK) Pty Ltd

#### ALS Laboratory Group

ANALYTICAL CHEMISTRY & TESTING SERVICES



#### SUB-CONTRACTING REPORT

CONTACT

: MR K.W. FAN

WORK ORDER

HK1864496

CLIENT

: ENVIROTECH SERVICES CO.

**ADDRESS** 

**PROJECT** 

: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T. HONG SUB-BATCH

: 11-DEC-2018

KONG

DATE RECEIVED DATE OF ISSUE

: 28-DEC-2018

NO. OF SAMPLES

: 1

: 1

CLIENT ORDER

General Comments

Sample(s) were received in ambient condition.

Sample(s) analysed and reported on as received basis.

Calibration was subcontracted to and analysed by Action United Enviro Services.

#### Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories

Position

Richard Fung

General Manager

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd Part of the ALS Laboratory Group

WORK ORDER

: HK1864496

SUB-BATCH

CLIENT PROJECT : 1 : ENVIROTECH SERVICES CO.

: \_\_\_



ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.	
HK1864496-001	S/N: 6Z7784	Equipments	11-Dec-2018	S/N: 6Z7784	

## **Equipment Verification Report (TSP)**

### **Equipment Calibrated:**

Type:

Laser Dust monitor

Manufacturer:

Sibata LD-3B

Serial No.

6Z7784

Equipment Ref:

Nil

Job Order

HK1864496

## **Standard Equipment:**

Standard Equipment:

Higher Volume Sampler

Location & Location ID:

AUES office (calibration room)

Equipment Ref:

HVS 018

Last Calibration Date:

21 September 2018

## **Equipment Verification Results:**

Testing Date:

17&18 December 2018

Hour	Time	Mean Temp °C	Mean Pressure (hPa)	Concentration in mg/m <sup>3</sup> (Standard Equipment)	Total Count (Calibrated Equipment)	Count/Minute (Total Count/min)
2hr03min	12:20 ~ 14:23	18.0	1022.2	0.038	2533	20.7
2hr14min	09:11 ~ 11:25	18.1	1022.2	0.029	2601	19.4
2hr14min	11:33 ~ 13:47	18.1	1022.2	0.047	3232	24.2

## Linear Regression of Y or X

Slope (K-factor):

0.0018

**Correlation Coefficient** 

0.9816

Date of Issue

28 December 2018

## Remarks:

- 1. **Strong** Correlation (R>0.8)
- Factor 0.0018 should be applied for TSP monitoring

\*If R<0.5, repair or re-verification is required for the equipment

0.05 0.045 0.04 0.035 0.025 0.02 0.015 0.015 0.010 0.005 0 5 20 15 20 25 30

Operator :	Fai So	_ Signature : _	Jav	Date : _	28 December 2018
QC Reviewer:	Ben Tam	Signature :		Date :	28 December 2018

#### TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location: Gold King Indu

Gold King Industrial Building, Kwai Chung Date of Calibration: 21-Sep-18

Location ID: Calibration Room Next Calibration Date: 21-Dec-18

CONDITIONS

Sea Level Pressure (hPa)
Temperature (°C)

1011.6 29.2

Corrected Pressure (mm Hg)
Temperature (K)

758.7 302

**CALIBRATION ORIFICE** 

Make-> TISCH
Model-> 5025A
Calibration Date-> 13-Feb-18

Qstd Slope -> Qstd Intercept -> Expiry Date-> 2.02017 -0.03691 13-Feb-19

CALIBRATION

ı							100	
١	Plate	H20 (L)	H2O (R)	H20	Qstd	I	IC	LINEAR
ı	No.	(in)	(in)	(in)	(m3/min)	(chart)	corrected	REGRESSION
١	18	5.4	5.4	10.8	1.632	56	55.56	Slope = $37.2548$
١	13	4.3	4.3	8.6	1.459	48	47.62	Intercept = $-5.5606$
١	10	3.3	3.3	6.6	1.280	43	42.66	Corr. coeff. = 0.9970
١	8	2.1	2.1	4.2	1.025	34	33.73	
١	5	1.3	1.3	2.6	0.810	24	23.81	

### Calculations :

Qstd = 1/m[Sqrt(H20(Pa/Pstd)(Tstd/Ta))-b]

IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate

IC = corrected chart respones

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration ( deg K )

Pstd = actual pressure during calibration ( mm Hg )

## For subsequent calculation of sampler flow:

1/m(( I )[Sqrt(298/Tav)(Pav/760)]-b)

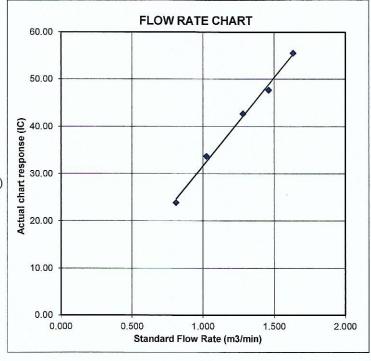
m = sampler slope

b = sampler intercept

I = chart response

Tay = daily average temperature

Pav = daily average pressure





## RECALIBRATION **DUE DATE:**

February 13, 2019

# Pertificate of

**Calibration Certification Information** 

Cal. Date: February 13, 2018

Rootsmeter 5/N: 438320

Ta: 293

°K

Operator: Jim Tisch

Calibration Model #: TE-5025A

Calibrator S/N: 1612

Pa: 763.3 mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3970	3.2	2.00
2	3	4	1	1.0000	6.3	4.00
3	5	6	1	0.8900	7.9	5.00
4	7	8	1	0.8440	8.7	5.50
5	9	10	1	0.7010	12.6	8.00

	Data Tabulation									
Vstd	Qstd	$\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$		Qa	$\sqrt{\Delta H (Ta/Pa)}$					
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)					
1.0172	0.7281	1.4293	0.9958	0.7128	0.8762					
1.0130	1.0130	2.0213	0.9917	0.9917	1.2392					
1.0109	1.1358	2.2599	0.9896	1.1120	1.3854					
1.0098	1.1964	2.3702	0.9886	1.1713	1.4530					
1.0046	1.4331	2.8586	0.9835	1.4030	1.7524					
	m=	2.02017		m=	1.26500					
QSTD	b=	-0.03691	QA	b=	-0.02263					
	r=	0.99988		r=	0.99988					

	Calculatio	ns	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/∆Time	Qa=	Va/ΔTime
	For subsequent flow ra	ite calculatio	ns:
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	$1/m\left(\left(\sqrt{\Delta H(Ta/Pa)}\right)-b\right)$

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
Pa: actual bar	ometric pressure (mm Hg)
b: intercept	
m: slope	

#### RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

#### ENVIROTECH SERVICES CO.

<u>High-Volume TSP Sampler</u> 5-Point Calibration Record

Location : AMS2 (Tung Chung Pier)

Calibrated by : P.F.Yueng Date : 04/03/2019

Sampler

Model : TE-5170 Serial Number : 1060

Calibration Orifice and Standard Calibration Relationship

 Serial Number
 : 2454

 Service Date
 : 25 Feb 2019

 Slope (m)
 : 2.07076

 Intercept (b)
 : -0.02917

 Correlation Coefficient(r)
 : 1.00000

**Standard Condition** 

Pstd (hpa) : 1013 Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1012 Ta(K) : 296

Resi	istance Plate	dH [green liquid]	Z	X=Qstd	IC	Y
		(inch water)		(cubic meter/min)		
1	18 holes	12.0	3.474	1.699	55	55.16
2	13 holes	9.2	3.042	1.489	50	50.14
3	10 holes	7.0	2.653	1.300	45	45.13
4	7 holes	4.6	2.151	1.055	38	38.11
5	5 holes	2.8	1.678	0.824	30	30.09

 $Notes: Z = SQRT\{dH(Pa/Pstd)(Tstd/Ta)\}, X = Z/m-b, Y(Corrected Flow) = IC*\{SQRT(Pa/Pstd)(Tstd/Ta)\}\}$ 

Sampler Calibration Relationship

Slope(m):28.539 Intercept(b): 7.384 Correlation Coefficient(r): 0.9973

Checked by: Magnum Fan Date: 08/03/2019

### <u>High-Volume TSP Sampler</u> <u>5-Point Calibration Record</u>

Location : AMS3C (Ying Tung Estate)

Calibrated by : P.F.Yeung
Date : 20/02/2019

<u>Sampler</u>

Model : TE-5170 Serial Number : S/N 3977

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454

 Service Date
 :
 19 Mar 2018

 Slope (m)
 :
 2.05242

 Intercept (b)
 :
 -0.01383

 Correlation Coefficient(r)
 :
 0.99994

**Standard Condition** 

Pstd (hpa) : 1013 Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1017 Ta(K) : 295

Resistance Plate		dH [green liquid]	Z	X=Qstd	IC	Y
		(inch water)		(cubic meter/min)	(chart)	(corrected)
1	18 holes	12.0	3.489	1.706	55	55.39
2	13 holes	9.0	3.021	1.479	50	50.35
3	10 holes	6.8	2.626	1.286	45	45.32
4	7 holes	4.6	2.160	1.059	38	38.27
5	5 holes	2.5	1.592	0.783	30	30.21

 $Notes: Z = SQRT\{dH(Pa/Pstd)(Tstd/Ta)\}, X = Z/m-b, Y(Corrected Flow) = IC*\{SQRT(Pa/Pstd)(Tstd/Ta)\}$ 

## Sampler Calibration Relationship (Linear Regression)

Slope(m):27.598 Intercept(b):9.062 Correlation Coefficient(r): 0.9980

Checked by: Magnum Fan Date: 25/02/2019

### <u>High-Volume TSP Sampler</u> <u>5-Point Calibration Record</u>

Location : AMS7B
Calibrated by : P.F.Yeung
Date : 20/02/2019

Sampler

Model : TE-5170 Serial Number : S/N 3976

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454

 Service Date
 :
 19 Mar 2018

 Slope (m)
 :
 2.05242

 Intercept (b)
 :
 -0.01383

 Correlation Coefficient(r)
 :
 0.99994

**Standard Condition** 

Pstd (hpa) : 1013 Tstd (K) : 298.18

Calibration Condition

Pa (hpa) : 1017 Ta(K) : 295

Resistance Plate		dH [green liquid]	Z	X=Qstd	IC	Y
		(inch water)		(cubic meter/min)	(chart)	(corrected)
1	18 holes	12.0	3.489	1.706	54	54.38
2	13 holes	9.2	3.055	1.495	50	50.35
3	10 holes	7.4	2.739	1.341	44	44.31
4	7 holes	4.6	2.160	1.059	38	38.29
5	5 holes	2.8	1.685	0.828	30	30.21

Notes:Z=SQRT{dH(Pa/Pstd)(Tstd/Ta)}, X=Z/m-b, Y(Corrected Flow)=IC\*{SQRT(Pa/Pstd)(Tstd/Ta)}

#### Sampler Calibration Relationship (Linear Regression)

Slope(m):27.481 Correlation Coefficient(r): 0.9950

Checked by: Magnum Fan Date: 25/02/2019



RECALIBRATION DUE DATE:

March 19, 2019

# Certificate of Calibration

**Calibration Certification Information** 

Cal. Date: March 19, 2018

Rootsmeter S/N: 438320

Ta: 294

°K

Operator: Jim Tisch
Calibration Model #:

TE-5025A

Calibrator S/N: 2454

**Pa:** 746.8 mm Hg

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4300	3.2	2.00
2	3	4	1	1.0040	6.4	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8590	8.7	5.50
5	9	10	1	0.7080	12.8	8.00

	Data Tabulation								
Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}$		Qa	√∆H(Ta/Pa)				
(m3)	(x-axis)	(y-axis)	Va	(x-axis)	(y-axis)				
0.9917	0.6935	1.4113	0.9957	0.6963	0.8874				
0.9874	0.9835	1.9959	0.9914	0.9875	1.2549				
0.9854	1.0913	2.2315	0.9894	1.0957	1.4030				
0.9843	1.1459	2.3405	0.9883	1.1506	1.4715				
0.9789	1.3826	2.8227	0.9829	1.3882	1.7747				
	m=	2.05242		m=	1.28519				
QSTD[	b=	-0.01383	QA	b=	-0.00869				
AND THE PERSON NAMED AND THE P	r=	0.99994		r=	0.99994				

	Calculation	ns	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=	ΔVol((Pa-ΔP)/Pa)
Qstd=	Vstd/∆Time	Qa=	Va/ΔTime
	For subsequent flow ra	te calculatio	ns:
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa=	$1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
Pa: actual bar	ometric pressure (mm Hg)
b: intercept	
m: slope	

#### RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

FAX: (513)467-9009



RECALIBRATION
DUE DATE:

February 25, 2020

# Certificate of Calibration

**Calibration Certification Information** 

Cal. Date: February 25, 2019

Rootsmeter S/N: 438320

Ta: 294

°K

Operator: Jim Tisch

Pa: 762.0

mm Hg

Calibration Model #: TE-5025A

Calibrator S/N: 2454

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4400	3.2	2.00
2	3	4	1	1.0200	6.4	4.00
3	5	6	1	0.9120	7.9	5.00
4	7	8	1	0.8700	8.8	5.50
5	9	10	1	0.7180	12.8	8.00

Data Tabulation							
Vstd (m3)	Qstd (x-axis)	$ \sqrt{\Delta H \left(\frac{Pa}{Pstd}\right) \left(\frac{Tstd}{Ta}\right)}  $ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \Big( Ta/Pa \Big)}$ (y-axis)		
1.0120	0.7028	1.4257	0.9958	0.6915	0.8784		
1.0077	0.9880	2.0162	0.9916	0.9722	1.2423		
1.0057	1.1028	2.2542	0.9896	1.0851	1.3889		
1.0045	1.1546	2.3642	0.9885	1.1362	1.4567		
0.9992	1.3916	2.8513	0.9832	1.3694	1.7569		
	m=	2.07076		m=	1.29667		
QSTD	b=	b= -0.02917		b=	-0.01797		
	r=	1.00000	QA	r=	1.00000		

	Calculation	s	
Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va= ΔVol((Pa-ΔP)/Pa)	
Qstd=	Vstd/∆Time	Qa= Va/ΔTime	
	For subsequent flow rat	e calculations:	
Qstd=	$1/m\left(\left(\sqrt{\Delta H\left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}\right)-b\right)$	Qa= 1/m (( √ΔH( Ta/Pa	a))-b)

	Standard Conditions
Tstd:	298.15 °K
Pstd:	760 mm Hg
	Key
ΔH: calibrator	manometer reading (in H2O)
ΔP: rootsmete	er manometer reading (mm Hg)
Ta: actual abs	olute temperature (°K)
Pa: actual bar	ometric pressure (mm Hg)
b: intercept	
m: clone	

#### RECALIBRATION

US EPA recommends annual recalibration per 1998
40 Code of Federal Regulations Part 50 to 51,
Appendix B to Part 50, Reference Method for the
Determination of Suspended Particulate Matter in
the Atmosphere, 9.2.17, page 30

Tisch Environmental, Inc. 145 South Miami Avenue Village of Cleves, OH 45002 www.tisch-env.com

TOLL FREE: (877)263-7610 FAX: (513)467-9009



Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration

校正證書

Certificate No.: C183089

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號: IC18-1132)

Date of Receipt / 收件日期: 31 May 2018

Description / 儀器名稱

Sound Level Meter

Manufacturer / 製造商

Rion

Model No. / 型號 Serial No. / 編號

NL-52

00331805

Supplied By / 委託者

Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,

New Territories, Hong Kong

TEST CONDITIONS/測試條件

Temperature / 溫度 :

 $(23 \pm 2)^{\circ}$ C

Relative Humidity / 相對濕度 :

 $(50 \pm 25)\%$ 

Line Voltage / 電壓 :

TEST SPECIFICATIONS / 測試規範

Calibration check

10 June 2018

TEST RESULTS / 測試結果

DATE OF TEST / 測試日期

The results apply to the particular unit-under-test only.

The results do not exceed manufacturer's specification.

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By 測試

Certified By

H C Chan

Date of Issue 簽發日期

14 June 2018

核證

Engineer

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

本證書所載校正用之測試器材均可溯源至國際標準。局部複印本證書需先獲本實驗所書面批准。



# Sun Creation Engineering Limited Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No.:

C183089

證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours, and switched on to warm up for over 10 minutes before the commencement of the test.

2. Self-calibration was performed before the test.

3. The results presented are the mean of 3 measurements at each calibration point.

4. Test equipment:

Equipment ID

Description

Certificate No.

CL280

40 MHz Arbitrary Waveform Generator

C180024

CL281

Multifunction Acoustic Calibrator

PA160023

5. Test procedure: MA101N.

6. Results:

6.1 Sound Pressure Level

6.1.1 Reference Sound Pressure Level

	UUT Setting			Applied Value		UUT	IEC 61672
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)	Class 1 Spec. (dB)
30 - 130	L <sub>A</sub>	A	Fast	94.00	1	94.2	± 1.1

6.1.2 Linearity

	UU'	T Setting		Applie	d Value	UUT
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)
30 - 130	$L_{A}$	A	Fast	94.00	1	94.2 (Ref.)
				104.00		104.2
				114.00		114.2

IEC 61672 Class 1 Spec. : ± 0.6 dB per 10 dB step and ± 1.1 dB for overall different.

6.2 Time Weighting

UUT Setting			Applied Value		UUT	IEC 61672	
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	Reading (dB)	Class 1 Spec. (dB)
30 - 130	$L_{A}$	A	Fast	94.00	1	94.2	Ref.
			Slow			94.2	± 0.3

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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Fax/傳真: (852) 2744 8986

Tel/電話: (852) 2927 2606



Sun Creation Engineering Limited Calibration & Testing Laboratory

# Certificate of Calibration

校正證書

Certificate No.: C183089

證書編號

6.3 Frequency Weighting

6.3.1 A-Weighting

	UUT Setting			Applied Value		UUT	IEC 61672
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.	Reading (dB)	Class 1 Spec.
30 - 130	L <sub>A</sub>	A	Fast	94.00	63 Hz	67.9	$-26.2 \pm 1.5$
			MEDIAL SE		125 Hz	78.0	$-16.1 \pm 1.5$
					250 Hz	85.5	$-8.6 \pm 1.4$
					500 Hz	91.0	$-3.2 \pm 1.4$
					1 kHz	94.2	Ref.
					2 kHz	95.4	$+1.2 \pm 1.6$
					4 kHz	95.2	$+1.0 \pm 1.6$
					8 kHz	93.2	-1.1 (+2.1; -3.1
					12.5 kHz	89.8	-4.3 (+3.0 : -6.0

6.3.2 C-Weighting

	UUT	Setting		Appl	ied Value	UUT	IEC 61672
Range (dB)	Function	Frequency Weighting	Time Weighting	Level (dB)	Freq.	Reading (dB)	Class 1 Spec.
30 - 130	$L_{C}$	C	Fast	94.00	63 Hz	93.3	$-0.8 \pm 1.5$
					125 Hz	94.0	$-0.2 \pm 1.5$
					250 Hz	94.2	$0.0 \pm 1.4$
					500 Hz	94.2	$0.0 \pm 1.4$
					1 kHz	94.2	Ref.
					2 kHz	94.1	$-0.2 \pm 1.6$
					4 kHz	93.4	$-0.8 \pm 1.6$
					8 kHz	91.3	-3.0 (+2.1; -3.1)
					12.5 kHz	87.9	-6.2 (+3.0; -6.0)

Remarks: - UUT Microphone Model No.: UC-59 & S/N: 04870

- Mfr's Spec. : IEC 61672 Class 1

- Uncertainties of Applied Value: 94 dB : 63 Hz - 125 Hz  $: \pm 0.35 \text{ dB}$ 

250 Hz - 500 Hz : ± 0.30 dB : ± 0.20 dB 1 kHz 2 kHz - 4 kHz  $: \pm 0.35 \text{ dB}$ 8 kHz  $: \pm 0.70 \text{ dB}$ 

12.5 kHz

104 dB : 1 kHz 114 dB : 1 kHz : ± 0.10 dB (Ref. 94 dB) : ± 0.10 dB (Ref. 94 dB)

- The uncertainties are for a confidence probability of not less than 95 %.

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Sun Creation Engineering Limited - Calibration & Testing Laboratory c/o 4/F, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong 輝創工程有限公司 一 校正及檢測實驗所

c/o 香港新界屯門興安里一號四樓 Tel/電話: (852) 2927 2606

Fax/傳真: (852) 2744 8986

E-mail/電郵: callab@suncreation.com

Website/網址: www.suncreation.com



Sun Creation Engineering Limited Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No.:

C183084

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號: IC18-1101)

Date of Receipt / 收件日期: 30 May 2018

Description / 儀器名稱

Precision Acoustic Calibrator

Manufacturer / 製造商

LARSON DAVIS

Model No. / 型號

CAL200

Serial No./編號

11333

Supplied By / 委託者

Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,

New Territories, Hong Kong

TEST CONDITIONS/測試條件

Temperature / 溫度

Relative Humidity / 相對濕度 :

 $(50 \pm 25)\%$ 

Line Voltage / 電壓 :

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期

9 June 2018

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.

The results do not exceed manufacturer's specification.

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via:

- The Government of The Hong Kong Special Administrative Region Standard & Calibration Laboratory
- Agilent Technologies / Keysight Technologies
- Rohde & Schwarz Laboratory, Germany
- Fluke Everett Service Center, USA

Tested By 測試

Certified By 核證

H C Chan

Date of Issue

14 June 2018

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory.

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Website/網址: www.suncreation.com



Sun Creation Engineering Limited Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No.:

C183084

證書編號

1. The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.

Measuring Amplifier

2. The results presented are the mean of 3 measurements at each calibration point.

3. Test equipment:

Equipment ID CL130 CL281 TST150A <u>Description</u>
Universal Counter
Multifunction Acoustic Calibrator

Certificate No. C173864 PA160023 C181288

Test procedure : MA100N.

5. Results:

5.1 Sound Level Accuracy

UUT Nominal Value	Measured Value (dB)	Mfr's Spec. (dB)	Uncertainty of Measured Value (dB)
94 dB, 1 kHz	93.8	± 0.2	± 0.2
114 dB, 1 kHz	113.8		

5.2 Frequency Accuracy

UUT Nominal Value (kHz)	Measured Value (kHz)	Mfr's Spec.	Uncertainty of Measured Value (Hz)
1	1.000	1 kHz ± 1 %	+1

Remark: The uncertainties are for a confidence probability of not less than 95 %.

Note:

Tel/電話: (852) 2927 2606

Only the original copy or the laboratory's certified true copy is valid.

The values given in this Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environment changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Sun Creation Engineering Limited shall not be liable for any loss or damage resulting from the use of the equipment.

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Fax/傳真: (852) 2744 8986

## ENVIROTECH SERVICES CO.

## **Calibration Report of Wind Meter**

Date of Calibration :	25 January 2019	
Brand of Test Meter:	Davis	
Model:	Vantage Pro 2 ( s/n: BB180328020)	
Location :	AMS3C	
Procedures:		
1. Wind Still Test:	The wind speed sensor was hold by hand un	til it keep still
2.Wind Speed Test:	The wind meter was on-site calibrated again	st the Anemometer
3.Wind Direction Test :	The wind meter was on-site calibrated again	st the marine compass at four directions
Results:		
Wind Still Test		
	Wind Speed (m/s)	
	0.00	
Wind Speed Test		
	Davis (m/s)	Anemometer (m/s)
	1.8	1.6
	2.4	2.6
	3.2	3.4

### Wind Direction Test

Davis (o)	Marine Compass (o)
271	270
359	0
89	90
181	180

Calibrated by: Checked by : Fact

Yeung Ping Fai

(Technical Officer) Checked by : Fact

Ho Kam Fat

(Senior Technical Officer)



Sun Creation Engineering Limited Calibration & Testing Laboratory

# Certificate of Calibration

Certificate No.: C184960

證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號: IC18-1761)

Date of Receipt / 收件日期: 23 August 2018

Description / 儀器名稱 :

Anemometer

Manufacturer / 製造商

Lutron

Model No. / 型號

AM-4201

Serial No./編號 Supplied By / 委託者

AF.27513

Envirotech Services Co.

Room 113, 1/F, My Loft, 9 Hoi Wing Road, Tuen Mun,

New Territories, Hong Kong

TEST CONDITIONS/測試條件

Temperature / 溫度 :

Relative Humidity / 相對濕度 :  $(50 \pm 25)\%$ 

Line Voltage / 電壓 :

TEST SPECIFICATIONS / 測試規範

Calibration check

DATE OF TEST / 測試日期

5 September 2018

TEST RESULTS / 測試結果

The results apply to the particular unit-under-test only.

The results are detailed in the subsequent page(s).

The test equipment used for calibration are traceable to National Standards via:

- Testo Industrial Services GmbH, Germany

Tested By

測試

T L Shek

Certified By

核證

Assistant Engineer

Date of Issue 簽發日期

6 September 2018

Engineer

The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory

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# Sun Creation Engineering Limited

Calibration & Testing Laboratory

# Certificate of Calibration 校正證書

Certificate No.:

C184960

證書編號

The unit-under-test (UUT) was allowed to stabilize in the laboratory for over 12 hours before the commencement of the test.

2. The results presented are the mean of 10 measurements at each calibration point.

3. Test equipment:

CL386

**Equipment ID** 

Description

Multi-function Measuring Instrument

Certificate No.

S16493

4. Test procedure: MA130N.

5. Results:

Air Velocity

Applied	UUT	Measured Correction				
Value	Reading	Value	ertainty			
(m/s)	(m/s)	(m/s)	Expanded Uncertainty (m/s)	Coverage Factor		
2.0	1.7	+0.3	0.2	2.0		
4.0	3.8	+0.2	0.3	2.0		
6.0	5.8	+0.2	0.3	2.0		
8.0	7.9	+0.1	0.3	2.0		
10.0	10.0	0.0	0.4	2.0		

Remarks: - The Measured Corrections are defined as: Value = Applied Value - UUT Reading

- The expanded uncertainties are for a level of confidence of 95 %.

Note:

Only the original copy or the laboratory's certified true copy is valid.

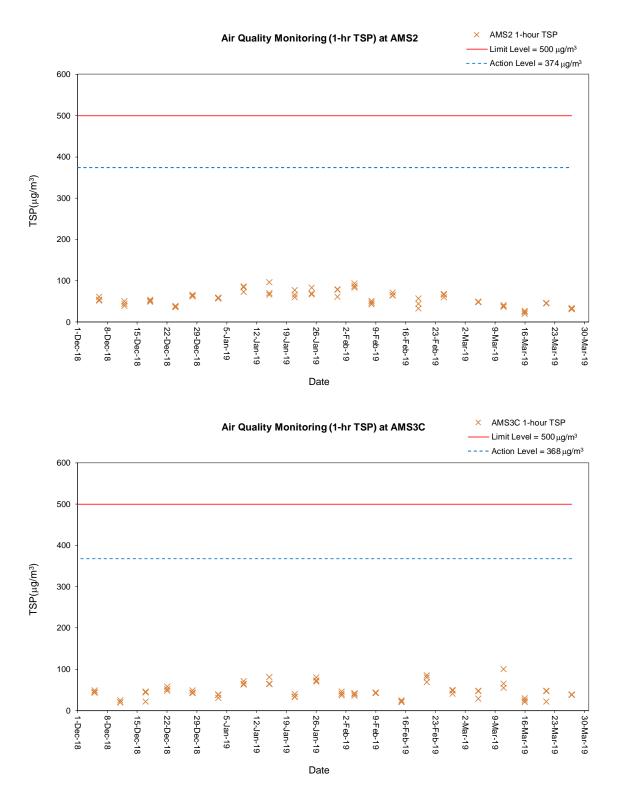
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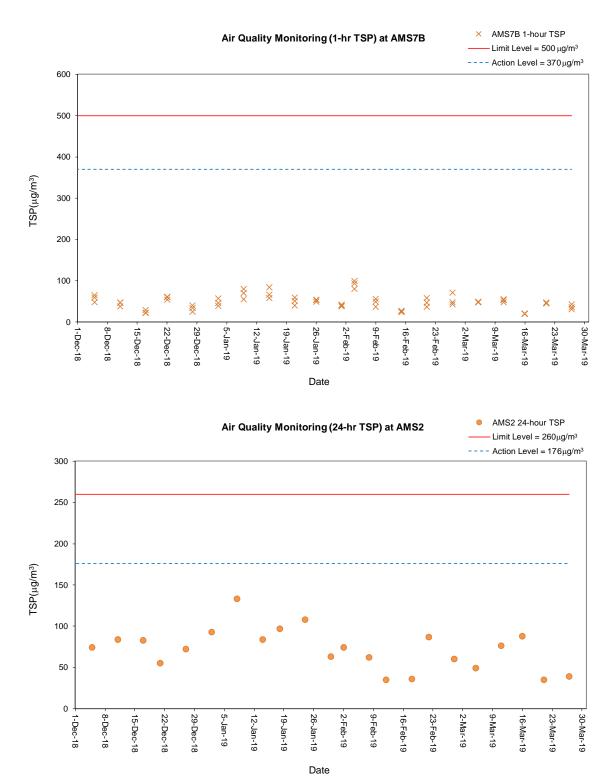
The test equipment used for calibration are traceable to the Nation Standards as specified in this certificate. This certificate shall not be reproduced except in full, without the prior written approval of this laboratory

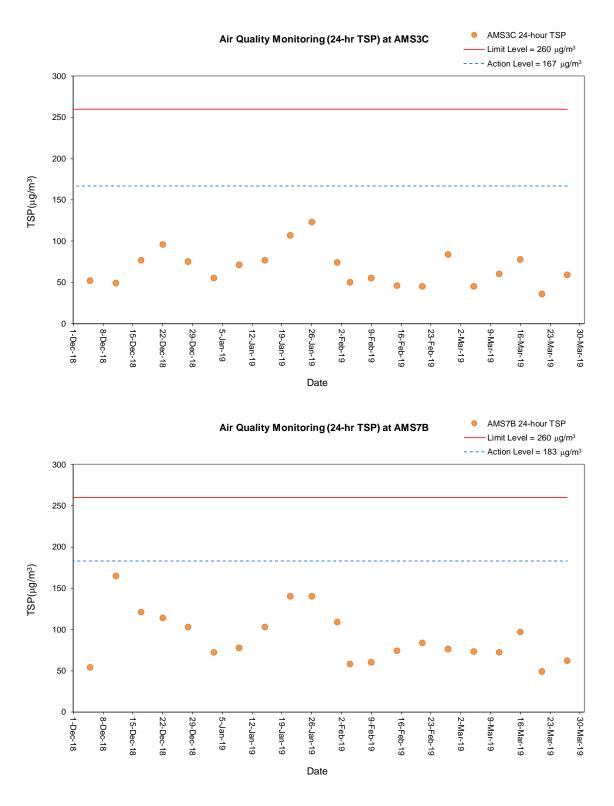
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# Appendix K. Monitoring Data and Graphical Plots (Air Quality, Noise and Water Quality)

Project	Contract	Station	Date	Parameter	Start Time	Result	Unit
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	05-Mar-19	1-hr TSP	13:00	49	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	05-Mar-19	1-hr TSP	14:00	48	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	05-Mar-19	1-hr TSP	15:00	49	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	11-Mar-19	1-hr TSP	09:52	41	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	11-Mar-19	1-hr TSP	10:52	37	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	11-Mar-19	1-hr TSP	11:52	38	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	16-Mar-19	1-hr TSP	12:14	20	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	16-Mar-19	1-hr TSP	13:14	24	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	16-Mar-19	1-hr TSP	14:14	27	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	21-Mar-19	1-hr TSP	13:58	46	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	21-Mar-19	1-hr TSP	14:58	45	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	21-Mar-19	1-hr TSP	15:58	46	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	27-Mar-19	1-hr TSP	14:56	31	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	27-Mar-19	1-hr TSP	15:56	32	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	27-Mar-19	1-hr TSP	16:56	34	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	05-Mar-19	1-hr TSP	08:22	29	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	05-Mar-19	1-hr TSP	09:22	47	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	05-Mar-19	1-hr TSP	10:22	48	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	11-Mar-19	1-hr TSP	13:42	55	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	11-Mar-19	1-hr TSP	14:42	65	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	11-Mar-19	1-hr TSP	15:42	100	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	16-Mar-19	1-hr TSP	08:11	30	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	16-Mar-19	1-hr TSP	09:11	25	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	16-Mar-19	1-hr TSP	10:11	21	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Mar-19	1-hr TSP	08:10	22	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Mar-19	1-hr TSP	09:10	47	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Mar-19	1-hr TSP	10:10	48	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Mar-19	1-hr TSP	08:34	39	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Mar-19	1-hr TSP	09:34	38	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Mar-19	1-hr TSP	10:34	38	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	05-Mar-19	1-hr TSP	13:56	48	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	05-Mar-19	1-hr TSP	14:56	48	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	05-Mar-19	1-hr TSP	15:56	49	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	11-Mar-19	1-hr TSP	08:46	55	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	11-Mar-19	1-hr TSP	09:46	53	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	11-Mar-19	1-hr TSP	10:46	48	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	16-Mar-19	1-hr TSP	13:16	21	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	16-Mar-19	1-hr TSP	14:16	20	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	16-Mar-19	1-hr TSP	15:16	20	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Mar-19	1-hr TSP	12:49	47	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Mar-19	1-hr TSP	13:49	45	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Mar-19	1-hr TSP	14:49	47	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Mar-19	1-hr TSP	13:59	43	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Mar-19	1-hr TSP	14:59	31	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Mar-19	1-hr TSP	15:59	36	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	05-Mar-19	24-hr TSP	13:10	49	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	11-Mar-19	24-hr TSP	12:59	76	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	16-Mar-19	24-hr TSP	12:22	88	μg/m³
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	21-Mar-19	24-hr TSP	14:12	35	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS2 Tung Chung Development Pier	27-Mar-19	24-hr TSP	14:56	39	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	05-Mar-19	24-hr TSP	08:30	45	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	11-Mar-19	24-hr TSP	13:42	60	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	16-Mar-19	24-hr TSP	08:20	78	μg/m³
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	21-Mar-19	24-hr TSP	08:16	36	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS3C Ying Tung Estate Market Rooftop	27-Mar-19	24-hr TSP	08:39	59	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	05-Mar-19	24-hr TSP	14:07	73	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	11-Mar-19	24-hr TSP	08:46	72	μg/m <sup>3</sup>
HKBCF	HY/2013/04	AMS7B 3RS Site Office	16-Mar-19	24-hr TSP	13:22	97	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	21-Mar-19	24-hr TSP	12:57	49	μg/m³
HKBCF	HY/2013/04	AMS7B 3RS Site Office	27-Mar-19	24-hr TSP	14:09	62	μg/m <sup>3</sup>



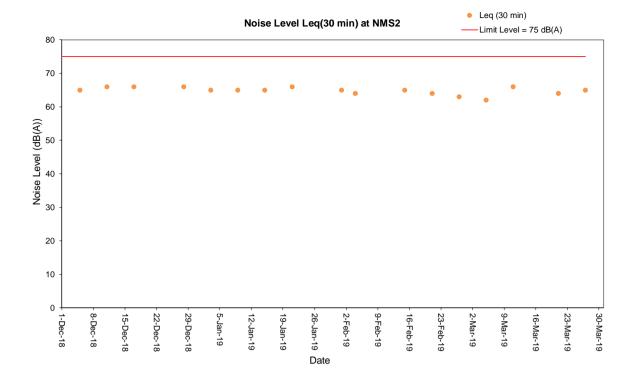


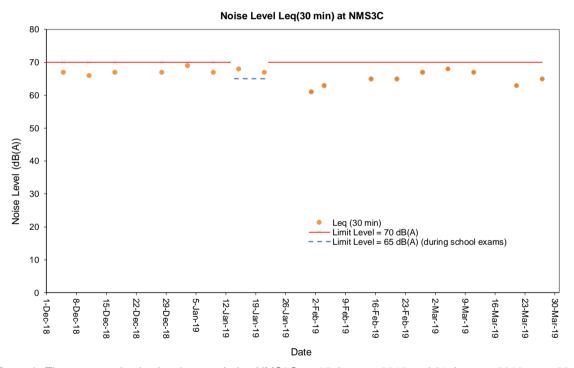


### Noise Monitoring Data

					Noise Level for 30 min, dB(A)				Facade /		
Project	Contract	Date	Station	Start Time	$L_{eq}$	L <sub>10</sub>	L <sub>90</sub>	Weather	Wind Speed, m/s	Free Field	Limit Level, dB(A)
HKBCF	HY/2013/04	05-Mar-19	NMS2 Seaview Crescent	16:43	62	64	60	Cloudy	<5	Facade	75
HKBCF	HY/2013/04	11-Mar-19	NMS2 Seaview Crescent	10:36	66	69	62	Sunny	<5	Facade	75
HKBCF	HY/2013/04	21-Mar-19	NMS2 Seaview Crescent	14:39	64	66	61	Sunny	<5	Facade	75
HKBCF	HY/2013/04	27-Mar-19	NMS2 Seaview Crescent	11:24	65	68	60	Cloudy	<5	Facade	75
HKBCF	HY/2013/04	05-Mar-19	NMS3C Ying Tung Estate Refuse Collection Point	08:44	68	70	66	Cloudy	<5	Free Field *	70
HKBCF	HY/2013/04	11-Mar-19	NMS3C Ying Tung Estate Refuse Collection Point	15:47	67	70	62	Sunny	<5	Free Field *	70
HKBCF	HY/2013/04	21-Mar-19	NMS3C Ying Tung Estate Refuse Collection Point	10:25	63	64	60	Sunny	<5	Free Field *	70
HKBCF	HY/2013/04	27-Mar-19	NMS3C Ying Tung Estate Refuse Collection Point	08:50	65	68	62	Cloudy	<5	Free Field *	70

Remark: \* Free field measurent; noise level shown includes +3dB(A) correction factor





Remark: The measured noise levels recorded at NMS3C on 15 January 2019 and 21 January 2019 were 68.4 dB(A) and 66.7 dB(A) respectively, which exceeded the noise level of 65dB(A) during examination period and were higher than the baseline level of 66.3 dB(A). Therefore, baseline correction was carried out and the corrected noise levels which solely represent the noise level of construction works were 64.2 dB(A) and 56.1 dB(A) respectively, therefore there was no exceedance after correction. As such the Event and Action Plan was not triggered.

# **Appendix L. Dolphin Monitoring Results**

# HK J efacean research project 香港鯨豚研究計劃

## HK CETACEAN RESEARCH PROJECT

# 香港鯨豚研究計劃

## CONTRACT NO. HY/2013/04

Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities – Infrastructure Works Stage II (Southern Portion) Dolphin Monthly Monitoring (Operational Phase)

First Monthly Progress Report (March 2019)

Submitted to Mott MacDonald Hong Kong Limited & China State Construction Engineering (Hong Kong) Limited

Submitted by Samuel K.Y. Hung, Ph.D., Hong Kong Cetacean Research Project

10 April 2019

### 1. Introduction

- 1.1. For the Hong Kong-Zhuhai-Macao Bridge (HZMB) Hong Kong Boundary Crossing Facilities (HKBCF), its operation requires the contractor (i.e. China State Construction Engineering (Hong Kong) Limited) and the associated environmental team (Mott MacDonald Hong Kong Limited) to implement the Environmental Monitoring and Audit (EM&A) programme during the operational phase.
- 1.2. According to the HKBCF EM&A Manual, monthly line-transect vessel surveys for Chinese White Dolphins should be conducted to cover the Northwest (NWL) and Northeast Lantau (NEL) survey areas, which should be the same as in AFCD annual marine mammal monitoring programme. However, as such monitoring surveys have been undertaken by the HKLR03 EM&A project in the same areas (i.e. NWL and NEL), a combined monitoring approach is recommend by the Highways Department, that the HKBCF EM&A project should utilize the monitoring data collected by HKLR03 EM&A project to avoid any redundancy in monitoring effort.
- 1.3. In April 2019, the Director of Hong Kong Cetacean Research Project (HKCRP), Dr. Samuel Hung, has been appointed by the environmental team as the dolphin specialist for the operational phase of the HKBCF EM&A project. He is responsible for the dolphin



# 香港鯨豚研究計劃

monitoring study, including the collection and collation of dolphin monitoring data from the HKLR03 EM&A project to examine any potential impacts of HKBCF during the operational phase on the dolphins. From the monitoring results, any changes in dolphin occurrence within the study area will be reviewed for possible causes, and appropriate actions and additional mitigation measures will be recommended as necessary.

1.4. This first monthly progress report of the HKBCF operational phase dolphin monitoring programme is submitted to the environmental team and the contractor, summarizing the results of the survey findings during the month of March 2019 by utilizing the survey data collected from the HKLR03 EM&A project.

## 2. Monitoring Methodology

- 2.1. Vessel-based Line-transect Survey
- 2.1.1. According to the requirement of the updated EM&A manual, the dolphin monitoring programme should cover all transect lines in NEL and NWL survey areas (see Figure 1) twice per month throughout the entire construction period. The co-ordinates of all transect lines are shown in Table 1.

Table 1. Co-ordinates of transect lines

	Line No.	Easting	Northing	Line No.		Easting	Northing
1	Start Point	804671	815456	13	Start Point	816506	819480
1	End Point	804671	831404	13	End Point	816506	824859
2	Start Point	805476	820800	14	Start Point	817537	820220
2	End Point	805476	826654	14	End Point	817537	824613
3	Start Point	806464	821150	15	Start Point	818568	820735
3	End Point	806464	822911	15	End Point	818568	824433
4	Start Point	807518	821500	16	Start Point	819532	821420
4	End Point	807518	829230	16	End Point	819532	824209
5	Start Point	808504	821850	17	Start Point	820451	822125
5	End Point	808504	828602	17	End Point	820451	823671
6	Start Point	809490	822150	18	Start Point	821504	822371



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6	End Point	809490	825352	18	End Point	821504	823761
	Otant Daint	040400	000000	40	Otant Daint	000540	000000
7	Start Point	810499	822000	19	Start Point	822513	823268
7	End Point	810499	824613	19	End Point	822513	824321
8	Start Point	811508	821123	20	Start Point	823477	823402
8	End Point	811508	824254	20	End Point	823477	824613
9	Start Point	812516	821303	21	Start Point	805476	827081
9	End Point	812516	824254	21	End Point	805476	830562
10	Start Point	813525	821176	22	Start Point	806464	824033
10	End Point	813525	824657	22	End Point	806464	829598
11	Start Point	814556	818853	23	Start Point	814559	821739
11	End Point	814556	820992	23	End Point	814559	824768
12	Start Point	815542	818807	24	Start Point	805476	815900
12	End Point	815542	824882	24	End Point	805476	819100

- 2.1.2. The HKLR03 survey team used standard line-transect methods (Buckland et al. 2001) to conduct the systematic vessel surveys, and followed the same technique of data collection that has been adopted over the last 22 years of marine mammal monitoring surveys in Hong Kong developed by HKCRP (see Hung 2017, 2018). For each monitoring vessel survey, a 15-m inboard vessel with an open upper deck (about 4.5 m above water surface) was used to make observations from the flying bridge area.
- 2.1.3. Two experienced observers (a data recorder and a primary observer) made up the on-effort survey team, and the survey vessel transited different transect lines at a constant speed of 13-15 km per hour. The data recorder searched with unaided eyes and filled out the datasheets, while the primary observer searched for dolphins and porpoises continuously through 7 x 50 *Fuijnon* marine binoculars. Both observers searched the sea ahead of the vessel, between 270° and 90° (in relation to the bow, which is defined as 0°). One to two additional experienced observers were available on the boat to work in shift (i.e. rotate every 30 minutes) in order to minimize fatigue of the survey team members. All observers were experienced in small cetacean survey techniques and identifying local cetacean species.
- 2.1.4. During on-effort survey periods, the survey team recorded effort data including time, position (latitude and longitude), weather conditions (Beaufort sea state and visibility),



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and distance traveled in each series (a continuous period of search effort) with the assistance of a handheld GPS (*Garmin eTrex Legend*).

- 2.1.5. Data including time, position and vessel speed were also automatically and continuously logged by handheld GPS throughout the entire survey for subsequent review.
- 2.1.6. When dolphins were sighted, the survey team would end the survey effort, and immediately record the initial sighting distance and angle of the dolphin group from the survey vessel, as well as the sighting time and position. Then the research vessel was diverted from its course to approach the animals for species identification, group size estimation, assessment of group composition, and behavioural observations. The perpendicular distance (PSD) of the dolphin group to the transect line was later calculated from the initial sighting distance and angle.
- 2.1.7. Survey effort being conducted along the parallel transect lines that were perpendicular to the coastlines (as indicated in Figure 1) was labeled as "primary" survey effort, while the survey effort conducted along the connecting lines between parallel lines was labeled as "secondary" survey effort. According to HKCRP long-term dolphin monitoring data, encounter rates of Chinese White Dolphins deduced from effort and sighting data collected along primary and secondary lines were similar in NEL and NWL survey areas. Therefore, both primary and secondary survey effort were presented as on-effort survey effort in this report.
- 2.1.8. Encounter rates of Chinese White Dolphins (number of on-effort sightings per 100 km of survey effort and number of dolphins from all on-effort sightings per 100 km of survey effort) were calculated in NEL and NWL survey areas in relation to the amount of survey effort conducted during each month of monitoring survey. Only data collected under Beaufort 3 or below condition would be used for encounter rate analysis. Dolphin encounter rates were calculated using primary survey effort alone, as well as the combined survey effort from both primary and secondary lines.

#### 2.2. Photo-identification Work

- 2.2.1. When a group of Chinese White Dolphins were sighted during the line-transect survey, the HKLR03 survey team would end effort and approach the group slowly from the side and behind to take photographs of them. Every attempt was made to photograph every dolphin in the group, and even photograph both sides of the dolphins, since the colouration and markings on both sides may not be symmetrical.
- 2.2.2. A professional digital camera (*Canon* EOS 7D model), equipped with long telephoto



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lenses (100-400 mm zoom), were available on board for researchers to take sharp, close-up photographs of dolphins as they surfaced. The images were shot at the highest available resolution and stored on Compact Flash memory cards for downloading onto a computer.

- 2.2.3. All digital images taken in the field were first examined, and those containing potentially identifiable individuals were sorted out. These photographs would then be examined in greater detail, and were carefully compared to the existing Chinese White Dolphin photo-identification catalogue maintained by HKCRP since 1995.
- 2.2.4. Chinese White Dolphins can be identified by their natural markings, such as nicks, cuts, scars and deformities on their dorsal fin and body, and their unique spotting patterns were also used as secondary identifying features (Jefferson 2000).
- 2.2.5. All photographs of each individual were then compiled and arranged in chronological order, with data including the date and location first identified (initial sighting), re-sightings, associated dolphins, distinctive features, and age classes entered into a computer database.

### 3. Monitoring Results

- 3.1. Vessel-based Line-transect Survey
- 3.1.1. Under the HKLR03 dolphin monitoring programme, two sets of systematic line-transect vessel surveys were conducted on the 4<sup>th</sup>, 11<sup>th</sup>, 13<sup>th</sup> and 18<sup>th</sup> of March 2019, to cover all transect lines in NWL and NEL survey areas twice during the monitoring month. The survey routes of each survey day are presented in Figures 2-5.
- 3.1.2. From the two sets of HKLR03 monitoring surveys conducted in March 2019, 259.07 km of survey effort was collected, with 95.6% of the total survey effort being conducted under favourable weather conditions (i.e. Beaufort Sea State 3 or below with good visibility) (Appendix I).
- 3.1.3. Among the NEL and NWL survey areas, 93.50 km and 165.57 km of survey effort were conducted respectively. Moreover, the total survey effort conducted on primary and secondary lines were 185.51 km and 73.56 km respectively (Appendix I).
- 3.1.4. Only three groups of six Chinese White Dolphins were sighted during the two sets of HKLR03 monitoring surveys conducted in March 2019 (Appendix II). All three dolphin



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groups were sighted in NWL, while no dolphin was sighted at all in NEL. Notably, all three groups were sighted during on-effort search, with two of them being sighted on primary lines (Appendix II). None of them was associated with any operating fishing vessel.

- 3.1.5. Distribution of dolphin sightings made in this monitoring month is shown in Figure 6. The three dolphin groups were sparsely sighted at the northwestern and southwestern corners of NWL survey area as well as near Black Point (Figure 6). All sightings were also located very far away from the HKBCF work site.
- 3.1.6. From the HKLR03 surveys conducted in March 2019, the encounter rates of Chinese White Dolphins deduced from the survey effort and on-effort sighting data made under favourable conditions (Beaufort 3 or below) are shown in Tables 2 & 3.

Table 2. Dolphin encounter rates deduced from the two sets of HKLR03 surveys (two surveys in each set) conducted in March 2019 in Northeast (NEL) and Northwest Lantau (NWL)

		Encounter rate (STG)	Encounter rate (ANI)
		(no. of on-effort dolphin sightings	(no. of dolphins from all on-effort
		per 100 km of survey effort)	sightings per 100 km of survey effort)
		Primary Lines Only	Primary Lines Only
	Set 1: March 4 <sup>th</sup> / 11 <sup>th</sup>	0.0	0.0
NEL	Set 2: March 13 <sup>th</sup> / 18 <sup>th</sup>	0.0	0.0
	Set 1: March 4 <sup>th</sup> / 11 <sup>th</sup>	0.0	0.0
NWL	Set 2: March 13 <sup>th</sup> / 18 <sup>th</sup>	3.4	6.8

Table 3. Overall dolphin encounter rates (sightings per 100 km of survey effort) from the two sets of HKLR03 surveys conducted in March 2019 on primary lines only as well as both primary lines and secondary lines in Northeast (NEL) and Northwest Lantau (NWL)

	Encou	nter rate (STG)	Encounter rate (ANI)			
	(no. of on-effo	ort dolphin sightings per	(no. of dolphins from all on-effort			
	100 km	of survey effort)	sightings per 100 km of survey effort)			
	Primary	Both Primary and	Primary	Both Primary and		
	Lines Only	Secondary Lines	Lines Only	Secondary Lines		
Northeast Lantau	0.0	0.0	0.0	0.0		
Northwest Lantau	1.7 1.8		3.4	3.6		

3.1.7. The average dolphin group size recorded during the March's HKLR03 monitoring



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surveys was 2.0 individuals per group, with all three dolphin sightings composed of small groups of two animals only (Appendix II). Such average was lower than the ones recorded in previous monitoring months during the construction phase.

## 3.2. Photo-identification Work

- 3.2.1. During the two sets of HKLR03 monitoring surveys conducted in March 2019, three known individual dolphins were sighted three times in total (Appendices III and IV). All of these identified individuals were re-sighted only once.
- 3.2.2. Notably, one of the identified individuals (WL145) was sighted with her young calf during their re-sightings in the present monitoring month.

#### 4. Conclusion

- 4.1. During this month of dolphin monitoring, no adverse impact from the operation of HKBCF on Chinese White Dolphins was noticeable from general observations.
- 4.2. Due to the monthly variation in dolphin occurrence within the study area, it would be more appropriate to draw conclusion on whether any impacts on dolphins have been detected in relation to the operation of HKBCF in the quarterly EM&A reports, where comparison on distribution, group size and encounter rates of dolphins between the quarterly operational monitoring period, impact monitoring period and baseline monitoring period will be made.

#### 5. References

- Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, London.
- Hung, S. K. 2017. Monitoring of Marine Mammals in Hong Kong waters: final report (2016-17). An unpublished report submitted to the Agriculture, Fisheries and Conservation Department, 162 pp.
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Jefferson, T. A. 2000. Population biology of the Indo-Pacific hump-backed dolphin in Hong Kong waters. Wildlife Monographs 144:1-65.

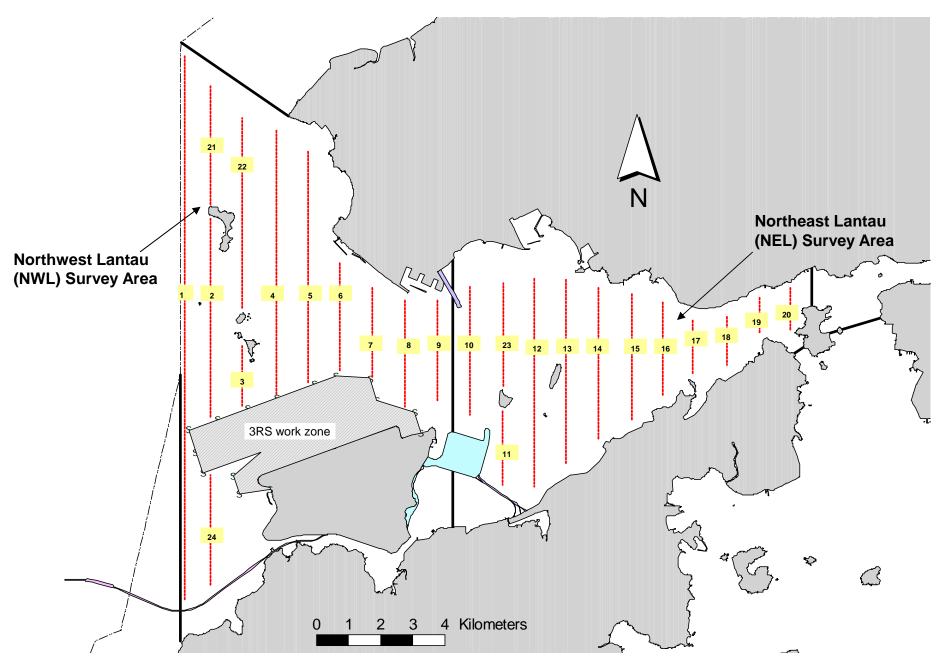


Figure 1. Transect Line Layout in Northwest and Northeast Lantau Survey Areas

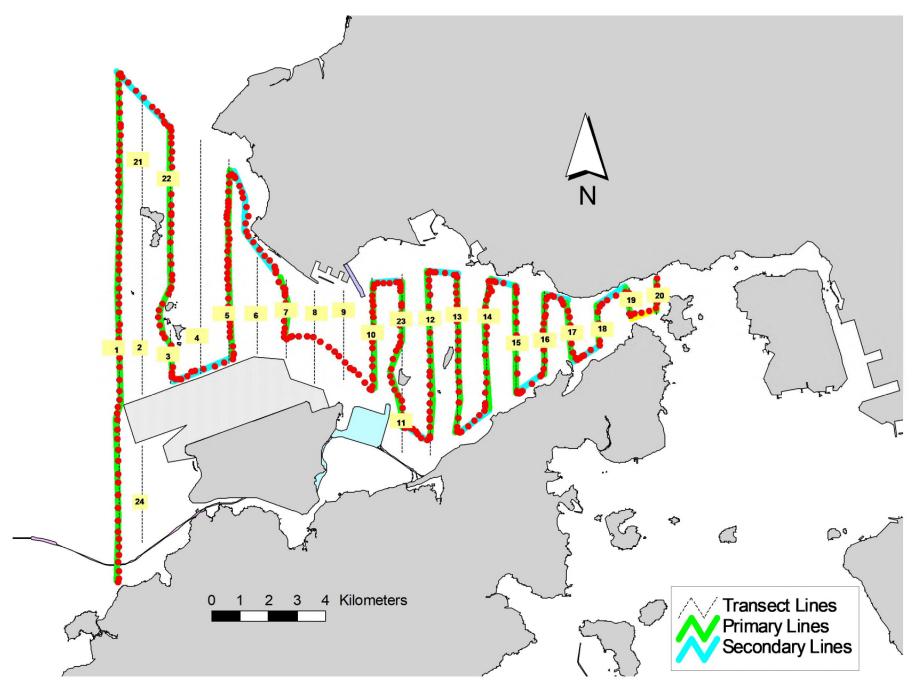


Figure 2. Survey Route on March 4th, 2019 (from HKLR03 project)

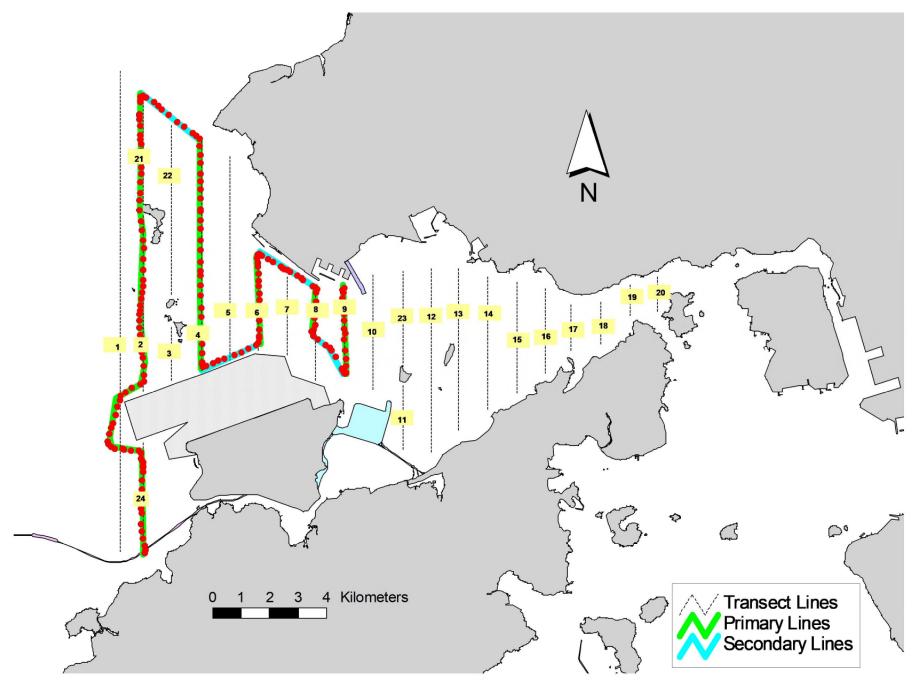


Figure 3. Survey Route on March 11th, 2019 (from HKLR03 project)

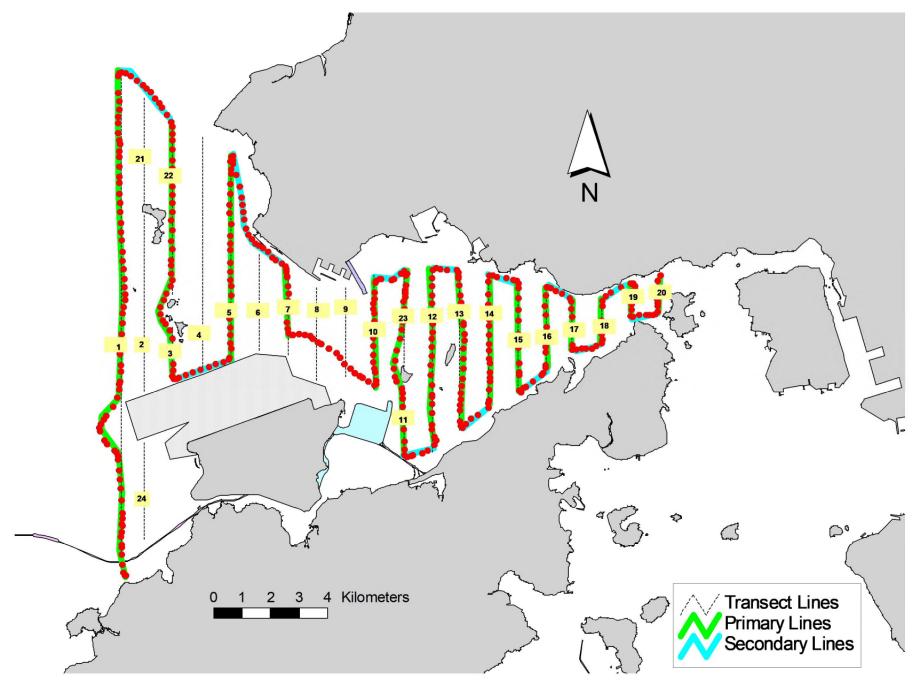


Figure 4. Survey Route on March 13th, 2019 (from HKLR03 project)

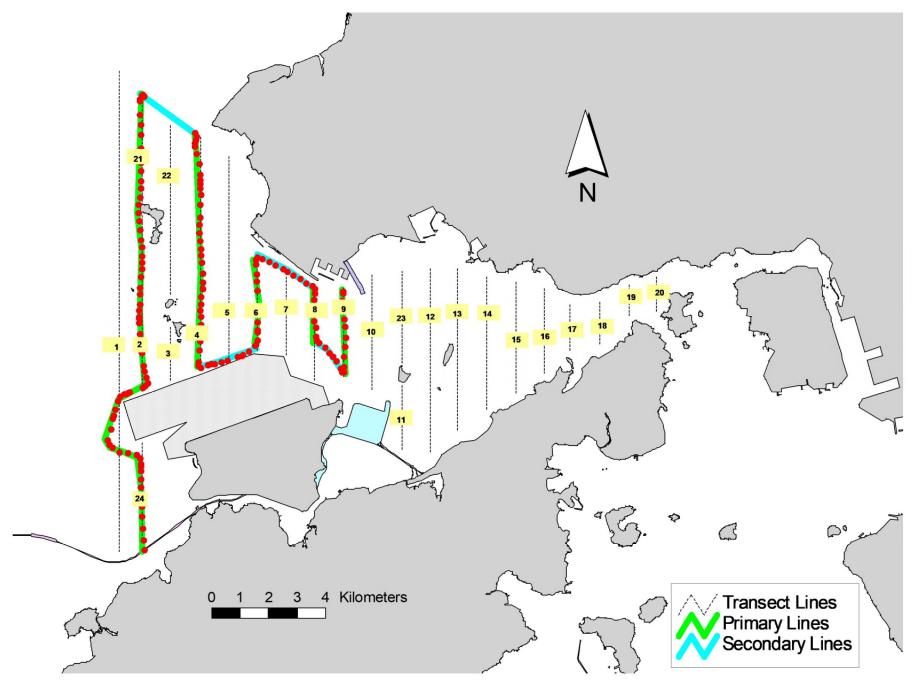


Figure 5. Survey Route on March 18th, 2019 (from HKLR03 project)

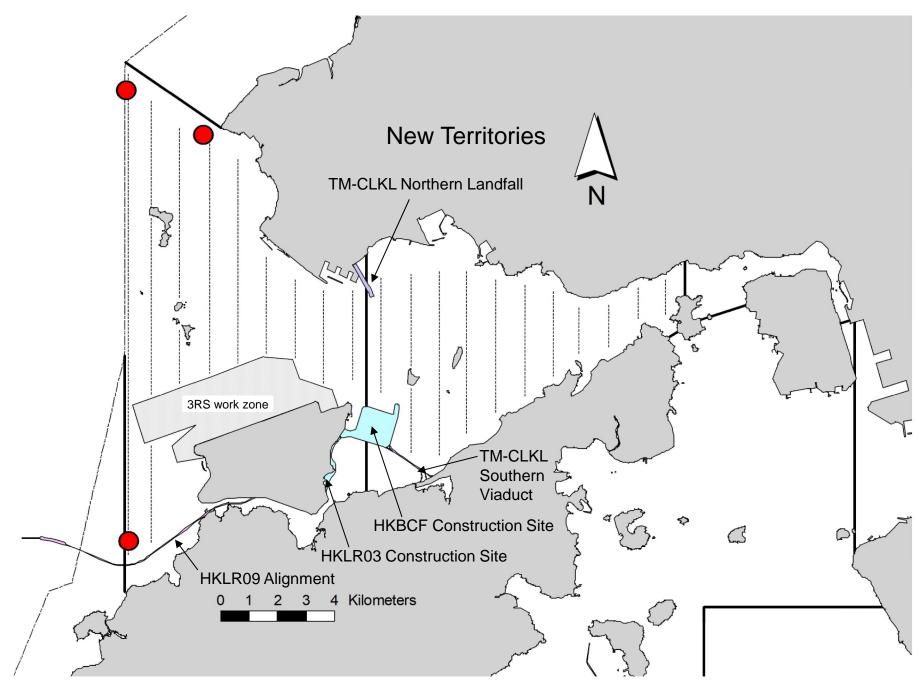


Figure 6. Distribution of Chinese White Dolphin Sightings during March 2019 HKLR03 Monitoring Surveys

### Appendix I. HKLR03 Survey Effort Database (March 2019)

(Abbreviations: BEAU = Beaufort Sea State; P = Primary Line Effort; S = Secondary Line Effort)

DATE	AREA	BEAU	EFFORT	SEASON	VESSEL	TYPE	P/S
4-Mar-19	NW LANTAU	2	11.18	SPRING	STANDARD36826	HKLR	Р
4-Mar-19	NW LANTAU	3	20.02	SPRING	STANDARD36826	HKLR	Р
4-Mar-19	NW LANTAU	2	8.70	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NW LANTAU	3	2.90	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NE LANTAU	2	4.90	SPRING	STANDARD36826	HKLR	Р
4-Mar-19	NE LANTAU	3	19.04	SPRING	STANDARD36826	HKLR	Р
4-Mar-19	NE LANTAU	4	9.20	SPRING	STANDARD36826	HKLR	Р
4-Mar-19	NE LANTAU	2	2.97	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NE LANTAU	3	6.69	SPRING	STANDARD36826	HKLR	S
4-Mar-19	NE LANTAU	4	2.30	SPRING	STANDARD36826	HKLR	S
11-Mar-19	NW LANTAU	2	26.50	SPRING	STANDARD36826	HKLR	Р
11-Mar-19	NW LANTAU	2	14.30	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	1	2.59	SPRING	STANDARD36826	HKLR	Р
13-Mar-19	NW LANTAU	2	21.23	SPRING	STANDARD36826	HKLR	Р
13-Mar-19	NW LANTAU	3	7.50	SPRING	STANDARD36826	HKLR	Р
13-Mar-19	NW LANTAU	1	3.40	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	2	4.45	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NW LANTAU	3	4.60	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NE LANTAU	2	17.90	SPRING	STANDARD36826	HKLR	Р
13-Mar-19	NE LANTAU	3	18.05	SPRING	STANDARD36826	HKLR	Р
13-Mar-19	NE LANTAU	2	10.55	SPRING	STANDARD36826	HKLR	S
13-Mar-19	NE LANTAU	3	1.90	SPRING	STANDARD36826	HKLR	S
18-Mar-19	NW LANTAU	2	19.21	SPRING	STANDARD36826	HKLR	Р
18-Mar-19	NW LANTAU	3	8.19	SPRING	STANDARD36826	HKLR	Р
18-Mar-19	NW LANTAU	2	9.25	SPRING	STANDARD36826	HKLR	S
18-Mar-19	NW LANTAU	3	1.55	SPRING	STANDARD36826	HKLR	S

#### Appendix II. HKLR03 Chinese White Dolphin Sighting Database (March 2019)

(Abberviations: STG# = Sighting Number; HRD SZ = Dolphin Herd Size; BEAU = Beaufort Sea State; PSD = Perpendicular Distance; BOAT ASSOC. = Fishing Boat Association; P/S: Sighting Made on Primary/Secondary Lines)

DATE	STG#	TIME	HRD SZ	AREA	BEAU	PSD	EFFORT	TYPE	NORTHING	EASTING	SEASON	BOAT ASSOC.	P/S
13-Mar-19	1	1018	2	NW LANTAU	2	131	ON	HKLR	815946	804673	SPRING	NONE	Р
13-Mar-19	2	1131	2	NW LANTAU	1	371	ON	HKLR	830873	804580	SPRING	NONE	Р
18-Mar-19	1	1140	2	NW LANTAU	2	853	ON	HKLR	829406	807254	SPRING	NONE	S

# Appendix III. Individual dolphins identified during HKLR03 monitoring surveys in (March 2019)

ID#	DATE	STG#	AREA
NL202	18/03/19	1	NW LANTAU
NL261	18/03/19	1	NW LANTAU
WL145	13/03/19	1	NW LANTAU



Appendix IV. Photographs of Identified Individual Dolphins in March 2019 (HKLR03)

## Appendix M. Wind Data

		Wind	Wind
Date	Time	Speed (m/s)	Direction
01/03/2019	12:00 AM		NW
01/03/2019	1:00 AM		NW
01/03/2019	2:00 AM		NW
01/03/2019	3:00 AM		WNW
01/03/2019	4:00 AM		NW
01/03/2019	5:00 AM		NW
01/03/2019	6:00 AM	2.2	
01/03/2019	7:00 AM		NW
01/03/2019	8:00 AM	2.2	
01/03/2019	9:00 AM	2.2	E
01/03/2019	10:00 AM		ENE
	11:00 AM		NW
01/03/2019			
01/03/2019	12:00 PM		ENE
01/03/2019	1:00 PM	2.2	
01/03/2019	2:00 PM		NW
01/03/2019	3:00 PM		NW
01/03/2019	4:00 PM		NW
01/03/2019	5:00 PM		NW
01/03/2019	6:00 PM		NW
01/03/2019	7:00 PM		NW
01/03/2019	8:00 PM		NW
01/03/2019	9:00 PM		NW
01/03/2019	10:00 PM		NW
01/03/2019	11:00 PM		NW
02/03/2019	12:00 AM		NE
02/03/2019	1:00 AM		ENE
02/03/2019	2:00 AM		NW
02/03/2019	3:00 AM		NW
02/03/2019	4:00 AM		E
02/03/2019	5:00 AM	0.9	
02/03/2019	6:00 AM	1.3	
02/03/2019	7:00 AM		ENE
	8:00 AM	1.8	ENE
02/03/2019	9:00 AM		
02/03/2019	10:00 AM		NW
02/03/2019	11:00 AM 12:00 PM	2.7	NW
02/03/2019			NW
02/03/2019	1:00 PM		NW
02/03/2019			NE
02/03/2019	3:00 PM 4:00 PM		NNW
02/03/2019			NW
02/03/2019	5:00 PM		NW
02/03/2019	6:00 PM	2.2	ENE
02/03/2019	7:00 PM	1.3	NI NI
02/03/2019	8:00 PM	1.3	
02/03/2019	9:00 PM	0.9	NE
02/03/2019	10:00 PM 11:00 PM		
02/03/2019	12:00 PM		ESE SSE
03/03/2019			
03/03/2019	1:00 AM	0.9	
03/03/2019	2:00 AM		ESE
03/03/2019	3:00 AM		NE
03/03/2019	4:00 AM		NNW
03/03/2019	5:00 AM	0.9	
03/03/2019	6:00 AM	0.4	
03/03/2019	7:00 AM		NE
03/03/2019	MA 00:8		SSE
03/03/2019	9:00 AM	0.4	ENE

		Wind	Wind
Date	Timo	Wind	
03/03/2019	Time 10:00 AM	Speed (m/s)	Direction ESE
03/03/2019			
03/03/2019	12:00 PM	0.4 0.4	
03/03/2019	1:00 PM		WNW
03/03/2019	2:00 PM	0.9	
03/03/2019	3:00 PM		WNW
03/03/2019	4:00 PM		NW
03/03/2019	5:00 PM		WNW
03/03/2019	6:00 PM		WSW
03/03/2019	7:00 PM	0.4	
03/03/2019	8:00 PM	0	
03/03/2019	9:00 PM	0	
03/03/2019	10:00 PM	0.4	
03/03/2019	11:00 PM	_	E
04/03/2019	12:00 AM	0	
04/03/2019	1:00 AM	0.4	
04/03/2019	2:00 AM		ENE
04/03/2019	3:00 AM	0	
04/03/2019	4:00 AM		ENE
04/03/2019	5:00 AM	0.9	
04/03/2019	6:00 AM	0.4	NE
04/03/2019	7:00 AM	0.4	NE
04/03/2019	8:00 AM	1.3	NE
04/03/2019	9:00 AM	1.3	NE
04/03/2019	10:00 AM	1.3	E
04/03/2019	11:00 AM	1.3	NE
04/03/2019	12:00 PM	1.8	NW
04/03/2019	1:00 PM	1.3	NW
04/03/2019	2:00 PM	1.8	NW
04/03/2019	3:00 PM	2.7	NW
04/03/2019	4:00 PM	2.7	NW
04/03/2019	5:00 PM	2.2	NW
04/03/2019	6:00 PM	2.2	
04/03/2019	7:00 PM	2.2	NW
04/03/2019	8:00 PM	2.7	NW
04/03/2019	9:00 PM		NW
04/03/2019	10:00 PM	1.8	NW
04/03/2019	11:00 PM	2.7	NW
05/03/2019	12:00 AM		NW
05/03/2019	1:00 AM		NW
05/03/2019	2:00 AM		NW
05/03/2019	3:00 AM		NW
05/03/2019	4:00 AM		NW
05/03/2019	5:00 AM		NW
05/03/2019	6:00 AM		NW
05/03/2019	7:00 AM		NW
05/03/2019	8:00 AM	1.8	
05/03/2019	9:00 AM	2.2	
05/03/2019	10:00 AM		NW
05/03/2019	11:00 AM		NNE
05/03/2019	12:00 PM		NW
05/03/2019	1:00 PM		NW
05/03/2019	2:00 PM		NNE
05/03/2019	3:00 PM		NNE
05/03/2019	4:00 PM		NE
05/03/2019	5:00 PM		NNW
05/03/2019	6:00 PM		SSE
05/03/2019	7:00 PM		NE
03/03/2019	7.00 FIVI	1.3	INL

		Wind	Wind
Date	Time	Speed (m/s)	Direction
05/03/2019	8:00 PM		NNW
05/03/2019	9:00 PM		ENE
05/03/2019	10:00 PM	0.9	
05/03/2019	11:00 PM		NW
06/03/2019	12:00 AM		NW
06/03/2019	1:00 AM		NW
06/03/2019	2:00 AM		NW
06/03/2019	3:00 AM		ENE
06/03/2019	4:00 AM		ENE
06/03/2019	5:00 AM	0.4	ESE
06/03/2019	6:00 AM		NNE
06/03/2019	7:00 AM	0.4	N
06/03/2019	8:00 AM	0.9	NW
06/03/2019	9:00 AM	1.8	NW
06/03/2019	10:00 AM		NW
06/03/2019	11:00 AM		NW
06/03/2019	12:00 PM		NW
06/03/2019	1:00 PM	1.8	
06/03/2019	2:00 PM	0.9	SSE
06/03/2019	3:00 PM		WNW
06/03/2019	4:00 PM	0.9	NNW
06/03/2019	5:00 PM	0.4	SSE
06/03/2019	6:00 PM		SE
06/03/2019	7:00 PM		SSE
06/03/2019	8:00 PM		SSW
06/03/2019	9:00 PM	0.4	
06/03/2019	10:00 PM		ENE
06/03/2019	11:00 PM		ENE
07/03/2019	12:00 AM		NE
07/03/2019	1:00 AM		ENE
07/03/2019	2:00 AM	1.3	
07/03/2019	3:00 AM		ENE
07/03/2019	4:00 AM	0.9	
07/03/2019	5:00 AM		NNE
07/03/2019	6:00 AM	1.8	
07/03/2019 07/03/2019	7:00 AM 8:00 AM		ENE ENE
07/03/2019	9:00 AM	1.8	
07/03/2019	10:00 AM	1.3	
07/03/2019	11:00 AM		NE
07/03/2019	12:00 PM		NW
07/03/2019	1:00 PM		ENE
07/03/2019	2:00 PM	0.9	
07/03/2019	3:00 PM		NNW
07/03/2019	4:00 PM	0.9	
07/03/2019	5:00 PM	2.2	
07/03/2019	6:00 PM		ENE
07/03/2019	7:00 PM	1.8	
07/03/2019	8:00 PM		NW
07/03/2019	9:00 PM		NW
07/03/2019	10:00 PM		NW
07/03/2019	11:00 PM		SSE
08/03/2019	12:00 AM		NE
08/03/2019	1:00 AM		NE
08/03/2019	2:00 AM		NW
08/03/2019	3:00 AM		NW
08/03/2019	4:00 AM		SSE
08/03/2019	5:00 AM	0.9	NW
		_	

		Wind	Wind
Date	Time	Speed (m/s)	Direction
08/03/2019	6:00 AM		NW
08/03/2019	7:00 AM	1.3	
08/03/2019	8:00 AM		NW
08/03/2019	9:00 AM		NW
08/03/2019	10:00 AM	2.7	
08/03/2019	11:00 AM		NW
08/03/2019 08/03/2019	12:00 PM		NW NW
08/03/2019	1:00 PM 2:00 PM		NW
08/03/2019	3:00 PM	2.7	NW
08/03/2019	4:00 PM		
08/03/2019	5:00 PM		NW
			NW
08/03/2019 08/03/2019	6:00 PM		NW
	7:00 PM 8:00 PM		NW
08/03/2019		2.7	NW
08/03/2019	9:00 PM		
08/03/2019	10:00 PM	2.7	NW
08/03/2019	11:00 PM	3.1	NW
09/03/2019	12:00 AM		
09/03/2019	1:00 AM		ENE
09/03/2019	2:00 AM	2.2	
09/03/2019	3:00 AM		ENE
09/03/2019	4:00 AM	1.3	
09/03/2019	5:00 AM		NW
09/03/2019	6:00 AM	1.8	
09/03/2019	7:00 AM		ENE
09/03/2019	8:00 AM	1.8	
09/03/2019	9:00 AM	1.8	
09/03/2019	10:00 AM	2.2	SE
09/03/2019	11:00 AM		NNE
09/03/2019	12:00 PM		SSE
09/03/2019	1:00 PM		SSE
09/03/2019	2:00 PM		NNW
09/03/2019	3:00 PM		NNW
09/03/2019	4:00 PM		WNW
09/03/2019	5:00 PM		SSE
09/03/2019	6:00 PM	1.3	S
09/03/2019	7:00 PM		SSE
09/03/2019	8:00 PM		SSE
09/03/2019	9:00 PM		SE
09/03/2019	10:00 PM		SSE
09/03/2019	11:00 PM	0.4	
10/03/2019	12:00 AM		SSE
10/03/2019	1:00 AM		SSE
10/03/2019	2:00 AM		SSE
10/03/2019	3:00 AM		SSE
10/03/2019	4:00 AM		SW
10/03/2019	5:00 AM		SSE
10/03/2019	6:00 AM		NNW
10/03/2019	7:00 AM		SSE
10/03/2019	8:00 AM		WNW
10/03/2019	9:00 AM		WNW
10/03/2019	10:00 AM		SSW
10/03/2019	11:00 AM		NE
10/03/2019	12:00 PM		WNW
10/03/2019	1:00 PM		WNW
10/03/2019	2:00 PM		WNW
10/03/2019	3:00 PM	0.4	WNW

		Wind	Wind
Date	Time	Speed (m/s)	Direction
10/03/2019	4:00 PM		NNW
10/03/2019	5:00 PM		NNE
10/03/2019	6:00 PM		NNW
10/03/2019	7:00 PM		NW
10/03/2019	8:00 PM		NNW
10/03/2019	9:00 PM	0.9	
10/03/2019	10:00 PM	0.9	
10/03/2019	11:00 PM		NW
11/03/2019	12:00 AM		SSE
11/03/2019	1:00 AM		NNE
11/03/2019	2:00 AM	0.4	
11/03/2019	3:00 AM		NNE
11/03/2019	4:00 AM	0.9	
11/03/2019	5:00 AM		NNW
11/03/2019	6:00 AM	0.4	
11/03/2019	7:00 AM		SE
11/03/2019	8:00 AM		SE
11/03/2019	9:00 AM		SSE
11/03/2019			NW
11/03/2019			NNW
11/03/2019			NW
11/03/2019	1:00 PM		WNW
11/03/2019	2:00 PM	0.4	
11/03/2019	3:00 PM		NNW
11/03/2019	4:00 PM		WNW
11/03/2019	5:00 PM		WNW
11/03/2019	6:00 PM		WNW
11/03/2019	7:00 PM		ENE
11/03/2019	8:00 PM		E
11/03/2019	9:00 PM		ESE
11/03/2019	10:00 PM		NW
11/03/2019	11:00 PM		NNW
12/03/2019	12:00 AM		NW
12/03/2019	1:00 AM		WNW
12/03/2019	2:00 AM		NNW
12/03/2019	3:00 AM		NW
12/03/2019	4:00 AM		NW
12/03/2019	5:00 AM		NW
12/03/2019			
12/03/2019	7:00 AM		SSW
12/03/2019	8:00 AM		ENE
12/03/2019	9:00 AM		ENE
12/03/2019	10:00 AM		ENE
12/03/2019	11:00 AM		NE
12/03/2019	12:00 PM		
12/03/2019	1:00 PM		
12/03/2019	2:00 PM		NE
12/03/2019	3:00 PM		
12/03/2019	4:00 PM	1.8	
12/03/2019	5:00 PM		NW
12/03/2019	6:00 PM		NW
12/03/2019	7:00 PM		NW
12/03/2019	8:00 PM		NW
12/03/2019	9:00 PM		NW
12/03/2019	10:00 PM		NW
12/03/2019	11:00 PM		NW
13/03/2019	12:00 AM		
13/03/2019	1:00 AM		NW
10/00/2013	1.00 /101	0.9	. 4 4 4

		Wind	Wind
Date	Time	Speed (m/s)	Direction
13/03/2019	2:00 AM		NW
13/03/2019	3:00 AM	0.9	
13/03/2019	4:00 AM		SSE
13/03/2019	5:00 AM		NNW
13/03/2019	6:00 AM		NW
13/03/2019	7:00 AM 8:00 AM		NW
13/03/2019			NW
13/03/2019	9:00 AM		NW
13/03/2019	10:00 AM		NW
13/03/2019	11:00 AM	1.8	NE
13/03/2019	12:00 PM		E
13/03/2019	1:00 PM		NW
13/03/2019	2:00 PM		NE
13/03/2019	3:00 PM		NW
13/03/2019	4:00 PM		NW
13/03/2019	5:00 PM		NW
13/03/2019	6:00 PM		NW
13/03/2019	7:00 PM		SE
13/03/2019	8:00 PM		NW
13/03/2019	9:00 PM		NW
13/03/2019	10:00 PM		NW
13/03/2019	11:00 PM		
14/03/2019	12:00 AM		NW
14/03/2019	1:00 AM		NW
14/03/2019	2:00 AM	2.7	NW
14/03/2019	3:00 AM		NW
14/03/2019	4:00 AM	2.7	NW
14/03/2019	5:00 AM	2.7	NW
14/03/2019	6:00 AM	2.2	NW
14/03/2019	7:00 AM	1.8	NW
14/03/2019	8:00 AM	1.8	NW
14/03/2019	9:00 AM	2.2	NW
14/03/2019	10:00 AM	2.7	NW
14/03/2019	11:00 AM	2.2	NW
14/03/2019	12:00 PM	1.3	ENE
14/03/2019	1:00 PM	0.9	NE
14/03/2019	2:00 PM	0	S
14/03/2019	3:00 PM	0	S
14/03/2019	4:00 PM	0	SW
14/03/2019	5:00 PM		S
14/03/2019	6:00 PM		
14/03/2019	7:00 PM	0	
14/03/2019	8:00 PM	0.4	
14/03/2019	9:00 PM		SSE
14/03/2019	10:00 PM	0.4	
14/03/2019	11:00 PM		SSE
15/03/2019	12:00 AM	0.4	SSE
15/03/2019	1:00 AM		SSE
15/03/2019	2:00 AM		ENE
15/03/2019	3:00 AM		NW
15/03/2019	4:00 AM	0.9	
15/03/2019	5:00 AM	1.3	
15/03/2019	6:00 AM		ENE
15/03/2019	7:00 AM		NW
15/03/2019	8:00 AM		NW
15/03/2019	9:00 AM		
15/03/2019	10:00 AM		N
15/03/2019	11:00 AM	0.4	WNW
10/00/2013	11.00 /101	0.4	* * 1 4 * *

			1.47
		Wind	Wind
Date	Time	Speed (m/s)	Direction
15/03/2019	12:00 PM	1.3	
15/03/2019	1:00 PM	0.9	
15/03/2019	2:00 PM	1.3	N
15/03/2019	3:00 PM		NE
15/03/2019	4:00 PM	0.9	ENE
15/03/2019	5:00 PM		
15/03/2019	6:00 PM	0.4	ENE
15/03/2019	7:00 PM	0	ENE
15/03/2019	8:00 PM	0.4	
15/03/2019	9:00 PM	0.4	ENE
15/03/2019	10:00 PM	0	NE
15/03/2019	11:00 PM	0	NE
16/03/2019	12:00 AM	0	NE
16/03/2019	1:00 AM	0	NE
16/03/2019	2:00 AM	0	NE
16/03/2019	3:00 AM	0	NE
16/03/2019	4:00 AM	0	NE
16/03/2019	5:00 AM	0.9	ENE
16/03/2019	6:00 AM	1.8	E
16/03/2019	7:00 AM	0.9	
16/03/2019	8:00 AM	0.9	
16/03/2019	9:00 AM	1.8	
16/03/2019	10:00 AM	2.2	
16/03/2019	11:00 AM		
16/03/2019	12:00 PM		NW
16/03/2019	1:00 PM		NW
16/03/2019	2:00 PM	2.2	
16/03/2019	3:00 PM	2.2	NW
16/03/2019	4:00 PM		NW
16/03/2019	5:00 PM		NW
16/03/2019	6:00 PM	2.2	NW
16/03/2019	7:00 PM	2.2	NW
16/03/2019	8:00 PM	2.2	NW
16/03/2019	9:00 PM	1.8	NW
16/03/2019	10:00 PM	1.8	
	11:00 PM	2.2	NW
16/03/2019 17/03/2019	12:00 AM		
. = /2 2 /2 2 / 2	4 00 414		
17/03/2019	1:00 AM		NW
17/03/2019	2:00 AM		NW
17/03/2019	3:00 AM		NW
17/03/2019	4:00 AM		NNW
17/03/2019	5:00 AM		NNW
17/03/2019	6:00 AM		NW
17/03/2019	7:00 AM		NW
17/03/2019	8:00 AM		NW
17/03/2019	9:00 AM		NW
17/03/2019	10:00 AM		NW
17/03/2019	11:00 AM		NW
17/03/2019	12:00 PM		
17/03/2019	1:00 PM		NE
17/03/2019	2:00 PM		ENE
17/03/2019	3:00 PM		NW
17/03/2019	4:00 PM		NW
17/03/2019	5:00 PM		NW
17/03/2019	6:00 PM		NW
17/03/2019	7:00 PM		WNW
17/03/2019	8:00 PM		NW
17/03/2019	9:00 PM	1.3	NW

		Wind	Wind
Date	Time	Speed (m/s)	
17/03/2019	10:00 PM	2.7	
17/03/2019			NW
18/03/2019	12:00 AM		NW
18/03/2019	1:00 AM	-	NW
18/03/2019	2:00 AM		NW
	3:00 AM		
18/03/2019			NW SSE
18/03/2019 18/03/2019	4:00 AM		SSE
18/03/2019	5:00 AM 6:00 AM		
	0.00		NW
18/03/2019	7:00 AM	1.8 1.8	
18/03/2019 18/03/2019	8:00 AM 9:00 AM		
		1.8 2.7	
18/03/2019	10:00 AM		NW
18/03/2019	11:00 AM		
18/03/2019	12:00 PM	2.2	
18/03/2019	1:00 PM		NNW
18/03/2019	2:00 PM		NW
18/03/2019	3:00 PM		NNW
18/03/2019	4:00 PM		NW
18/03/2019	5:00 PM	0.9	
18/03/2019	6:00 PM		WNW
18/03/2019	7:00 PM	0.4	
18/03/2019	8:00 PM		ENE
18/03/2019	9:00 PM	0	
18/03/2019	10:00 PM	0	
18/03/2019	11:00 PM	0	
19/03/2019	12:00 AM	0	ENE
19/03/2019	1:00 AM	0	
19/03/2019	2:00 AM	0	
19/03/2019	3:00 AM	0	
19/03/2019	4:00 AM	0	
19/03/2019	5:00 AM	0	
19/03/2019	6:00 AM	0	
19/03/2019	7:00 AM	0	
19/03/2019	8:00 AM	0	
19/03/2019	9:00 AM	_	ENE
19/03/2019	10:00 AM		ENE
19/03/2019	11:00 AM		ENE
19/03/2019	12:00 PM		WNW
19/03/2019	1:00 PM		SSE
19/03/2019	2:00 PM		NE
19/03/2019	3:00 PM		NW
19/03/2019	4:00 PM		NE
19/03/2019	5:00 PM		SE
19/03/2019	6:00 PM		NW
19/03/2019	7:00 PM		NW
19/03/2019	8:00 PM		
19/03/2019	9:00 PM		ENE
19/03/2019	10:00 PM		ENE
19/03/2019	11:00 PM		NW
20/03/2019	12:00 AM		NW
20/03/2019	1:00 AM		NW
20/03/2019	2:00 AM		NW
20/03/2019	3:00 AM		NW
20/03/2019	4:00 AM		NW
20/03/2019	5:00 AM		NW
20/03/2019	6:00 AM		NW
20/03/2019	7:00 AM	1.3	NW

		Wind	Wind
Date	Time	Speed (m/s)	Direction
20/03/2019	8:00 AM		NW
20/03/2019	9:00 AM		NW
20/03/2019	10:00 AM		NE
20/03/2019	11:00 AM		NW
20/03/2019			NW
20/03/2019	1:00 PM		NW
20/03/2019	2:00 PM	0.9	
20/03/2019	3:00 PM		NW
20/03/2019	4:00 PM		
20/03/2019	5:00 PM		SSE
20/03/2019	6:00 PM		NW
20/03/2019	7:00 PM		ENE
20/03/2019	8:00 PM	0.4	
20/03/2019	9:00 PM		ENE
20/03/2019	10:00 PM	0.4	
20/03/2019	11:00 PM	0.4	
21/03/2019	12:00 AM		NNW
21/03/2019	1:00 AM		NNE
21/03/2019	2:00 AM	0.4	
21/03/2019	3:00 AM	0.4	
21/03/2019	4:00 AM		SSE
21/03/2019	5:00 AM		SSE
21/03/2019	6:00 AM		WNW
21/03/2019	7:00 AM		SW
21/03/2019	8:00 AM		SSE
21/03/2019	9:00 AM		WNW
21/03/2019	10:00 AM		SSE
21/03/2019	11:00 AM		SSE
21/03/2019	12:00 PM		SSE
21/03/2019	1:00 PM		SSE
21/03/2019	2:00 PM	0.9	
21/03/2019	3:00 PM	1.3	SSE
21/03/2019	4:00 PM	1.3	SSE
21/03/2019	5:00 PM	1.3	SSE
21/03/2019	6:00 PM	1.3	SSE
21/03/2019	7:00 PM	0.9	SSE
21/03/2019	8:00 PM	1.3	
21/03/2019	9:00 PM	1.3	SSE
21/03/2019	10:00 PM	1.3	SSE
21/03/2019	11:00 PM		
22/03/2019			
22/03/2019	1:00 AM		
22/03/2019	2:00 AM		
22/03/2019	3:00 AM		NNE
22/03/2019	4:00 AM		
22/03/2019	5:00 AM	0.4	ESE
22/03/2019	6:00 AM		ENE
22/03/2019	7:00 AM		SW
22/03/2019	8:00 AM	0.4	
22/03/2019	9:00 AM		ENE
22/03/2019	10:00 AM		NNE
22/03/2019	11:00 AM		NNE
22/03/2019	12:00 PM		NW
22/03/2019	1:00 PM		SSE
22/03/2019	2:00 PM		SSE
22/03/2019	3:00 PM		SSE
22/03/2019	4:00 PM		
22/03/2019	5:00 PM	0.4	SSE

		Wind	Wind
Date	Time	Speed (m/s)	Direction
22/03/2019	6:00 PM		NNE
22/03/2019	7:00 PM	0.9	SSE
22/03/2019	8:00 PM	0.9	N
22/03/2019	9:00 PM	0.9	N
22/03/2019	10:00 PM	0.9	NW
22/03/2019	11:00 PM	0.9	
23/03/2019	12:00 AM	0.4	
23/03/2019	1:00 AM	0.9	
23/03/2019	2:00 AM		NW
23/03/2019	3:00 AM	0.9	
23/03/2019	4:00 AM		NW
23/03/2019	5:00 AM		NW
		2.7	
23/03/2019	6:00 AM		NW
23/03/2019	7:00 AM		NW
23/03/2019	8:00 AM		
23/03/2019	9:00 AM	2.7	
23/03/2019	10:00 AM	2.2	NW
23/03/2019	11:00 AM	2.7	NW
23/03/2019	12:00 PM	2.7	NW
23/03/2019	1:00 PM		NW
23/03/2019	2:00 PM	1.3	
23/03/2019	3:00 PM	1.3	SE
23/03/2019	4:00 PM	0.4	WNW
23/03/2019	5:00 PM	0.4	WNW
23/03/2019	6:00 PM	0.4	WNW
23/03/2019	7:00 PM	0.9	SSE
23/03/2019	8:00 PM	0.4	SSE
23/03/2019	9:00 PM	1.8	NNE
23/03/2019	10:00 PM	1.8	NE
23/03/2019	11:00 PM		NE
24/03/2019	12:00 AM	2.2	NE
24/03/2019	1:00 AM	1.8	NE
24/03/2019	2:00 AM	1.8	NE
24/03/2019	3:00 AM	1.8	NE
24/03/2019	4:00 AM		NNE
24/03/2019	5:00 AM	1.3	
24/03/2019	6:00 AM	1.3	NE
24/03/2019	7:00 AM	4.0	ENE
24/03/2019	8:00 AM		NE
24/03/2019	9:00 AM		NNE
24/03/2019	10:00 AM		SE
24/03/2019	11:00 AM		NW
24/03/2019	12:00 AM	2.2	
24/03/2019			
	1:00 PM	1.8	
24/03/2019	2:00 PM	2.2	
24/03/2019	3:00 PM	1.8	
24/03/2019	4:00 PM	1.3	
24/03/2019	5:00 PM		NW
24/03/2019	6:00 PM	2.2	
24/03/2019	7:00 PM		SE
24/03/2019	8:00 PM	2.2	
24/03/2019	9:00 PM		NW
24/03/2019	10:00 PM	2.7	
24/03/2019	11:00 PM	1.3	
25/03/2019	12:00 AM		SSE
25/03/2019	1:00 AM		NW
25/03/2019	2:00 AM		ENE
25/03/2019	3:00 AM	2.2	ENE

		Wind	Wind
Date	Time	Speed (m/s)	Direction
25/03/2019	4:00 AM	0.9	
25/03/2019	5:00 AM		SW
25/03/2019	6:00 AM	0	
25/03/2019	7:00 AM	0.9	
25/03/2019	8:00 AM	2.2	
	9:00 AM		
25/03/2019		0.4	SSE
25/03/2019	10:00 AM		
25/03/2019	11:00 AM		NW
25/03/2019	12:00 PM		NW
25/03/2019	1:00 PM	0.4	
25/03/2019	2:00 PM		WNW
25/03/2019	3:00 PM		WNW
25/03/2019	4:00 PM		NW
25/03/2019	5:00 PM		WNW
25/03/2019	6:00 PM	0.4	
25/03/2019	7:00 PM	0	
25/03/2019	8:00 PM	0	WNW
25/03/2019	9:00 PM	0	
25/03/2019	10:00 PM	0	
25/03/2019	11:00 PM	0	
26/03/2019	12:00 AM	0	S
26/03/2019	1:00 AM	0	_
26/03/2019	2:00 AM	0	
26/03/2019	3:00 AM	0	SSE
26/03/2019	4:00 AM	0	SSE
26/03/2019	5:00 AM	0	
26/03/2019	6:00 AM	0	
26/03/2019	7:00 AM	1.8	NW
26/03/2019	8:00 AM	0.9	NW
26/03/2019	9:00 AM	1.3	SE
26/03/2019	10:00 AM	1.3	
26/03/2019	11:00 AM	2.2	
26/03/2019	12:00 PM	2.2	
26/03/2019	1:00 PM	2.2	NW
26/03/2019	2:00 PM	3.1	
26/03/2019	3:00 PM		NW
26/03/2019	4:00 PM	3.1	
26/03/2019	5:00 PM	2.7	
26/03/2019	6:00 PM	1.8	
26/03/2019	7:00 PM		ENE
26/03/2019	8:00 PM	1.3	SE
26/03/2019	9:00 PM	1.3	
26/03/2019	10:00 PM	0.9	
26/03/2019	11:00 PM		NNE
27/03/2019	12:00 AM	1.3	
27/03/2019	1:00 AM	0.9	
27/03/2019	2:00 AM		SSE
27/03/2019	3:00 AM		NW
27/03/2019	4:00 AM		NW
27/03/2019	5:00 AM		NW
27/03/2019	6:00 AM		NW
27/03/2019	7:00 AM		NW
27/03/2019	8:00 AM		NW
27/03/2019	9:00 AM		NW
27/03/2019	10:00 AM		NW
			NE
27/03/2019	11:00 AM		
27/03/2019	12:00 PM		ENE
27/03/2019	1:00 PM	1.8	ㄷ

		Wind	Wind
Date	Time	Speed (m/s)	Direction
27/03/2019	2:00 PM	1.3	
27/03/2019	3:00 PM		NW
27/03/2019	4:00 PM		NW
27/03/2019	5:00 PM	0.9	
27/03/2019	6:00 PM		
		0.9	
27/03/2019	7:00 PM	1.3	NW
27/03/2019	8:00 PM		
27/03/2019	9:00 PM		NNW
27/03/2019	10:00 PM		NW
27/03/2019	11:00 PM		NNW
28/03/2019	12:00 AM		NW
28/03/2019	1:00 AM		NNW
28/03/2019	2:00 AM	0.4	
28/03/2019	3:00 AM		ENE
28/03/2019	4:00 AM		ENE
28/03/2019	5:00 AM	0	
28/03/2019	6:00 AM	0	
28/03/2019	7:00 AM	0	
28/03/2019	8:00 AM		SW
28/03/2019	9:00 AM	0.4	
28/03/2019	10:00 AM		NNE
28/03/2019	11:00 AM		NW
28/03/2019	12:00 PM		SSE
28/03/2019	1:00 PM		NW
28/03/2019	2:00 PM	1.3	
28/03/2019	3:00 PM		NNE
28/03/2019	4:00 PM		NNW
28/03/2019	5:00 PM		NNW
28/03/2019	6:00 PM		WNW
28/03/2019	7:00 PM		NNE
28/03/2019	8:00 PM	0.4	
28/03/2019	9:00 PM	0	
28/03/2019	10:00 PM	0	
28/03/2019	11:00 PM	0	
29/03/2019	12:00 AM	0	
29/03/2019	1:00 AM	0	
29/03/2019	2:00 AM	0.4	ENE
29/03/2019			
29/03/2019	4:00 AM		E
29/03/2019	5:00 AM		
29/03/2019	6:00 AM		NE
29/03/2019	7:00 AM		
29/03/2019	8:00 AM		NE
29/03/2019	9:00 AM		NNE
29/03/2019	10:00 AM		NNE
29/03/2019	11:00 AM		NNE
29/03/2019	12:00 PM		SSE
29/03/2019	1:00 PM		SSE
29/03/2019	2:00 PM		SSE
29/03/2019	3:00 PM		SSE
29/03/2019	4:00 PM		SSE
29/03/2019	5:00 PM		SSE
29/03/2019	6:00 PM		SSE
29/03/2019	7:00 PM		
29/03/2019	8:00 PM	0.4	
29/03/2019	9:00 PM		SSE
29/03/2019	10:00 PM	0.4	ENE
29/03/2019	11:00 PM	0	E

		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1100
	<b>-</b>	Wind	Wind
Date	Time	Speed (m/s)	Direction
30/03/2019	12:00 AM	0	E
30/03/2019	1:00 AM		ENE
30/03/2019	2:00 AM		NE
30/03/2019	3:00 AM		ENE
30/03/2019	4:00 AM	0	ENE
30/03/2019	5:00 AM	0	
30/03/2019	6:00 AM	0	
30/03/2019	7:00 AM		ENE
30/03/2019	8:00 AM		ESE
30/03/2019	9:00 AM	-	NE
30/03/2019	10:00 AM		NW
30/03/2019	11:00 AM	1.8	NW
30/03/2019	12:00 PM	1.8	NW
30/03/2019	1:00 PM	2.2	NW
30/03/2019	2:00 PM	1.8	NW
30/03/2019	3:00 PM	2.2	NW
30/03/2019	4:00 PM	1.8	NW
30/03/2019	5:00 PM	1.8	NW
30/03/2019	6:00 PM		NW
30/03/2019	7:00 PM		NW
30/03/2019	8:00 PM		ENE
30/03/2019	9:00 PM	1.3	
30/03/2019	10:00 PM		NW
30/03/2019	11:00 PM		NW
31/03/2019	12:00 AM		NW
31/03/2019	1:00 AM		NW
31/03/2019	2:00 AM		NW
31/03/2019	3:00 AM		NW
31/03/2019	4:00 AM		
31/03/2019	5:00 AM	3.1	NW
31/03/2019	6:00 AM	3.1	NW
31/03/2019	7:00 AM	2.2	SSE
31/03/2019	8:00 AM		NW
31/03/2019	9:00 AM	3.1	NW
31/03/2019	10:00 AM		NW
31/03/2019	11:00 AM		NW
31/03/2019	12:00 PM	3.6	NW
31/03/2019	1:00 PM		NNW
31/03/2019	2:00 PM		NW
31/03/2019	3:00 PM		
31/03/2019	4:00 PM		NW
31/03/2019	5:00 PM		
	6:00 PM		NW
31/03/2019			
31/03/2019	7:00 PM		NW
31/03/2019	8:00 PM		NW
31/03/2019	9:00 PM		NW
31/03/2019	10:00 PM		NW
31/03/2019	11:00 PM	3.1	NW