



AUES PROJECT NO.: TCS/00684/13

**WSD CONTRACT NO. 1/WSD/13 -
IMPROVEMENT OF FRESH WATER SUPPLY TO
CHEUNG CHAU**

**QUARTERLY ENVIRONMENTAL MONITORING AND
AUDIT (EM&A) REPORT (NO.11)–
OCTOBER TO DECEMBER 2016**

**PREPARED FOR
CHINA ROAD- CHINA PIPELINE JOINT VENTURE**

Quality Index

Date	Reference No.	Prepared By	Approved By
10 February 2017	TCS00684/13/600/R0306v2	 Martin Li Assistant Environmental Consultant	 T.W. Tam Environmental Team Leader

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1	3 February 2017	First Submission
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Attention: Mr. Ernest CHAN

Dear Sir

**Contract No. 1/WSD/13
Independent Environmental Checker Services for
Improvement of Freshwater Supply to Cheung Chau
Verification of Quarterly EM&A Report**

Reference is made to the *Quarterly Environmental Monitoring and Audit (EM&A) Report (No.11) – October to December 2016 Version 2 (Ref No: TCS00684/13/600/R0306v2)* dated 10 February 2017 submitted by the Environmental Team via their e-mail on 10 February 2017.

We are pleased to inform you that we have no further comment on the captioned document. We herewith verify that the Quarterly EM&A Report for October to December 2016 is prepared in accordance with Section 9.5 of the *Final EM&A Manual for the Improvement of Fresh Water Supply to Cheung Chau – Investigation* (EIAO Register No.: AEIAR-151/2010).

Thank you very much for your kind attention. Please do not hesitate to contact the undersigned should you have any queries.

Yours faithfully
for and on behalf of
SMEC Asia Limited

Vivian CHAN
Independent Environmental Checker

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EXECUTIVE SUMMARY

- ES.01 Water Supplies Department (hereafter referred as “WSD”) is the Project Proponent and the Permit Holder of *Improvement of Fresh Water Supply to Cheung Chau* (hereinafter referred as “the Project”), which is a Designated Project to be implemented under Environmental Permit number EP-392/2010/B (hereinafter referred as “the EP-392/2010/B” or “the EP”).
- ES.02 Action-United Environmental Services and Consulting (AUES) has been appointed as the independent Environmental Team (ET) to implement the relevant EM&A programme. In the Project, China Road - China Pipeline Joint Venture (hereinafter “CRCPJV”) is the Main Contractor, SMEC Asia Limited as an Independent Environmental Checker (IEC), and Black & Veatch Hong Kong Limited is the representative engineer on site to manage the Project. The Works is predicted to take about 24 months.
- ES.03 As part of the project EM&A program, baseline monitoring was carried out by the ET in accordance with the project EM&A Manual from **4 January to 31 January 2014** to determine the ambient environmental conditions i.e. noise and marine water quality before commencement of construction works. The Baseline Report summarized the key findings and the rationale behind determining a set of Action and Limit Levels (A/L Levels) from the baseline data. It was submitted on **13 February 2014** and verified by IEC and endorsed by EPD before impact monitoring commencement on **28 March 2014**.
- ES.04 A set of A/L Levels serve as the yardsticks for assessing the acceptability of the environmental impact during the construction phase impact monitoring. They are statistical in nature and derived according to the criteria set out in the EM&A Manual and are given in the following tables.

Table ES-1 Action and Limit Levels of Water Quality Monitoring

Impact Station	Dissolved Oxygen (mg/L)				Depth Average of Turbidity (NTU)		Depth Average of SS (mg/L)	
	Depth Average of Surface & Middle		Bottom		Action Level	Limit Level	Action Level	Limit Level
	Action Level	Limit Level	Action Level	Limit Level				
W1	5.64	4.54	NA	NA	5.87	8.81	7.00	8.00
W2	5.16	5.02	NA	NA	5.50	5.66	7.00	8.00
W3	6.18	5.66	5.36	5.05	6.94	7.29	8.00	8.00
W4	5.94	4.95	5.71	5.54	7.50	8.03	7.85	11.57
W5	5.14	5.00	5.79	5.79	5.44	7.43	6.00	6.43
W6	5.92	4.26	6.04	4.49	6.82	7.10	8.00	9.59
W7	6.08	5.78	6.08	5.60	5.71	6.26	7.85	10.00

Table ES-2 Action and Limit Levels of Construction Noise Monitoring

Monitoring Location	Action Level	Limit Level in dB(A)
	Time Period: 0700-1900 hours on normal weekdays	
N1	When one or more documented complaints are received	75 dB(A)

- ES.05 This is the **11th** Quarterly Environmental Monitoring and Audit Report for the Project, covering the period from **1 October 2016** to **31 December 2016** (the Reporting Quarter).

ENVIRONMENTAL MONITORING AND AUDIT ACTIVITIES

- ES.06 Environmental monitoring activities under the EM&A program in this Reporting Quarter are summarized in the following table.

Table ES-3 Environmental Monitoring Activities in Reporting Quarter

Issues	Environmental Monitoring Parameters / Inspection	Occasions
Construction Noise	$L_{eq(30min)}$ Daytime	13
Water Quality	Marine Water Sampling	37
Inspection / Audit	ET Regular Environmental Site Inspection	13
	IEC Monthly Environmental Site Audit	3

BREACH OF ACTION AND LIMIT (A/L) LEVELS

ES.07 In this Reporting Quarter, no exceedance of construction noise was recorded. There were twenty (20) Action Level exceedances and one hundred and twenty-three (123) Limit Level exceedance in water quality were recorded. The statistics of environmental exceedance, NOE issued and investigation of exceedance are summarized in the following table.

Table ES-4 Summary NOE issued and investigation of exceedance in Reporting Quarter

Environmental Issues	Monitoring Parameters	Action Level	Limit Level	Event & Action		
				NOE Issued	Investigation	Corrective Actions
Construction Noise	$L_{eq(30min)}$ Daytime	0	0	0	-	-
Water Quality	DO	0	0	0	Not Project related	-
	Turbidity	0	0	0	Not Project related	-
	SS	20	123	143	Not Project related	-

Note: NOE – Notification of Exceedance

ENVIRONMENTAL COMPLAINT

ES.08 No environmental complaint was recorded or received in this Reporting Quarter.

NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTIONS

ES.09 No environmental summons or successful prosecutions were recorded in this Reporting Quarter.

REPORTING CHANGE

ES.10 There were no reporting changes made in this Reporting Quarter.

SITE INSPECTION BY EXTERNAL PARTIES

ES.11 No joint site inspection with AFCD and EPD was held in the reporting period.

FUTURE KEY ISSUES

ES.12 Due to dry and windy season has come, therefore air quality mitigation measures shall be adopted to prevent construction dust emission.

ES.13 Although dry season has come, but raining days may be encountered. So, water quality mitigation measures to prevent surface runoff into nearby water bodies or public areas should paid attention. Moreover, noise mitigation measures should be properly maintained to prevent construction noise as impacted surrounding resident.

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1.0 INTRODUCTION

PROJECT BACKGROUND

- 1.1 Water Supplies Department (hereafter referred as “WSD”) is the Project Proponent and the Permit Holder of *Improvement of Fresh Water Supply to Cheung Chau* (hereinafter referred as “the Project”), which is a Designated Project to be implemented under Environmental Permit number EP-392/2010/B (hereinafter referred as “the EP-392/2010/B” or “the EP”).
- 1.2 The scope of the works comprises primarily the laying of a new submarine fresh water main across the Adamasta Channel from Lantau Island to Cheung Chau by horizontal directional drilling method to enhance the reliability of fresh water supply to Cheung Chau. The Works commenced on 28 March 2014 and is predicted to undertaken about 24 months. The layout plan of project is shown in *Appendix A*.
- 1.3 Action-United Environmental Services and Consulting (AUES) has been appointed as the independent environmental team (ET) to implement the relevant EM&A programme of Water Supplies Department (WSD) Contract No. *1/WSD/13 – Improvement of Fresh Water Supply to Cheung Chau*. In the Project, **China Road - China Pipeline Joint Venture** (hereinafter “CRCPJV”) is a main-contractor, SMEC Asia Limited as an Independent Environmental Checker (IEC), and Black & Veatch Hong Kong Limited is the representative engineer on site to manage the Project.
- 1.4 According to the Particular Specification (PS) Section 25 and the EP-392/2010/B, overall scope of environmental monitoring including construction noise and water quality, and site environmental audit should be undertaken in accordance with the provided Environmental Monitoring and Audit Manual by an independent Environmental Team (ET).
- 1.5 The baseline monitoring program was carried out during the period between **4 January** and **31 January 2014** at the designated monitoring locations by the ET according to the EM&A Manual. The “Baseline Monitoring Report (R0014 Version 3)” had submitted to EPD before commencement of major construction works and approved by the IEC on 21 February 2014. Further to CRCPJV’s instructions, the EM&A program was commenced on 1 April 2014 and the monitoring schedule had been issued to relevant parties on 28 March 2014.
- 1.6 This is the **11th** quarterly Environmental Monitoring and Audit Report for the Project, covering the period from **1 October 2016** to **31 December 2016** (the Reporting Quarter).

REPORT STRUCTURE

- 1.7 The Quarterly Environmental Monitoring and Audit (EM&A) Report is structured into the following sections:-

SECTION 1	INTRODUCTION
SECTION 2	PROJECT ORGANIZATION AND CONSTRUCTION PROGRESS
SECTION 3	SUMMARY OF MONITORING REQUIREMENTS
SECTION 4	IMPACT MONITORING RESULTS
SECTION 5	WASTE MANAGEMENT
SECTION 6	SITE INSPECTIONS
SECTION 7	ENVIRONMENTAL COMPLAINTS AND NON-COMPLIANCE
SECTION 8	IMPLEMENTATION STATUES OF MITIGATION MEASURES
SECTION 9	IMPACT FORECAST
SECTION 10	CONCLUSIONS AND RECOMMENDATION

2.0 PROJECT ORGANIZATION AND CONSTRUCTION PROGRESS

PROJECT ORGANIZATION AND MANAGEMENT STRUCTURE

- 2.1 Organization structure and contact details of relevant parties with respect to on-site environmental management are shown in [Appendix B](#).

CONSTRUCTION PROGRESS

- 2.2 The layout plans with location of construction activities carried out are enclosed in [Appendix A](#), the master and three month rolling construction programs are enclosed in [Appendix C](#) and the major construction activities undertaken in this Reporting Quarter are listed below:-

1 to 31 October 2016

Construction Activities	Potential Environmental Impact(s)
Excavation work and landmain connection work	Air impact and noise generated during excavation work.

1 to 30 November 2016

Construction Activities	Potential Environmental Impact(s)
Landmain connection work at Cheung Chau and Ha So Pai	Air impact and noise generated during excavation work.

1 to 31 December 2016

Construction Activities	Potential Environmental Impact(s)
Landmain connection work at Cheung Chau and Ha So Pai	Air impact and noise generated during excavation work.

SUMMARY OF ENVIRONMENTAL SUBMISSIONS

- 2.3 A summary of the relevant permits, licenses, and/or notifications on environmental protection for this Project in this Reporting Quarter is presented in [Table 2-1](#).

Table 2-1 Status of Environmental Licenses and Permits

Item	Description	License/Permit Status
1	Air pollution Control (Construction Dust)	Notified EPD on 28/10/2013 Ref. no. 366253
2	Chemical waste Producer Registration	Application date: 20/12/2013 Date approved: 30/01/2014 WPN: 8334-920-C3839-01
3	Water Pollution Control Ordinance (Discharge License)	Application date: 03/01/2014 License no. WT00018191-2014 Valid to 28/02/2019
4	Billing Account for Disposal of Construction Waste	Application no. :RS01134 Date approved: 1/11/2013 Account Number: 7018602
5	Environmental Permit	Issued by EPD on 15 June 2016 Permit Number: EP-392/2010/B

- 2.4 Baseline Monitoring Report (TCS00684/13/600/R0014Ver.3) for the Project was issued by the ETL and verified by the IEC on 24 March 2014. The report was also submitted to the EPD for endorsement.
- 2.5 According to Clause 3.9 EP-392/2010/B stipulation, the detailed proposal of the HDD technique and the management of the drilling fluid for construction of the Project were submitted on 9 July 2014.
- 2.6 According to Clause 4.3 EP-392/2010/B stipulation, the detailed proposal of the cleaning and sterilization process of the Project were submitted on 19 October 2016.

3.0 SUMMARY OF MONITORING REQUIREMENTS

GENERAL

3.1 The Environmental Monitoring and Audit requirements are set out in the Approved EM&A manual. Environmental aspects such as the construction noise and marine water quality were identified as the key issues during the construction phase of the Project. The detailed requirements are presented in the sub-sections below.

MONITORING PARAMETERS

3.2 The EM&A baseline and impact monitoring program covers the following environmental issues:

- Construction noise; and
- Marine Water quality;

3.3 A summary of the monitoring parameters is presented in *Table 3-1*:

Table 3-1 Summary of the monitoring parameters of EM&A Requirements

Environmental Issue	Parameters
Marine Water Quality	In-situ Measurements <ul style="list-style-type: none"> • Dissolved Oxygen Concentration (mg/L); • Dissolved Oxygen Saturation (%); • Turbidity (NTU); • pH value; • Salinity (ppt); • Water depth (m); • Temperature (°C); and • # Total residual chlorine (TRC) (mg/L)
	Laboratory Analysis <ul style="list-style-type: none"> • Suspended Solids (mg/L)
Noise	<ul style="list-style-type: none"> • $L_{eq(30min)}$ during normal working hours; and • $L_{eq(5min)}$ during Restricted Hours.

TRC monitoring would be carried out by the Main-Contractor.

MONITORING LOCATION

Water Quality

3.4 Two control stations (W8 and W9) and seven impact stations (W1-W7) were recommended in the *EM&A Manual Section 2.5*. Detailed and co-ordination of water quality monitoring stations is described in *Table 3-2* and the graphical is shown in *Appendix D*.

Table 3-2 Location of Marine Water Quality Monitoring Station

Station	Description	Co-ordinate	
		Easting	Northing
W1	Impact Station – Marine waters near the proposed launching site at Cheung Chau	820 704	808 688
W2	Impact Station – Marine waters near the proposed launching site at Cheung Chau	820 656	808 631
W3	Impact Station – Marine waters along the proposed water main alignment	820 445	809 036
W4	Impact Station – Marine waters along the proposed water main alignment	820 072	809 297
W5	Impact Station – Marine waters near the proposed reception site at Lantau	819 875	809 700
W6	Impact Station – Marine waters near the Cheung Sha Wan Fish Culture Zone	819 174	810 917
W7	Impact Station – Marine waters between the works and the Cheung Sha Wan Fish Culture Zone	820 055	810 523

Station	Description	Co-ordinate	
		Easting	Northing
W8	Control station – Marine waters of Adamasta Channel	821 328	810 240
W9	Control station – Marine waters of Adamasta Channel	819 045	807 953

Construction Noise

- 3.5 According to *EM&A Manual Section 6.4*, only one noise sensitive receiver (NSR) is designated for the construction noise monitoring. The detailed construction noise monitoring station to under the Project is described in *Table 3-3* and graphical is shown in *Appendix D*.

Table 3-3 Location of Construction Noise Monitoring Station

Noise Monitoring Station	NSR ID	Location
N1	NSR2	Village house at No. 1A Tai Kwan Wan San Tsuen

MONITORING FREQUENCY AND PERIOD

- 3.6 The requirements of impact monitoring are stipulated in *Sections 2.6* and *2.7* of the EM&A Manual and listed as follows.

Construction Noise Monitoring

Parameters : One set of Leq(30min) as 6 consecutive Leq(5min) between 0700-1900 hours on normal weekdays
 Frequency : Once every week
 Duration : Throughout out the construction period

Water Quality (Marine) Monitoring

Parameters : In-situ measurements including water depth, temperature, DO, pH, turbidity and salinity; and Suspended Solids is analyzed by HOKLAS-accredited laboratory.
Frequency : Three days a week, at mid ebb and mid flood tides. The interval between 2 sets of monitoring will be more than 36 hours.
Sampling : (i.) Three depths: 1m below water surface, 1m above sea bottom and at mid-depth when the water depth exceeds 6m.
Depth : (ii.) If the water depth is between 3m and 6m, two depths: 1m below water surface and 1m above sea bottom.
 (iii.) If the water depth is less than 3m, 1 sample at mid-depth is taken
Duration : Throughout out the construction period

MONITORING EQUIPMENT

Water Quality Monitoring

- i. **Dissolved Oxygen and Temperature Measuring Equipment** – The instrument should be a portable and weatherproof dissolved oxygen (DO) measuring instrument complete with cable and sensor, and use a DC power source. The equipment should be capable of measuring as included a DO level in the range of 0 – 20mg L-1 and 0 – 200% saturation; and a temperature of 0 – 45 degree Celsius.
- ii. **pH Meter** – The instrument shall consist of a potentiometer, a glass electrode, a reference electrode and a temperature-compensating device. It shall be readable to 0.1 pH in arrange of 0 to 14.
- iii. **Turbidity (NTU) Measuring Equipment** – The instrument should be a portable and weatherproof turbidity measuring instrument using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU.

- iv. **Water Sampling Equipment** – A water sampler should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.
- v. **Water Depth Detector** – A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can either be hand held or affixed to the bottom of the work boat.
- vi. **Salinity Measuring Equipment** – A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.
- vii. **Sample Containers and Storage** – Water samples for SS should be stored in high density polythene bottles with no preservative added, packed in ice (cooled to 4°C without being frozen).
- viii. **Monitoring Position Equipment** - A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message ‘screen pop-up’ facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.
- ix. **Suspended Solids Analysis** – Analysis of suspended solids shall be carried out in a HOKLAS or other international accredited laboratory.

Noise Monitoring

- 3.7 Sound level meter in compliance with the *International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1)* specifications shall be used for carrying out the noise monitoring. The sound level meter shall be checked using an acoustic calibrator. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m s⁻¹.
- 3.8 The monitoring equipment using for the EM&A program were proposed by the ET and verified by the IEC prior to the commencement of the monitoring. Details of the equipment used for impact monitoring are listed in **Table 3-4** below.

Table 3-4 Monitoring Equipment Used in EM&A Program

Equipment	Model
Construction Noise	
Integrating Sound Level Meter	B&K Type 2238
Calibrator	B&K Type 4231
Portable Wind Speed Indicator	Testo Anemometer
Water quality	
A Digital Global Positioning System	GPS12 Garmin
Water Depth Detector	Eagle Sonar
Water Sampler	A 2-litre transparent PVC cylinder with latex cups at both ends
Thermometer & DO meter	YSI ProDSS Digital Sampling System Water Quality Meter / YSI Professional Plus Multifunctional Meter
pH meter	
Salinometer	
Turbidimeter	YSI ProDSS Digital Sampling System Water Quality Meter / HACH Turbidimeter 2100Q
Sample Container	High density polythene bottles (provided by laboratory)
Storage Container	‘Willow’ 33-litter plastic cool box with Ice pad
Suspended Solids	HOKLAS-accredited laboratory (ALS Technichem (HK) Pty Ltd)
Total residual chlorine	Would be provided by CRCPJV later

MONITORING METHODOLOGY

Water Quality

- 3.9 Water quality monitoring is conducted at the designated locations. The sampling produce with the in-situ monitoring are presented as below:

Sampling Procedures

- 3.10 A Digital Global Positioning System (GPS) is used to identify the designated monitoring stations prior to water sampling. A portable, battery-operated echo sounder is used for the determination of water depth at each station. At each station, marine water sample is collected at three depths: 1m below water surface, 1m above sea bottom and at mid-depth when the water depth exceeds 6m. Samples at 1m below water surface and 1m above sea bottom are collected when the water depth is between 3m and 6m. Only 1 sample at mid-depth is taken when the water depth is below 3m.
- 3.11 The marine water sampler is lowered into the water body at the predetermined depth. The trigger system of the sampler should been activated with a messenger. The opening ends of the sampler then is closed accordingly and water sample is collected.
- 3.12 The sample container is rinsed with a portion of the water sample. The water sample then is transferred to the high-density polythene bottles as provided by the laboratory, labeled with a unique sample number and sealed with a screw cap.
- 3.13 Before commencement of the sampling, general information such as the date and time of sampling, weather condition and tidal condition as well as the personnel responsible for the monitoring are to be recorded on the monitoring field data sheet.
- 3.14 A ‘Willow’ 33-litter plastic cool box packed with ice is used to preserve the collected water samples prior to arrival at the laboratory for chemical determination. The water temperature of the cool box is maintained at a temperature as close to 4⁰C as possible without being frozen. Samples collected are delivered to the laboratory upon collection

In-situ Measurement

Positioning of Monitoring Locations

- 3.15 A digital Global Positioning System (GPS) is used during marine water monitoring to ensure the monitoring vessel is at the correct location when taking measurement and samples.

Depth, Dissolved Oxygen (DO), Temperature, Salinity and pH value

- 3.16 The *YSI ProDSS Digital Sampling System Water Quality Meter/ YSI Professional Plus Multifunctional Meter* are used for marine water in-situ measures, which automates the measurements and data logging of depth, temperature, dissolved oxygen, dissolved oxygen saturation, pH and salinity simultaneously. Before each round of monitoring, the dissolved oxygen probe is calibrated by the wet bulb method and the salinity probes checked with distilled water.

Turbidity

- 3.17 *YSI ProDSS Digital Sampling System Water Quality Meter, or* A portable turbidity meter, brand named “*Hach 2100q*” are used for in-situ turbidity measurement.

Laboratory Analysis

- 3.18 All water samples are analyzed with Suspended Solids (SS) as specified in the *EM&A Manual* by a local HOKLAS-accredited testing laboratory (ALS Technichem (HK) Pty Ltd HOKLAS registration no. 66). SS analysis is determined by the laboratory upon receipt of the water samples using HOKLAS accredited analytical methods namely ALS Method EA-025.

Construction Noise

- 3.19 Noise measurements were taken in terms of the A-weighted equivalent sound pressure level (L_{eq}) measured in decibels (dB). Supplementary statistical results (L_{10} and L_{90}) were also obtained for reference.
- 3.20 Sound level meters listed in **Table 3-4** are complied with the *International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1)* specifications, as recommended in Technical Memorandum (TM) issued under the *Noise Control Ordinance (NCO)*.
- 3.21 During the monitoring, all noise measurements were performed with the meter set to FAST response and on the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq(30min)}$ in six consecutive $L_{eq(5min)}$ measurements were used as the monitoring parameter for the time period between 0700-1900 hours on weekdays; and also $L_{eq(15min)}$ in three consecutive $L_{eq(5min)}$ measurements is used as monitoring parameter for other time periods (e.g. during restricted hours), if necessary.
- 3.22 During the measurement, the sound level meter is mounted on a tripod with a height of 1.2m above ground and placed at the assessment point and oriented such that the microphone is pointed to the site with the microphone facing perpendicular to the line of sight. The windshield is fitted for all measurements. The assessment point is normally set as free-field situation for the measurement.
- 3.23 Prior of noise measurement, the accuracy of the sound level meter is checked using an acoustic calibrator generating a known sound pressure level at a known frequency. The checking was performed before and after the noise measurement.

EQUIPMENT CALIBRATION

- 3.24 The sound level meter and calibrator are calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme at yearly basis.
- 3.25 The Multi-parameter Water Quality Monitoring System is calibrated by HOKLAS accredited laboratory of three month intervals.

METEOROLOGICAL INFORMATION

- 3.26 The meteorological information during the construction phase is obtained from Cheung Chau Station of the Hong Kong Observatory (HKO).

DATA MANAGEMENT AND DATA QA/QC CONTROL

- 3.27 The impact monitoring data are handled by the ET's systematic data recording and management, which complies with in-house Quality Management System. Standard Field Data Sheets (FDS) are used in the impact monitoring program.
- 3.28 The monitoring data recorded in the equipment e.g. noise meter and Multi-parameter Water Quality Monitoring System are downloaded directly from the equipment at the end of each monitoring day. The downloaded monitoring data are input into a computerized database properly maintained by the ET. The laboratory results are input directly into the computerized database and QA/QC checked by personnel other than those who input the data. For monitoring activities require laboratory analysis, the local laboratory follows the QA/QC requirements as set out under the HOKLAS scheme for all laboratory testing.

DETERMINATION OF ACTION/LIMIT (A/L) LEVELS

- 3.29 According to the approved Environmental Monitoring and Audit Manual, the construction noise and water quality criteria were set up, namely Action and Limit levels are listed in **Tables 3-5 and 3-6** as below.

Table 3-5 Action and Limit Levels for Water Quality

Impact Station	Dissolved Oxygen (mg/L)				Depth Average of Turbidity (NTU)		Depth Average of SS (mg/L)	
	Depth Average of Surface & Middle		Bottom					
	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
W1	5.64	4.54	NA	NA	5.87	8.81	7.00	8.00
W2	5.16	5.02	NA	NA	5.50	5.66	7.00	8.00
W3	6.18	5.66	5.36	5.05	6.94	7.29	8.00	8.00
W4	5.94	4.95	5.71	5.54	7.50	8.03	7.85	11.57
W5	5.14	5.00	5.79	5.79	5.44	7.43	6.00	6.43
W6	5.92	4.26	6.04	4.49	6.82	7.10	8.00	9.59
W7	6.08	5.78	6.08	5.60	5.71	6.26	7.85	10.00

Table 3-6 Action and Limit Levels for Construction Noise

Monitoring Location	Action Level	Limit Level in dB(A)
	Time Period: 0700-1900 hours on normal weekdays	
N1	When one or more documented complaints are received	75 dB(A)

If works are to be carried out during restricted hours, the conditions stipulated in the construction noise permit issued by the NCA have to be followed.

- 3.30 Should non-compliance of the environmental quality criteria occurs, remedial actions will be triggered according to the Event and Action Plan enclosed in [Appendix E](#).

4.0 IMPACT MONITORING RESULTS

4.1 Further to CRCPJV's notification, the EM&A program was commenced on 1 April 2014. The works undertaken during the reporting quarter has been illustrated in [Appendix C](#). The monitoring results are presented in the following sub-sections. The graphical plots of the trends in monitored parameters over the Reporting Quarter are presented in [Appendix F](#).

RESULTS OF WATER QUALITY MONITORING

4.2 In this Reporting Quarter, **37** monitoring days have been carried out at the designated monitoring locations.

4.3 Monitoring results of the three key parameters, dissolved oxygen (DO), turbidity and suspended solids, in this Reporting Quarter are summarized in [Tables 4-1 to 4-4](#).

Table 4-1 Results Summary of Depth Average (Surface & Middle Layer) of DO (mg/L)

Tidal		W1	W2	W3	W4	W5	W6	W7	W8	W9
Mid-Ebb	Average	6.83	6.83	6.82	6.81	6.66	6.86	6.92	6.81	6.81
	Min	5.81	5.76	6.20	5.97	5.89	6.17	6.12	5.91	5.81
	Max	8.75	9.01	8.71	8.89	8.63	8.83	9.15	8.58	9.07
Mid-Flood	Average	6.81	6.82	6.77	6.76	6.82	7.02	6.94	6.94	6.71
	Min	5.73	5.75	6.20	6.04	5.93	6.17	6.20	5.98	4.64
	Max	8.26	8.66	8.77	8.43	9.80	9.51	9.10	9.46	8.83

Table 4-2 Results Summary of Bottom Depth of DO (mg/L)

Tidal		W1	W2	W3	W4	W5	W6	W7	W8	W9
Mid-Ebb	Average	NA	NA	6.42	6.43	6.58	6.53	6.61	6.48	6.44
	Min	NA	NA	5.68	5.75	5.83	6.07	6.08	5.64	4.85
	Max	NA	NA	8.63	8.90	8.94	8.42	9.49	9.01	8.73
Mid-Flood	Average	NA	NA	6.46	6.47	6.58	6.63	6.62	6.52	6.30
	Min	NA	NA	5.52	5.73	5.81	6.05	6.08	5.69	4.05
	Max	NA	NA	8.74	8.51	8.49	8.97	8.33	8.71	8.79

Table 4-3 Results Summary of Depth Average of Turbidity (NTU)

Tidal		W1	W2	W3	W4	W5	W6	W7	W8	W9
Mid-Ebb	Average	2.60	2.99	3.19	3.31	2.51	2.39	2.66	2.49	3.38
	Min	0.84	0.89	0.96	0.83	0.98	0.77	0.80	0.80	0.90
	Max	4.99	5.04	6.80	6.45	5.17	4.63	4.58	5.37	11.77
Mid-Flood	Average	2.65	2.60	3.37	3.14	2.48	2.68	2.70	2.89	3.45
	Min	0.60	0.50	0.79	1.27	0.73	0.79	0.79	0.78	0.67
	Max	5.24	5.18	5.95	5.47	5.23	4.97	5.67	5.72	6.67

Table 4-4 Results Summary of Depth Average of Suspended Solids (mg/L)

Tidal		W1	W2	W3	W4	W5	W6	W7	W8	W9
Mid-Ebb	Average	6.59	6.89	7.87	7.48	6.64	6.91	7.02	7.14	8.23
	Min	1.50	1.00	1.75	2.00	1.25	2.00	2.60	2.80	2.33
	Max	16.00	14.00	18.83	16.17	16.25	14.83	13.83	13.33	19.50
Mid-Flood	Average	6.42	6.58	7.63	7.81	6.72	7.23	7.02	7.31	8.02
	Min	1.50	1.50	1.80	2.50	2.00	2.50	2.33	3.17	3.17
	Max	14.00	14.50	14.50	15.17	14.00	16.17	13.17	14.17	15.33

Remark: If the monitoring result is less than 1, the average was calculated by assuming the monitored value to be 1.

4.4 During the Reporting Quarter, field measurements showed that temperatures of marine water were within 19.3°C to 29.1°C; the salinity concentrations within 20.71 to 34.84 ppt and pH values within 7.10 to 8.85.

4.5 A summary of exceedances for the three parameters: dissolved oxygen (DO), turbidity and suspended solids is shown in [Table 4-5](#).

Table 4-5 Summary of Water Quality Exceedance

Station	DO (Ave of Top & mid-depth)		DO Bottom Depth		Turbidity (Depth Ave.)		SS (Depth Ave)		Total Exceedance	
	Action	Limit	Action	Limit	Action	Limit	Action	Limit	Action	Limit
W1	0	0	0	0	0	0	1	19	1	19
W2	0	0	0	0	0	0	0	20	0	20
W3	0	0	0	0	0	0	0	22	0	22
W4	0	0	0	0	0	0	6	14	6	14
W5	0	0	0	0	0	0	1	21	1	21
W6	0	0	0	0	0	0	5	14	5	14
W7	0	0	0	0	0	0	7	13	7	13
No of Exceedance	0	0	0	0	0	0	20	123	20	123

- 4.6 In this Reporting Quarter, twenty (20) Action Level exceedances and one hundred and twenty-three (123) Limit Level exceedance in water quality were recorded.
- 4.7 For the exceedances of the last Reporting Quarter, investigations had been carried out and it is considered that the exceedances were not related to the work under the project since no marine work was being taken. The possible reasons for the exceedance may be likely due to natural variation as the baseline monitoring was carried during winter. Formal investigation reports had been submitted for IEC's endorsement.

RESULTS OF CONSTRUCTION NOISE MONITORING

- 4.8 The sound level was set in a free field situation during construction noise measurement. Therefore, a façade correction of +3dB(A) has been added according to acoustical principles and EPD guidelines.
- 4.9 In this Reporting Quarter, a total of **13** events of construction noise measurements were conducted. A summary of construction noise monitoring at the identified locations during the Reporting Quarter are summarized in **Table 4-6**.

Table 4-6 Summary of Construction Noise Monitoring Results – N1

Station	Corrected Leq(30min) (dB(A))*	
	Max	Min
N1	59	55
Record Date	2 November, & 29 December 2016	13 & 20 October 2016

(*) A façade correction of +3 dB(A) has been added according to acoustical principles and EPD guidelines.

- 4.10 As showed in the above table, the results were well below 75dB(A), also no noise complaint (which is an Action Level exceedance) was received by the RE, WSD, EPD and the Contractor. Hence, no Action or Limit Level exceedance was triggered during in this quarter. The graphical plot is shown in **Appendix F**.
- 4.11 The meteorological information during reporting quarter extracted from Cheung Chau Station of the Hong Kong Observatory (HKO) shows in **Appendix G**.

5.0 WASTE MANAGEMENT

5.1 Waste management was carried out by an on-site Environmental Officer or an Environmental Supervisor from time to time.

RECORDS OF WASTE QUANTITIES

All types of waste arising from the construction work are classified into the following:

- Construction & Demolition (C&D) Material;
- Chemical Waste;
- General Refuse; and
- Excavated Soil.

5.2 The quantities of waste for disposal in this Reporting Period are summarized in [Table 5-1](#) and [5-2](#) and the Monthly Summary Waste Flow Table is shown in [Appendix H](#). Whenever possible, materials were reused on-site as far as practicable.

Table 5-1 Summary of Quantities of Inert C&D Materials

Type of Waste	Quantity			Disposal Location
	Oct 16	Nov 16	Dec 16	
C&D Materials (Inert) ('000 m ³)	0	0	0	-
Reused in this Contract (Inert) ('000 m ³)	0	0	0	-
Reused in other Projects (Inert) ('000 m ³)	0	0	0	-
Disposal as Public Fill (Inert) ('000 m ³)	9.64	13.25	0	Outlying Island Transfer facility (Cheung Chau Station)

Table 5-2 Summary of Quantities of C&D Wastes

Type of Waste	Quantity			Disposal Location
	Oct 16	Nov 16	Dec 16	
Recycled Metal ('000kg)	0	0	0	-
Recycled Paper / Cardboard Packing ('000kg)	0	0	0	-
Recycled Plastic ('000kg)	0	0	0	-
Chemical Wastes ('000kg)	0	0	0	-
General Refuses ('000 m ³)	0.02	0.03	0.01	Outlying Island Transfer facility (Cheung Chau Station)

5.3 There was no site effluent discharged but the estimated volume of surface runoff was less than 50m³ in this quarterly period.

6.0 SITE INSPECTION

6.1 According to the Environmental Monitoring and Audit Manual, the environmental site inspection should be formulated by ET Leader. Regular environmental site inspections had been carried out by the ET to confirm the environmental performance. 13 weekly site inspections were carried out on **4, 11, 19 and 25 October 2016; 2, 8, 18, 22 and 30 November 2016; and 6, 13, 20 and 29 December 2016** with the Representatives of the Engineer and the Contractor to evaluate the site environmental performance in this Reporting Quarter. Furthermore, joint site inspection with IEC also undertaken on **26 October 2016, 18 November 2016** and **6 December 2016**. No non-compliance was noted. However, minor deficiencies were observed during weekly site inspection or joint site inspection.

6.2 Observations for the site inspections within this Reporting Quarter are summarized in *Table 6-1*.

Table 6-1 Site Observations

Date	Findings / Deficiencies	Follow-Up Status
29 September 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Stockpile without proper cover was observed. The Contractor should cover the stockpile well with tarpaulin sheet to reduce dust generation. - Stagnant water was observed at the drainage channel. The Contractor should remove the stagnant water and ensure the drainage channel is functioning well to avoid accumulation of stagnant water. 	<p>To be follow-up.</p> <p>Stagnant water at the drainage channel was removed.</p>
4 October 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Stockpile without proper cover was observed. The Contractor should cover the stockpile well with tarpaulin sheet to reduce dust generation. 	<p>To be follow-up.</p>
11 October 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Oil stain was observed on site. The contractor should remove the oil stain to prevent land contamination. - Stockpile without proper cover was observed. The Contractor should cover the stockpile well with tarpaulin sheet to reduce dust generation. 	<p>Oil stain was removed.</p> <p>To be follow-up.</p>
19 October 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Stockpile without proper cover was observed. The Contractor should cover the stockpile well with tarpaulin sheet to reduce dust generation. 	<p>To be follow-up.</p>

25 October 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Stagnant water at drip tray was observed. The Contractor should remove the stagnant water to prevent mosquito breeding. - Stockpile without proper cover was observed. The Contractor should cover the stockpile well with tarpaulin sheet to reduce dust generation. 	<p>Stagnant water in drip tray was removed.</p> <p>The stockpile was covered well with tarpaulin sheet.</p>
26 October 2016 (IEC Inspection)	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - Open stockpile was observed at Cheung Chau Site. The Contractor should cover the stockpile with impervious sheeting to minimize generation of dust muddy runoff. - Chemical containers without secondary containment underneath were observed at the Cheung Chau Site. The Contractor should provide secondary containment such as drip tray to all chemical containers to prevent land contamination. 	<p>The stockpile was covered well with tarpaulin sheet.</p> <p>Chemical containers were placed inside drip tray.</p>
2 November 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - No adverse environmental issue was observed. 	Nil.
8 November 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - The Contractor was reminded to pump the water at the sump pit to the WetSep regularly to avoid stagnant being stored at the drainage channel. 	Not required for reminder.
18 November 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - No adverse environmental issue was observed. 	Nil.
22 November 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - No adverse environmental issue was observed. 	Nil.
30 November 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - No adverse environmental issue was observed. 	Nil.
6 December 2016	<p><u>Observation:</u></p> <ul style="list-style-type: none"> - No adverse environmental issue was observed. 	Nil.
13 December	<p><u>Observation:</u></p>	

2016	- The Contractor was reminded to keep drainage channel clean.	Not required for reminder.
20 December 2016	<u>Observation:</u> - No adverse environmental issue was observed.	Nil.
29 December 2016	<u>Observation:</u> - The Contractor was reminded to cover the stockpile properly at the end of workday to reduce dust generation.	Not required for reminder.

7.0 ENVIRONMENTAL COMPLAINT AND NON-COMPLIANCE

ENVIRONMENTAL COMPLAINT, SUMMONS AND PROSECUTION

7.1 No environmental complaint, summons and prosecution was received in this reporting period. The statistical summary table of environmental complaint is presented in *Tables 7-1, 7-2* and *7-3*.

Table 7-1 Statistical Summary of Environmental Complaints

Reporting Period	Environmental Complaint Statistics		
	Frequency	Cumulative	Complaint Nature
28 March to December 2014	0	0	NA
January to December 2015	0	0	NA
January – September 2016	0	0	NA
October 2016	0	0	NA
November 2016	0	0	NA
December 2016	0	0	NA

Table 7-2 Statistical Summary of Environmental Summons

Reporting Period	Environmental Summons Statistics		
	Frequency	Cumulative	Complaint Nature
28 March to December 2014	0	0	NA
January to December 2015	0	0	NA
January – September 2016	0	0	NA
October 2016	0	0	NA
November 2016	0	0	NA
December 2016	0	0	NA

Table 7-3 Statistical Summary of Environmental Prosecution

Reporting Period	Environmental Prosecution Statistics		
	Frequency	Cumulative	Complaint Nature
28 March to December 2014	0	0	NA
January to December 2015	0	0	NA
January – September 2016	0	0	NA
October 2016	0	0	NA
November 2016	0	0	NA
December 2016	0	0	NA

8.0 IMPLEMENTATION STATUS OF MITIGATION MEASURES

GENERAL REQUIREMENTS

- 8.1 The environmental mitigation measures that recommended in the Implementation Schedule for Environmental Mitigation Measures (ISEMM) in the approved EM&A Manual covered the issues of dust, noise, water and waste and they are showed [Appendix I](#).
- 8.2 CRCPJV had been implementing the required environmental mitigation measures according to the Environmental Monitoring and Audit Manual subject to the site condition. Environmental mitigation measures generally implemented by CRCPJV in this Reporting Quarter are summarized in [Table 8-1](#).

Table 8-1 Environmental Mitigation Measures

Issues	Environmental Mitigation Measures
Water Quality	<ul style="list-style-type: none"> • Wastewater were appropriately treated by treatment facilities; • Drainage channels were provided to convey run-off into the treatment facilities; and • Drainage systems were regularly and adequately maintained.
Air Quality	<ul style="list-style-type: none"> • Regular watering to reduce dust emissions from all exposed site surface, particularly during dry weather; • Frequent watering for particularly dusty construction areas and areas close to air sensitive receivers; • Cover all excavated or stockpile of dusty material by impervious sheeting or sprayed with water to maintain the entire surface wet; • Public roads around the site entrance/exit had been kept clean and free from dust; and • Tarpaulin covering of any dusty materials on a vehicle leaving the site.
Noise	<ul style="list-style-type: none"> • Good site practices to limit noise emissions at the sources; • Use of quiet plant and working methods; • Use of site hoarding or other mass materials as noise barrier to screen noise at ground level of NSRs; • Use of shrouds/temporary noise barriers to screen noise from relatively static PMEs; • Scheduling of construction works outside school examination period in critical area; and • Alternative use of plant items within one worksite, where practicable.
Waste and Chemical Management	<ul style="list-style-type: none"> • Excavated material should be reused on site as far as possible to minimize off-site disposal. Scrap metals or abandoned equipment should be recycled if possible; • Waste arising should be kept to a minimum and be handled, transported and disposed of in a suitable manner; • The Contractor should adopt a trip ticket system for the disposal of C&D materials to any designed public filling facility and/or landfill; and • Chemical waste shall be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes.
General	<ul style="list-style-type: none"> • The site was generally kept tidy and clean.

9.0 CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

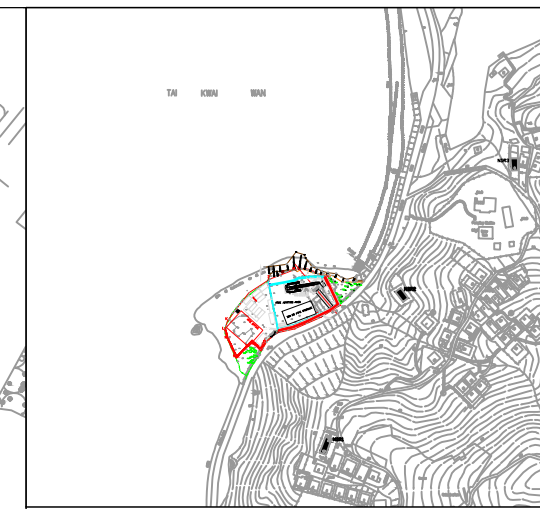
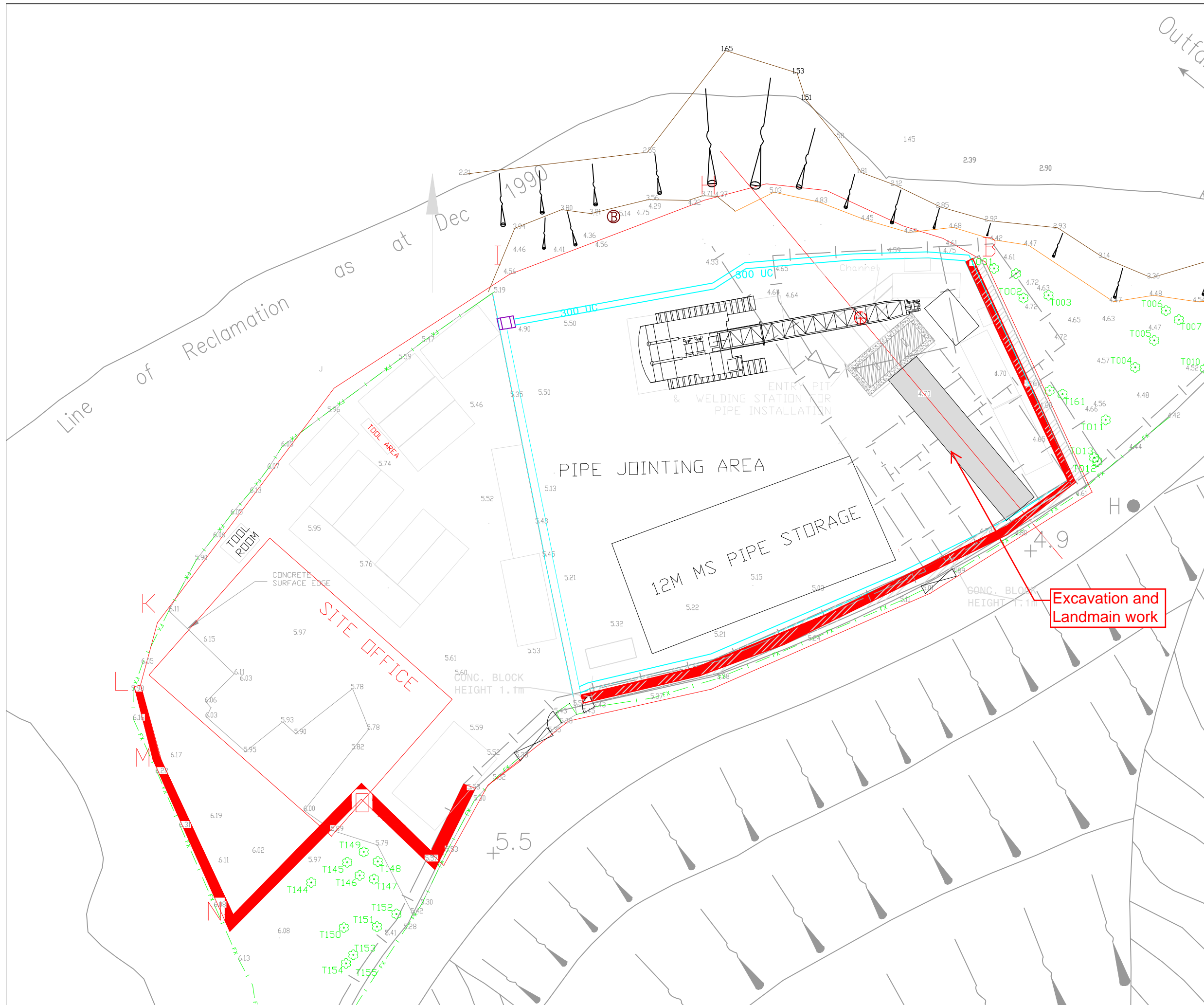
- 9.1 This is **11th** quarterly EM&A report presenting the monitoring results and inspection findings for the Reporting Period from **1 October 2016** to **31 December 2016**.
- 9.2 No noise complaint (which is an Action Level exceedance) was received and no construction noise measurement results that exceeded the Limit Level were recorded in the Reporting Quarter. No NOEs or the associated corrective actions were therefore issued.
- 9.3 In this Reporting Quarter, twenty (20) Action Level exceedances and one hundred and twenty-three (123) Limit Level exceedance in water quality were recorded.
- 9.4 No documented complaint, notification of summons or successful prosecution was received by the Project.
- 9.5 The ET had carried out site inspection on **4, 11, 19 and 25 October 2016; 2, 8, 18, 22 and 30 November 2016; and 6, 13, 20 and 29 December 2016** with the Representatives of the Engineer and the Contractor. Furthermore, joint site inspection with IEC also undertaken on **26 October 2016, 18 November 2016** and **6 December 2016**. No non-compliance was noted; however minor deficiencies were observed during site inspection. The deficiencies has rectified within the specified deadlines. The environmental performance of the Project was therefore considered satisfactory.

RECOMMENDATIONS

- 9.6 Due to dry and windy season has come, therefore air quality mitigation measures shall be adopted to prevent construction dust emission.
- 9.7 Although dry season has come, but raining days may be encounter. So, water quality mitigation measures to prevent surface runoff into nearby water bodies or public areas should paid attention. Moreover, noise mitigation measures should be properly maintained to prevent construction noise as impacted surrounding resident.
- 9.8 To control the site performance on waste management, the CRCPJV shall ensure that all solid and liquid waste management works are fully in compliance with the relevant license/permit requirements, such as the effluent discharge licence and the chemical waste producer registration. CRCPJV is also reminded to implement the recommended environmental mitigation measures according to the Environmental Monitoring and Audit Manual.

Appendix A

Project Site Layout Plan and Location of Construction Works in the Reporting Period



Key to symbols:

Given co-ordinates refer to Marine Department Notice No.169 of 2014

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client

香港特別行政區政府水務署
WATER SUPPLIES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

Main Contractor

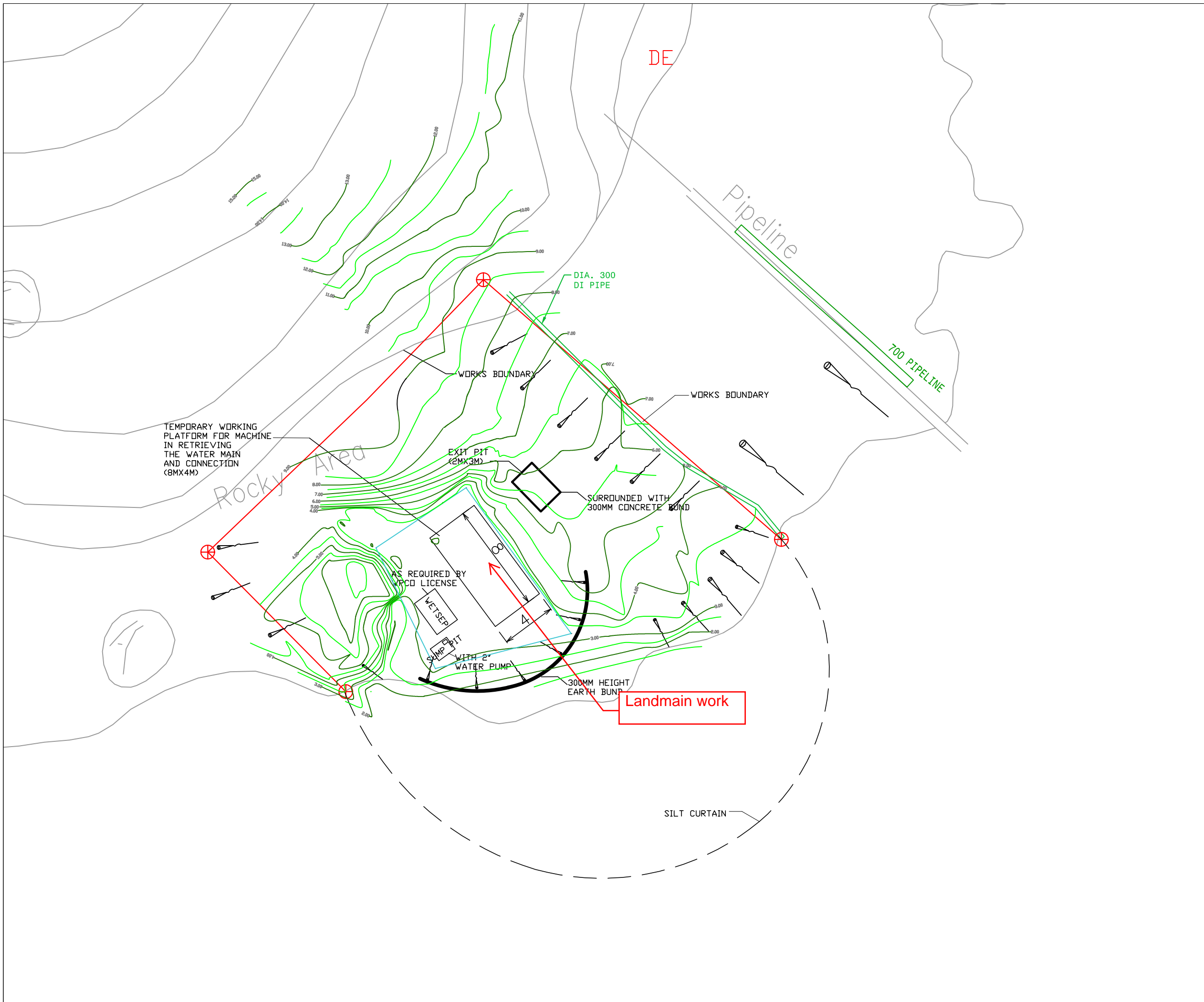
中國路橋 CRBC 中國石油天然氣管道局
CHINA PIPELINE JOINT VENTURE
China Road-China Pipeline Joint Venture

Project
CONTRACT NO. 1/WSD/13
IMPROVEMENT OF FRESH WATER
SUPPLY TO CHEUNG CHAU

Title
Layout Plan of Works Area at Tai Kwai
Wan

Drawing Number 1/WSD/13/SK051-3

Scale at A3	Status	
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Key to symbols:

Rev	Date	Drawn	Description	Ch'k'd	App'd

Client



Main Contractor



China Road-China Pipeline Joint Venture

Project
 CONTRACT NO. 1/WSD/13
 IMPROVEMENT OF FRESH WATER
 SUPPLY TO CHEUNG CHAU

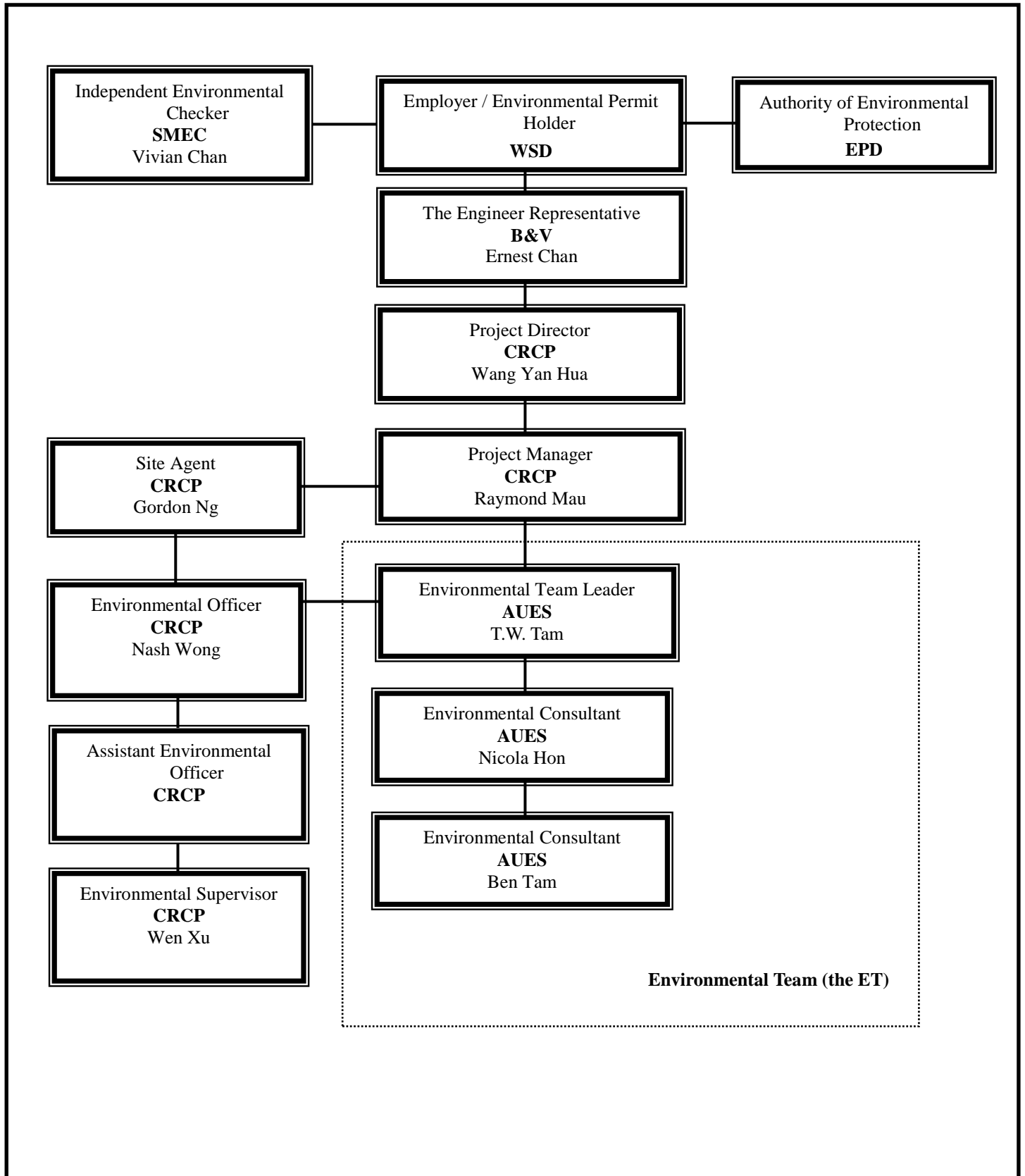
Title
 UPDATED DRAINAGE PLAN AND
 SITE LAYOUT AT HA SO PAI

Drawing Number
1/WSD/13/SK044

Scale at A3 **1:150** Date: **24/08/2015**

Appendix B

Organization Structure and Contact Details of Relevant Parties



Environmental Management Organization

Contact Details of Key Personnel

Organization	Project Role	Name of Key Staff	Tel No.	Fax No.
B&V	Engineer's Representative	Ernest Chan	2981 1149	3485 4114
SMEC	Independent Environmental Checker	Vivian Chan	3995 8120	3995 8101
CRCP	Project Director	Wang Yan Hua	2981 1686	2981 1689
CRCP	Site Agent	Gordon Ng	2981 1686	2981 1689
CRCP	Environmental Officer	Nash Wong	2981 1686	2981 1689
CRCP	Environmental Supervisor	Wen Xu	2981 1686	2981 1689
AUES	Environmental Team Leader	T. W. Tam	2959 6059	2959 6079
AUES	Environmental Consultant	Nicola Hon	2959 6059	2959 6079
AUES	Environmental Consultant	Ben Tam	2959 6059	2959 6079
AUES	Assistant Environmental Consultant	Martin Li	2959 6059	2959 6079

General Enquiries Hotline: 56958167

Legend:

WSD (Employer) – Water Supplies Department

B&V (Engineer) – Black & Veatch Hong Kong Limited

CRCP (Main Contractor) – China Road – China Pipeline JV

SMEC (IEC) – SMEC Asia Limited

AUES (ET) – Action-United Environmental Services & Consulting

Appendix C

Master and Three Months Rolling Construction Programs

Appendix D

Monitoring Locations Designated in the EM&A Manual

NOTE:
1. THE FINAL LOCATIONS OF THE MONITORING STATIONS SHALL BE PROPOSED BY THE ENVIRONMENTAL PROTECTION DEPARTMENT AND APPROVED BY THE INDEPENDENT ENVIRONMENTAL CHECKER (IEC) BEFORE SUBMITTING TO EPD FOR APPROVAL PRIOR TO COMMENCEMENT OF ANY MONITORING.

LEGEND:
— PROPOSED SUBMARINE FRESH WATER MAIN
⊕ W1 WATER QUALITY MONITORING STATION
⊕ W2 WATER QUALITY MONITORING STATION

Revision	Date	Description	Initial
	Designed	Checked	Checked
	TL	FD	SZ
	10/09	10/09	10/09
	10/09	10/09	10/09

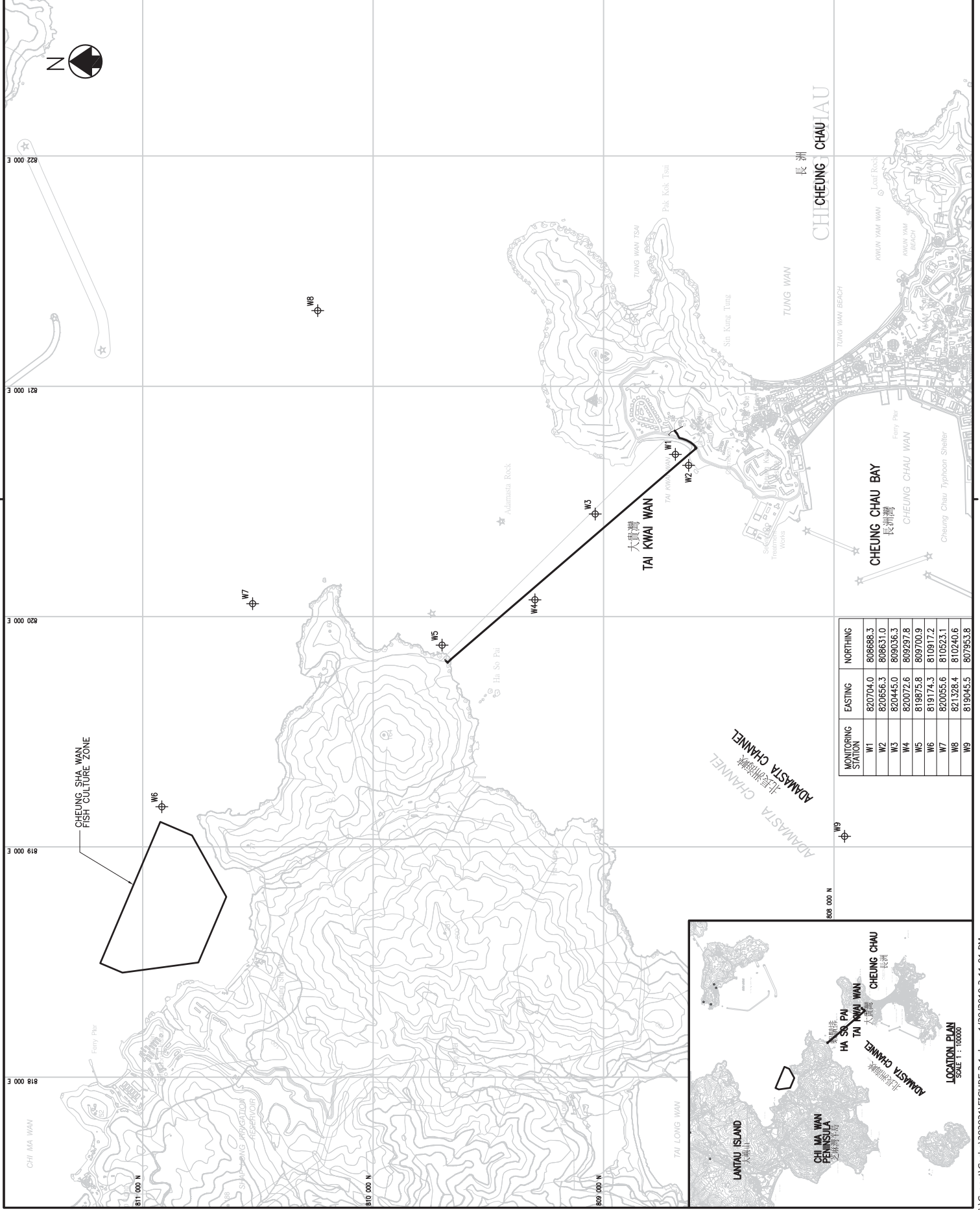
Agreement No. CE 1/2008 (WS)
Agreement Title
IMPROVEMENT OF FRESH WATER SUPPLY TO CHEUNG CHAU
— INVESTIGATION

Drawing Title
LOCATIONS OF PROPOSED WATER QUALITY MONITORING STATIONS

Drawing No. **FIGURE 2.1**
Revision
AS 1/15000



BLACK & VEATCH HONG KONG LIMITED
博達工程顧問有限公司



MONITORING STATION	EASTING	NORTHING
W1	820704.0	808688.3
W2	820656.3	808631.0
W3	820445.0	809036.3
W4	820072.6	809297.8
W5	819875.8	809700.9
W6	819174.3	810917.2
W7	820056.6	810523.1
W8	821328.4	810240.6
W9	819045.5	807953.8



LEGEND :

- PROPOSED SUBMARINE FRESH WATER MAIN
- PROPOSED LAND-BASED FRESH WATER MAIN
- REPRESENTATIVE NOISE SENSITIVE RECEIVER
- ▨ PROPOSED LAUNCHING SITE AND NOISE BARRIER
- PROPOSED 4m HIGH TEMPORARY NOISE BARRIER
- ⊙ N1 NOISE MONITORING STATION

Revision	Date	Description	Initial
	Designed	Checked	Checked
	Initial	Drawn	
	TL	FD	SZ
	10/09	10/09	10/09
	10/09	10/09	10/09
	Approved		

Agreement No. CE 1/2008 (WS)

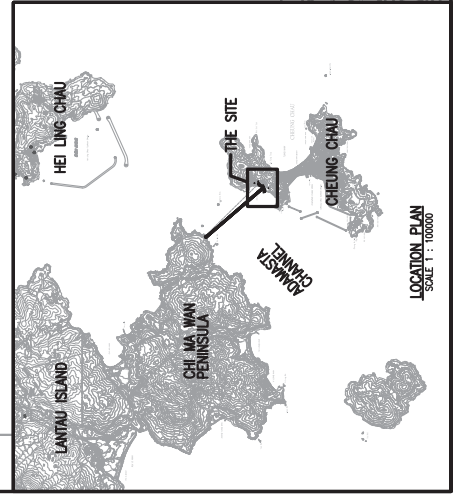
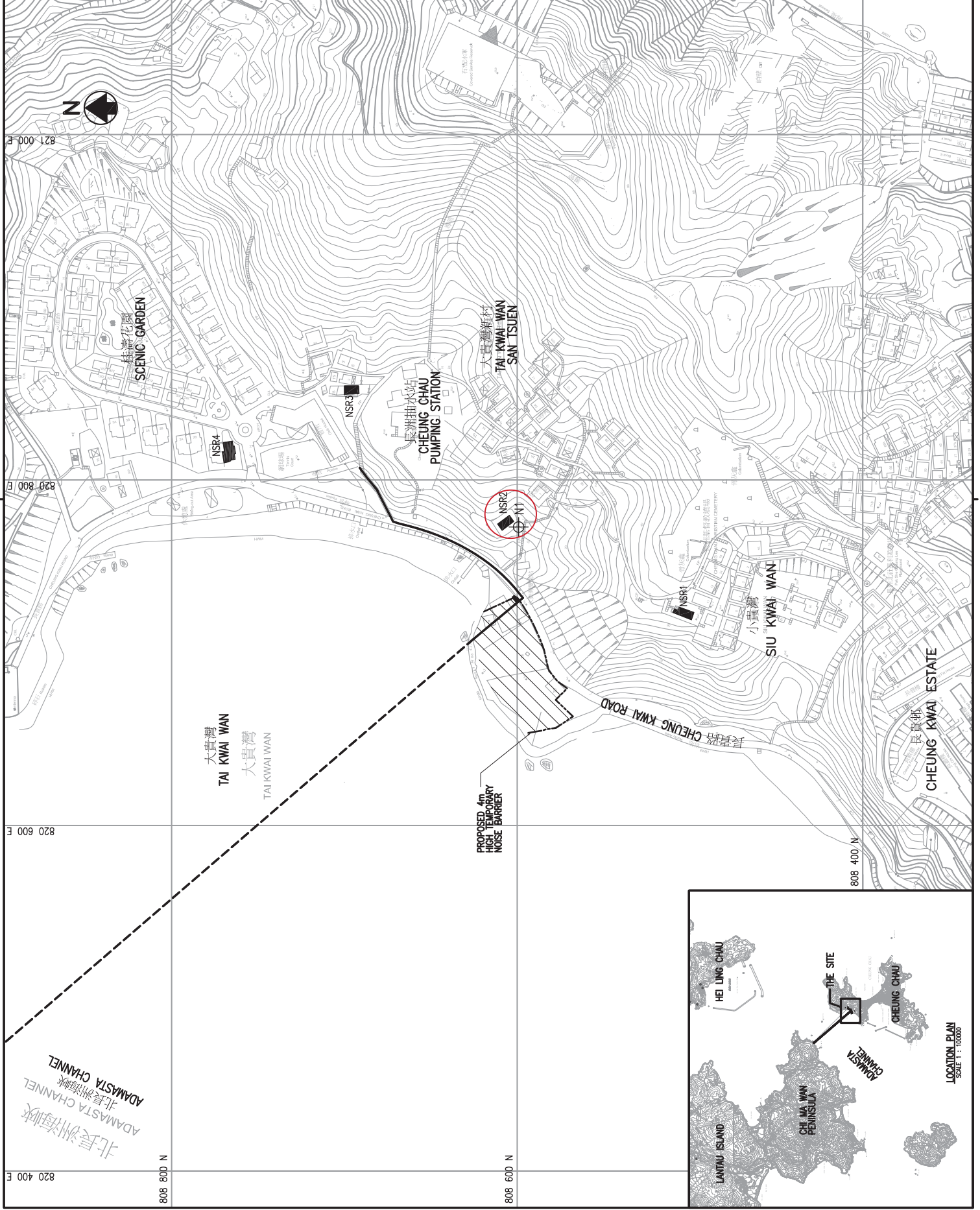
Agreement Title
IMPROVEMENT OF FRESH WATER SUPPLY TO CHEUNG CHAU
— INVESTIGATION

Drawing Title
LOCATIONS OF PROPOSED NOISE MONITORING STATION AND NOISE SENSITIVE RECEIVERS

Drawing No. **FIGURE 6.1**

Revision

Scale
AS 1:2000



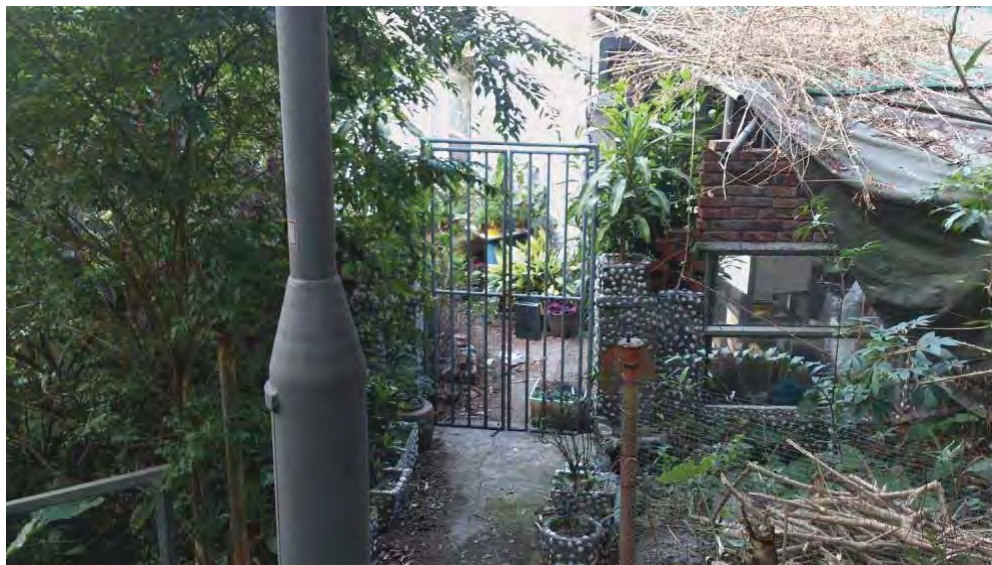


Photo 1: View from the light pole (proposed N1a) to the NSR-N1.

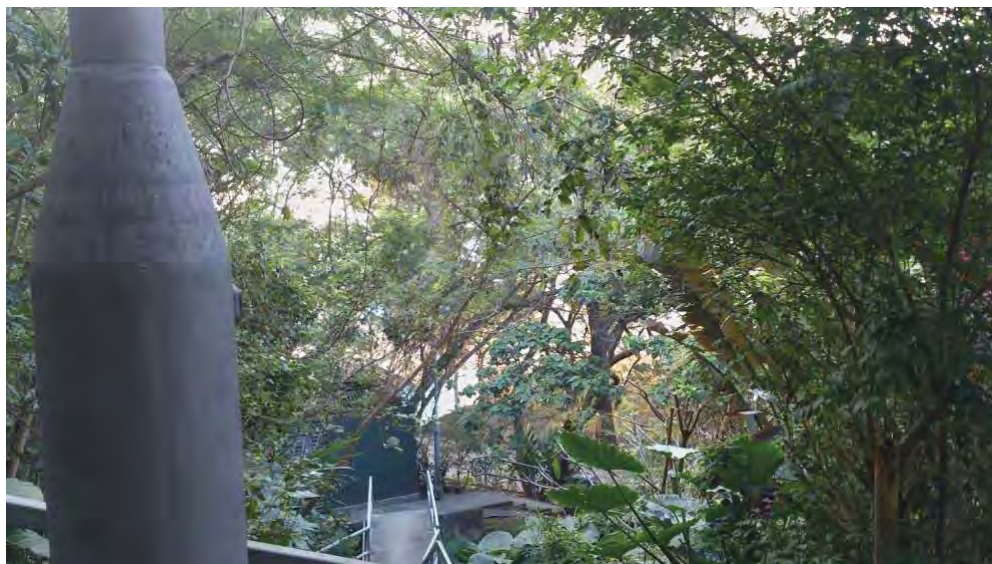


Photo 2: View from the light pole (proposed N1a) to the construction site

Appendix E

Event and Action Plan

Table 2.6 Event and Action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
Action Level being exceeded by one sampling day	<ol style="list-style-type: none"> Repeat in-site measurement to confirm findings. Identify source(s) of impact. Inform IEC and Contractor. Check monitoring data, all plant, equipment and Contractor's working methods. Discuss mitigation measures with IEC and Contractor. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Discuss with IEC on the proposed mitigation measures. Make agreement on the mitigation measures to be implemented. Assess effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Inform the ER and confirm notification of the non-compliance in writing. Rectify unacceptable practice. Check all plant and equipment. Consider changes of working methods. Discuss with ET and IEC and propose mitigation measures to IEC and ER. Implement the agreed mitigation measures.
Action Level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings; Identify source(s) of impact. Inform IEC and Contractor. Check monitoring data, all plant, equipment and Contractor's working methods. Discuss mitigation measures with IEC and Contractor. Ensure mitigation measures are implemented. Prepare to increase the monitoring frequency to daily. Repeat measurement on next day of exceedance. 	<ol style="list-style-type: none"> Discuss with ET and Contractor on the mitigation measures. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Discuss with IEC on the proposed mitigation measures. Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Inform the ER and confirm notification of the non-compliance in writing. Rectify unacceptable practice. Check all plant and equipment. Consider changes of working methods. Discuss with ET and IEC and propose mitigation measures to IEC and ER within 3 working days. Implement the agreed mitigation measures.
Limit Level being exceeded by one sampling day	<ol style="list-style-type: none"> Repeat in-situ measurement to confirm findings. Identify source(s) of impact. Inform IEC, contractor, AFCD and EPD. Check monitoring data, all plant, equipment and Contractor's working methods. Discuss mitigation measures with IEC, ER and Contractor. Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit Level. 	<ol style="list-style-type: none"> Discuss with IEC, ET and Contractor on the proposed mitigation measures. Request Contract to critically review the working methods. Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Discuss with IEC, ET and Contractor on the proposed mitigation measures. Request Contract to critically review the working methods. Make agreement on the mitigation measures to be implemented. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> Inform the ER and confirm notification of the non-compliance in writing. Rectify unacceptable practice. Check all plant and equipment. Consider changes of working methods. Discuss with ET, IEC and ER and propose mitigation measures to IEC and ER within 3 working days. Implement the agreed mitigation measures.

Event	ET Leader	IEC	ER	Contractor
Limit Level being exceeded by more than one consecutive sampling days	<ol style="list-style-type: none"> 1. Repeat in-situ measurement to confirm findings. 2. Identify source(s) of impact. 3. Inform IEC, contractor, AFCD and EPD. 4. Check monitoring data, all plant, equipment and Contractor's working methods. 5. Discuss mitigation measures with IEC, ER and Contractor. 6. Ensure mitigation measures are implemented. 7. Increase the monitoring frequency to daily until no exceedance of Limit Level for two consecutive days. 	<ol style="list-style-type: none"> 1. Discuss with ET and Contractor on the mitigation measures. 2. Review proposals on mitigation measures submitted by Contractor and advise the ER accordingly. 3. Assess the effectiveness of the implemented mitigation measures. 	<ol style="list-style-type: none"> 1. Discuss with IEC, ET and Contractor on the proposed mitigation measures. 2. Request Contractor to critically review the working methods. 3. Make agreement on the mitigation measures to be implemented. 4. Assess the effectiveness of the implemented mitigation measures. 5. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the work until no exceedance of Limit Level. 	<ol style="list-style-type: none"> 1. Inform the ER and confirm notification of the non-compliance in writing. 2. Rectify unacceptable practice. 3. Check all plant and equipment. 4. Consider changes of working methods. 5. Discuss with ET, IEC and ER and propose mitigation measures to IEC and ER within 3 working days. 6. Implement the agreed mitigation measures. 7. As directed by the ER, to slow down or to stop all or part of the work or construction activities.

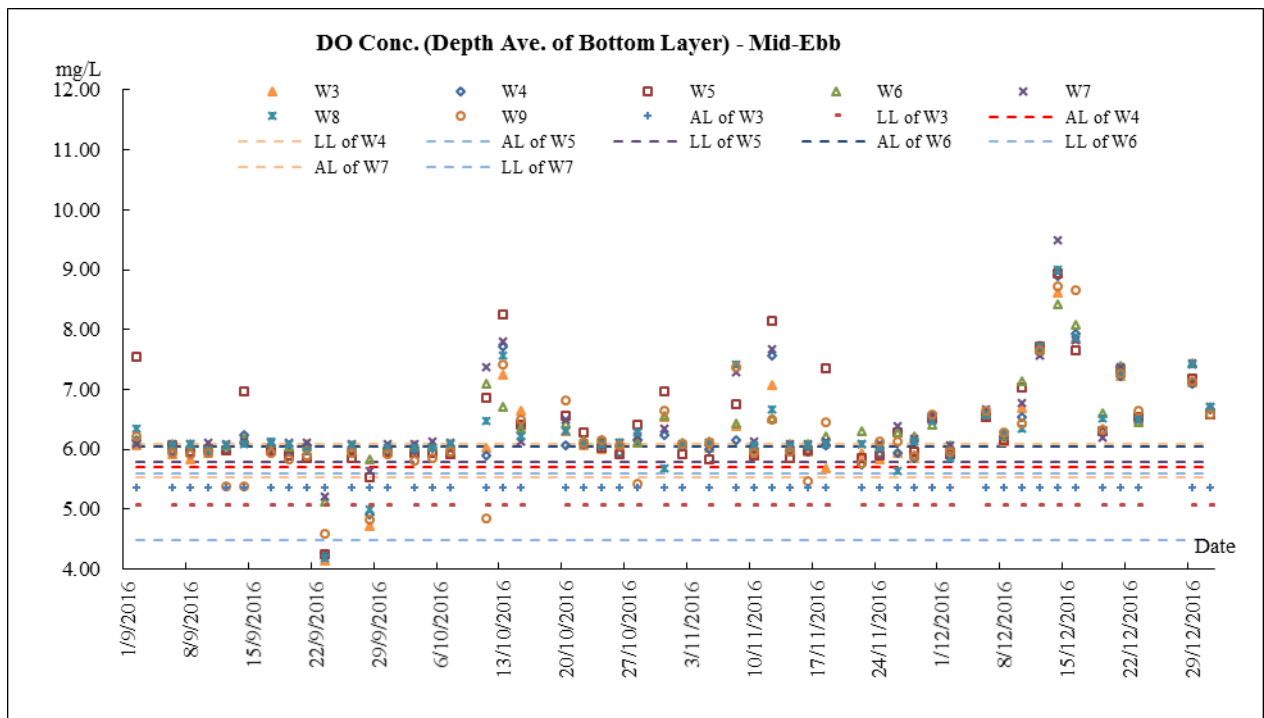
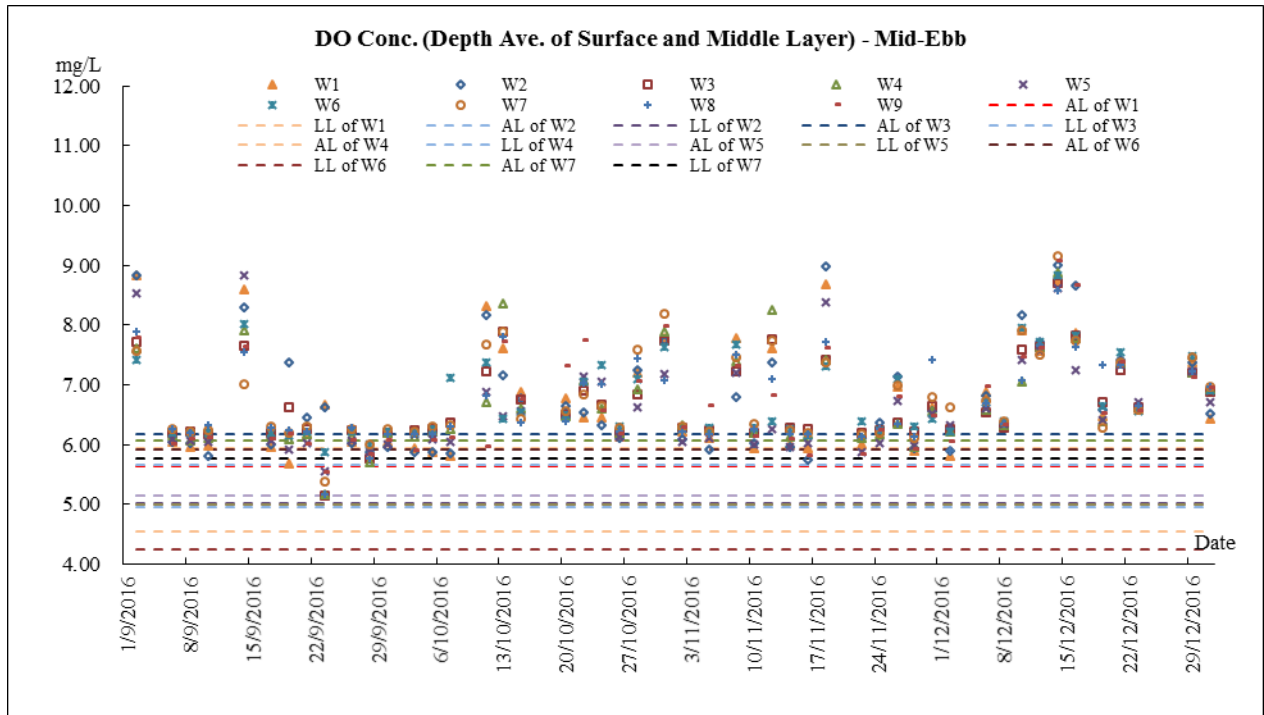
Table 6.3 Event/Action Plan for Construction Noise Monitoring

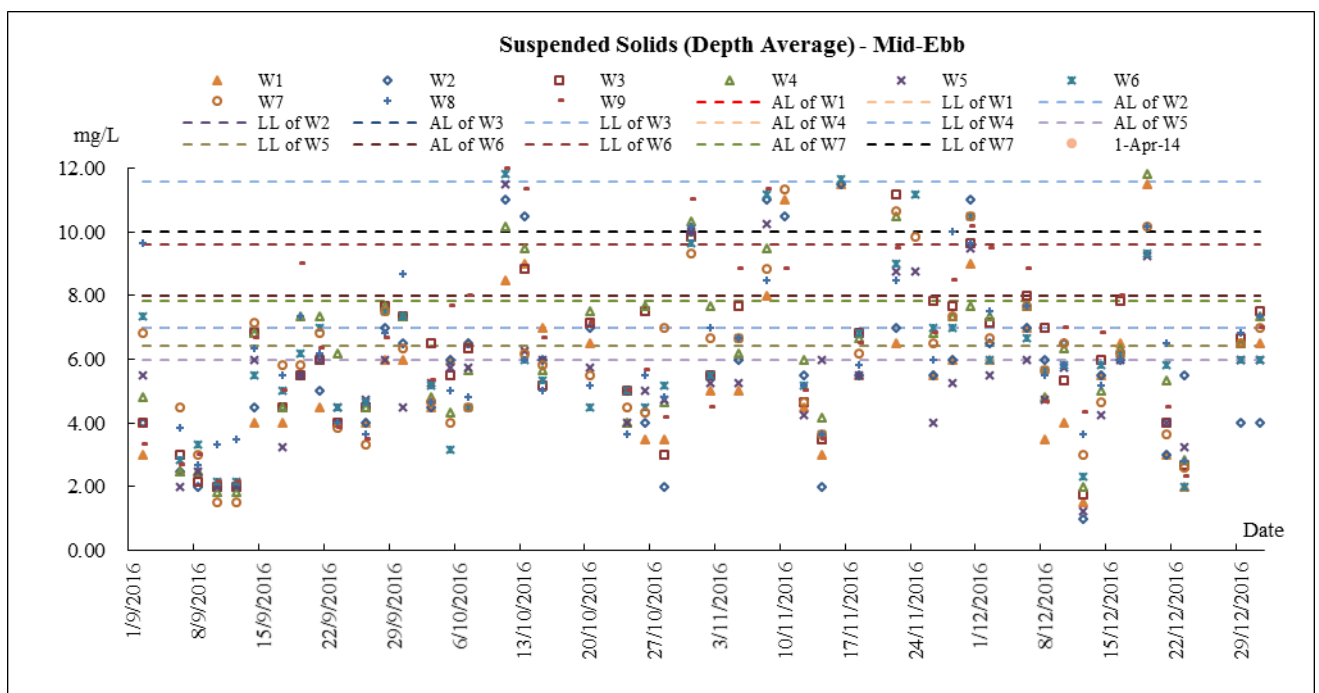
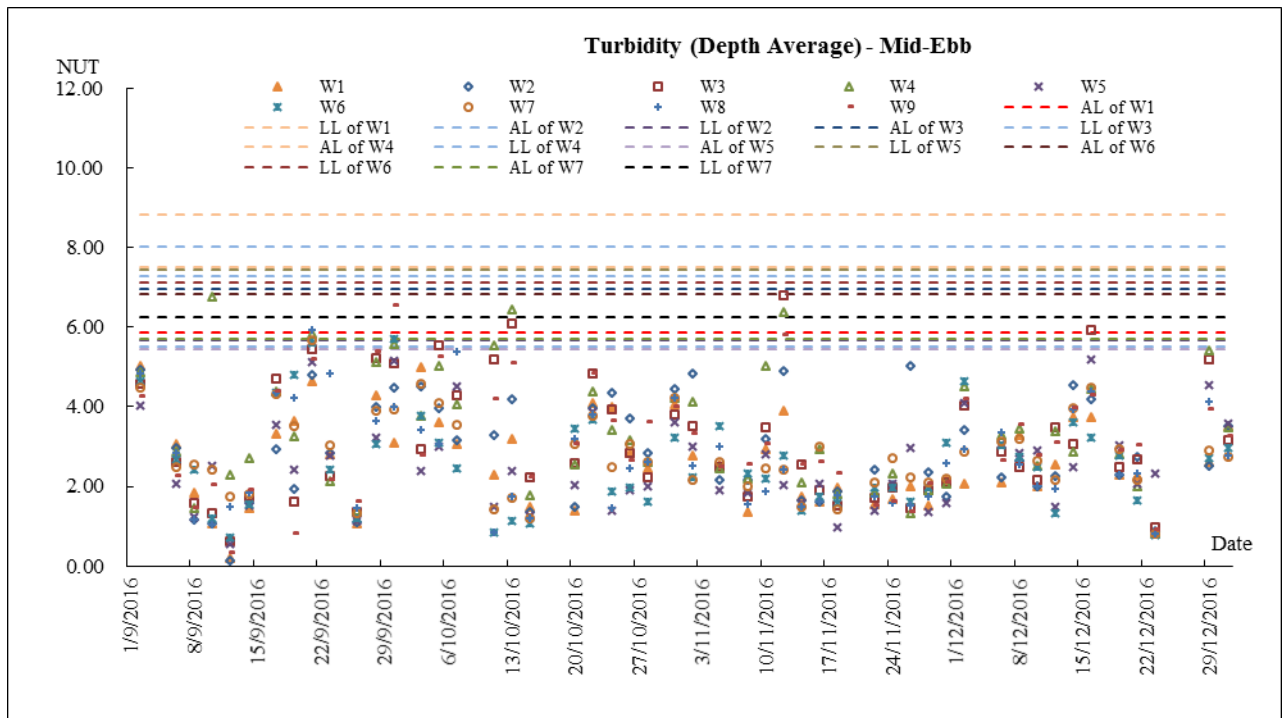
EVENT	ACTION			
	ET Leader	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify IEC, Contractor and ER 2. Carry out investigation and identify source 3. Report the results of investigation to the IEC, Contractor and ER 4. Discuss with the Contractor and formulate remedial measures 5. Increase monitoring frequency 6. Check compliance to Action/Limit Levels after application of mitigation measures 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET Leader 2. Review the proposed remedial measures by the Contractor and advise the ER & ET accordingly 3. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of complaint in writing 2. Notify Contractor 3. Check monitoring data submitted by the ET 4. Require Contractor to propose remedial measures for the analysed noise problem 5. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to ER and IEC within three working days of notification 2. Liaise with the ER to ensure the effectiveness of the agreed mitigation 3. Amend proposal if required 4. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify IEC, ER, EPD and Contractor 2. Identify Source 3. Repeat measurement to confirm findings 4. Increase monitoring frequency 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 6. Inform IEC, ER and EPD the causes & actions taken for the exceedances 7. Assess effectiveness of Contractor's remedial actions and keep IEC, EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by ET 2. Discuss amongst ER, ET Leader and Contractor on the potential remedial actions 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER & ET accordingly 4. Supervise the implementation of remedial measures 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of exceedance 2. Notify Contractor 3. Check monitoring data submitted by the ET 4. Require Contractor to propose remedial measures for the analysed noise problem 5. Discuss with ET, IEC and Contractor on proposed remedial actions to be implemented 6. Ensure remedial measures are properly implemented 7. Assess the effectiveness of the remedial actions and keep the Contractor informed 8. 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 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER within 3 working days of notification 3. Liaise with the ER to ensure the effectiveness of the agreed mitigation 4. Amend proposal if required 5. Implement the agreed proposals 6. Resubmit proposals if problem still not under control 7. Stop the relevant portion of works as determined by the ER until the exceedance is abated

Appendix F

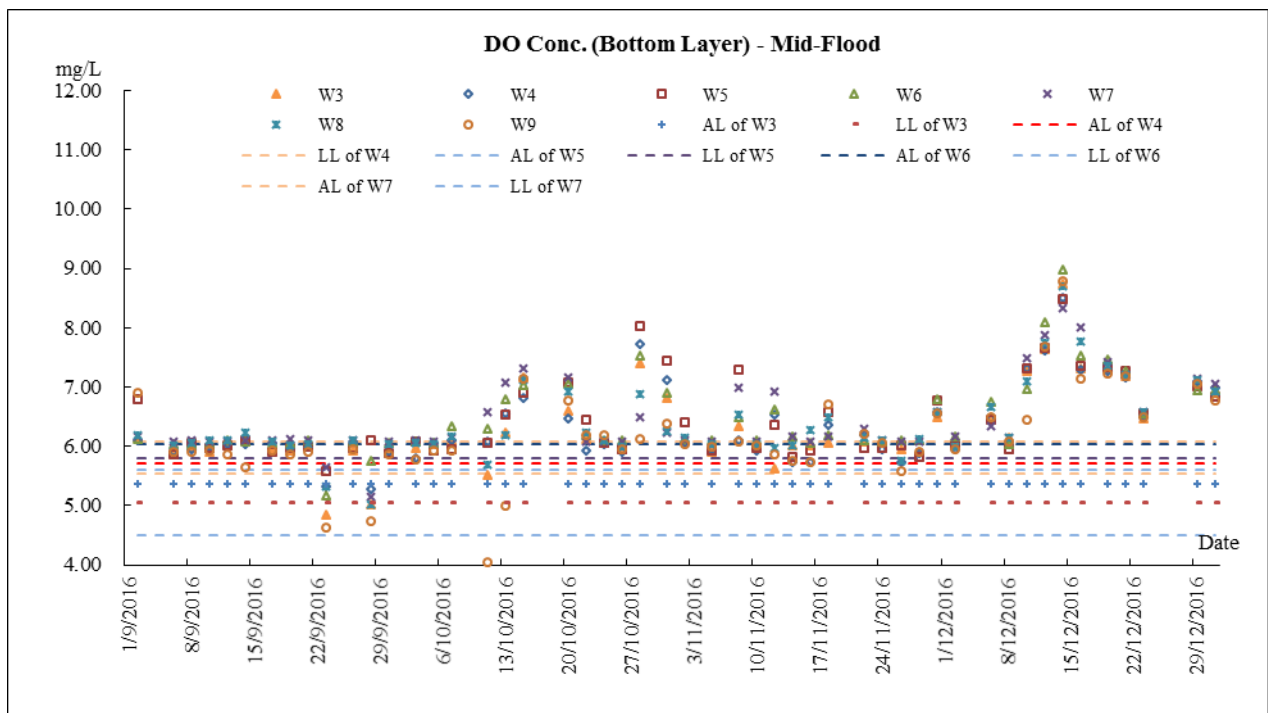
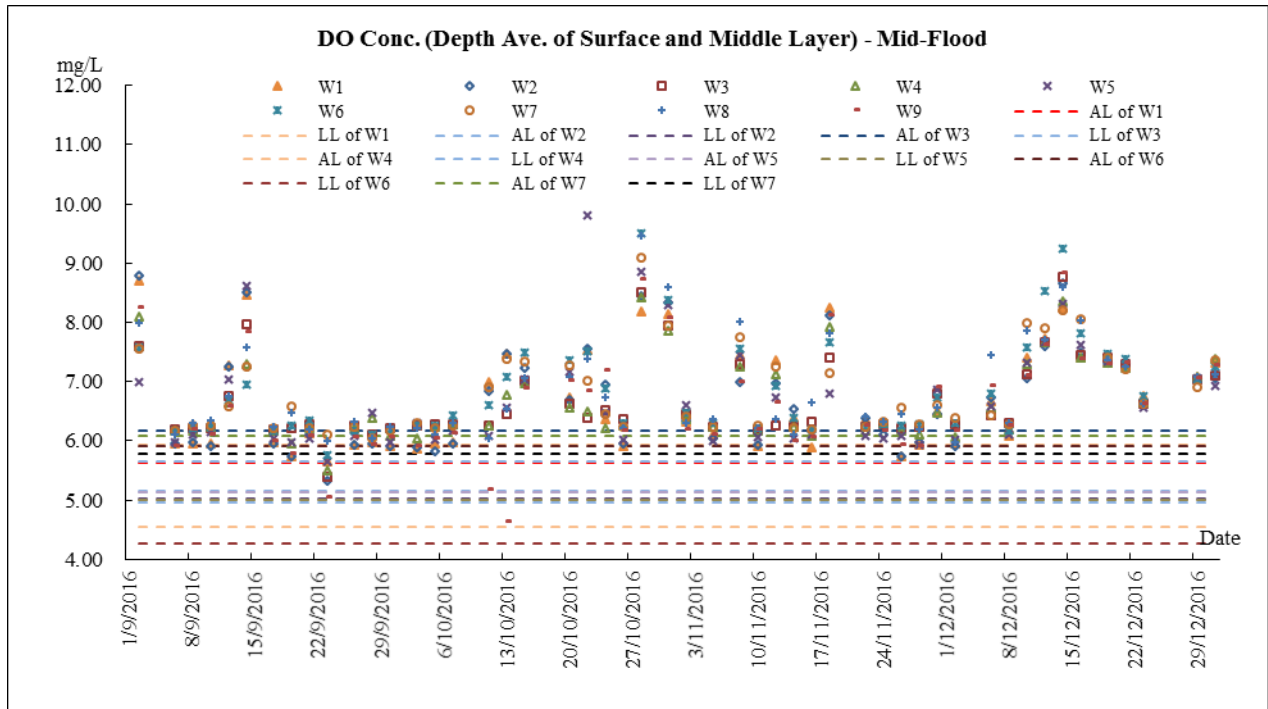
Graphical Plots of Impact Monitoring

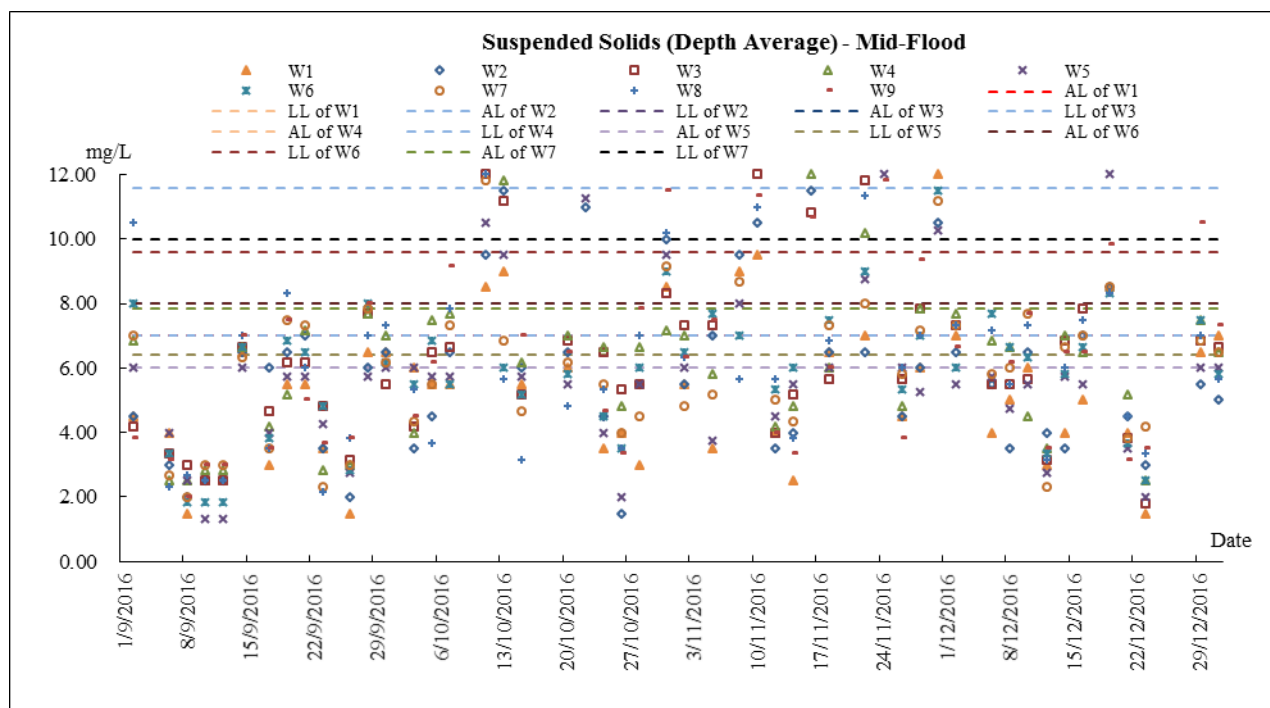
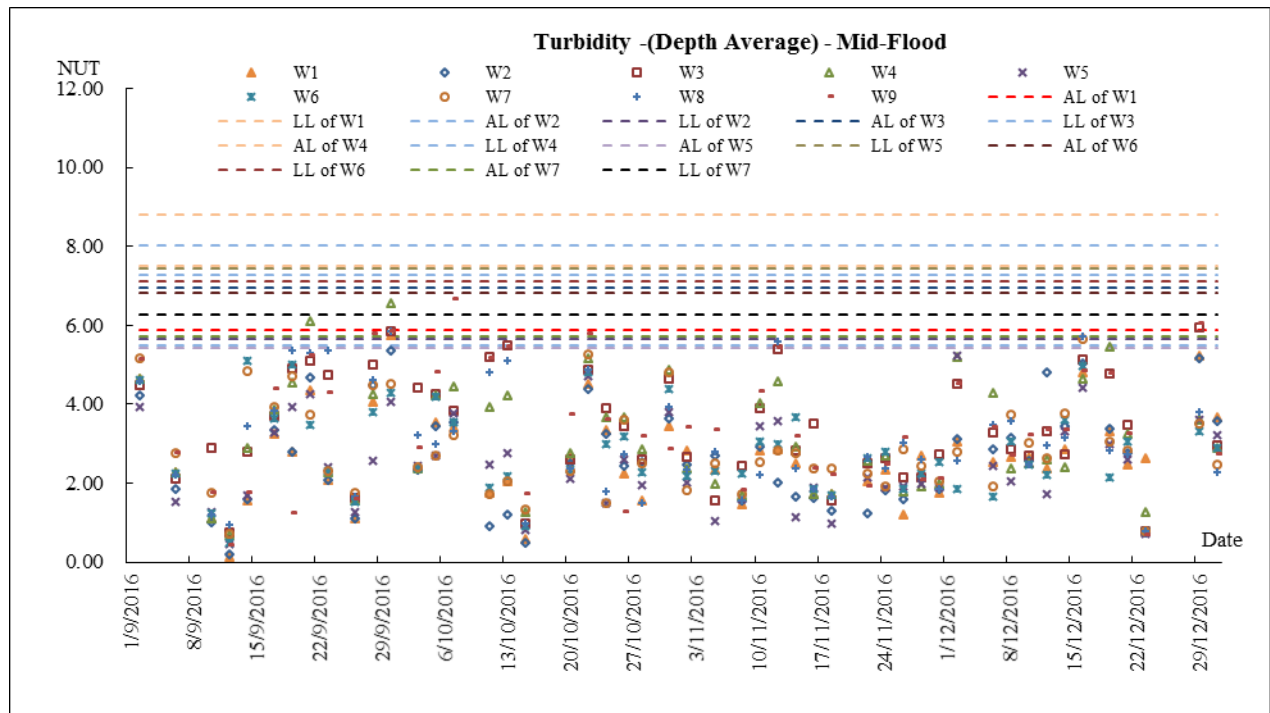
Marine Water Quality – Mid-ebb



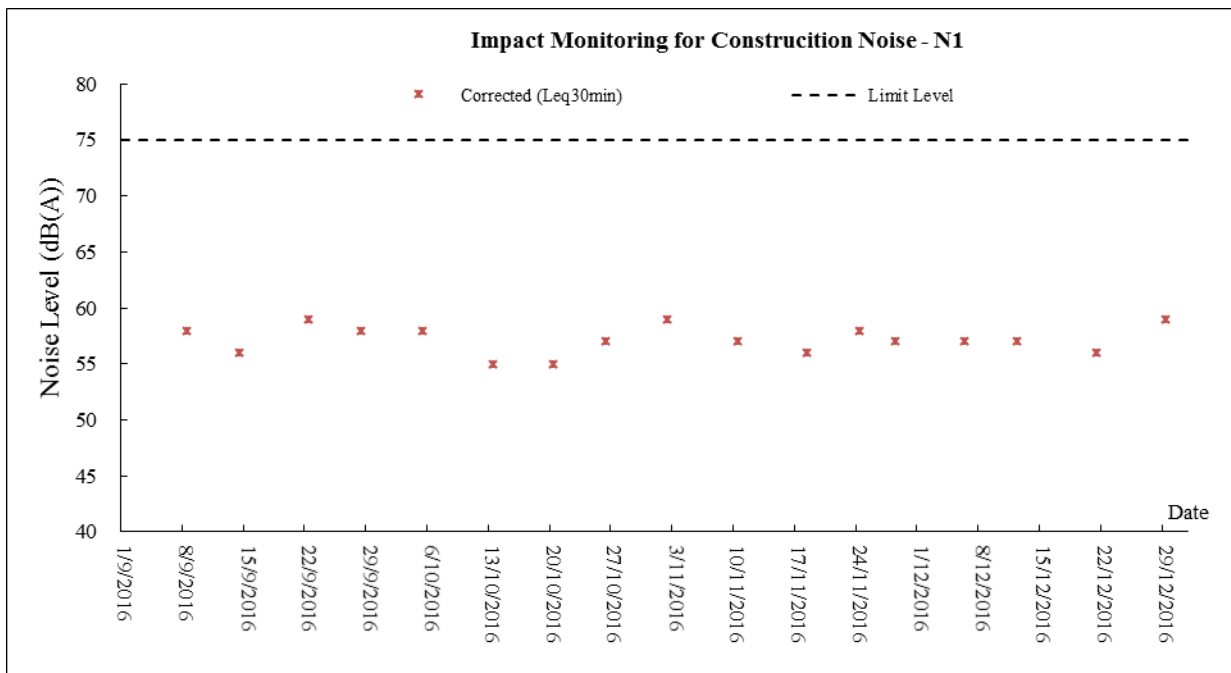


Marine Water Quality – Mid-flood





Noise



Appendix G

Meteorological Data

Weather Condition – October 2016

October 2016 was marked by record-breaking high mean temperatures, despite a succession of cyclonic systems passing by in the vicinity of Hong Kong and the duration of sunshine falling under 80 percent of the October normal. The monthly mean maximum temperature of 29.1 degrees, monthly mean temperature of 26.8 degrees and monthly mean minimum temperature of 25.0 degrees were all 1.3 degrees above their respective normals and were the highest ever on record for October. After the passage of the remnant circulation of Severe Typhoon Megi over southern China in late September, Tropical Storm Aere hovered for days over the coastal waters of Guangdong at the doorstep of Hong Kong in early October. Then came Super Typhoon Sarika and Super Typhoon Haima in less than a week between 16 and 21 October. The former brought torrential rain that broke the October hourly rainfall record and triggered the Black Rainstorm Warning on 19 October, while the latter led to the issuance of the No. 8 Gale or Storm Signal on 21 October. The monthly rainfall recorded at the Hong Kong Observatory was 624.4 millimetres, more than six times the October normal of 100.9 millimetres and the second highest on record for October. The accumulated rainfall of 2888.9 millimetres up to the end of October was about 24 percent above the normal figure of 2334.0 millimetres for the same period.

Weather Condition – November 2016

November 2016 was characterized by relatively warm weather during the first three weeks, followed by rainy and cooler weather in the latter part of the month. Overall, the month was warmer and much wetter than usual. The mean temperature for the month was 22.3 degrees, 0.5 degree above the normal figure of 21.8 degrees. The monthly total rainfall recorded at the Hong Kong Observatory was 131.3 millimetres, more than three times the November normal of 37.6 millimetres and the eighth highest on record for November. The accumulated rainfall of 3020.2 millimetres up to end of November was about 27 percent above the normal figure of 2371.7 millimetres for the same period.

Weather Condition – December 2016

With the northeast monsoon over the south China coastal areas remaining relatively weak for most of the month, December 2016 was warmer than usual. The monthly mean temperature of 19.6 degrees was 1.7 degrees above the normal figure of 17.9 degrees and the third highest for December since record began in 1884. The total rainfall recorded in the month was only 6.6 millimetres, less than one quarter of the normal figure of 26.8 millimetres. But in terms of rainfall for the whole year, the annual total of 3026.8 millimetres was about 26 percent above the yearly normal of 2398.5 millimetres.

*The detailed meteorological data for each successive day can be referred to in the Monthly EM&A Reports (October, November and December 2016).

Appendix H Monthly Summary Waste Flow Table

Environmental Management Plan

Date: 31 December 2016

Name of Department: WSD

Contract No.: 1/WSD/13

MONTHLY SUMMARY WASTE FLOW TABLE FOR 2016 (YEAR)

QUARTER ENDING	ACTUAL QUANTITIES OF INERT C&D MATERIALS GENERATED MONTHLY						ACTUAL QUANTITIES OF C&D WASTES GENERATED MONTHLY				
	TOTAL QUANTITY GENERATED	BROKEN CONCRETE (SEE NOTE 3)	REUSED IN THE CONTRACT	REUSED IN OTHER PROJECTS	DISPOSED AS PUBLIC FILL	IMPORTED FILL	METALS	PAPER/ CARDBOARD PACKAGING	PLASTICS (SEE NOTE 2)	CHEMICAL WASTE	OTHERS, E.G. GENERAL REFUSE
	(IN '000M ³)	(IN '000M ³)	(IN '000M ³)	(IN '000M ³)	(IN '000M ³)	(IN '000M ³)	(IN '000 KG)	(IN '000KG)	(IN '000KG)	(IN '000KG)	(IN '000M ³)
JAN	-	-	-	-	0.17	-	-	-	-	-	0.07
FEB	-	-	-	-	0	-	-	-	-	-	0.04
MAR	-	-	-	-	0	-	-	-	-	-	0.02
APR	-	-	-	-	0	-	-	-	-	-	0.06
MAY	-	-	-	-	0.70	-	-	-	-	-	0.02
JUNE	-	-	-	-	2.00	-	-	-	-	-	0.02
SUB-TOTAL	0	0	0	0	2.87	0	0	0	0	0	0.23
JULY	-	-	-	-	8.97	-	-	-	-	-	0.07
AUG	-	-	-	-	11.87	-	-	-	-	-	0.06
SEPT	-	-	-	-	9.64	-	-	-	-	-	0.02
OCT	-	-	-	-	12.71	-	-	-	-	-	0.03
NOV	-	-	-	-	13.25	-	-	-	-	-	0.03
DEC	-	-	-	-	0	-	-	-	-	-	0.01
TOTAL	0	0	0	0	46.06	0	0	0	0	0	0.45

Appendix I

Implementation Schedule for Environmental Mitigation Measures (ISEMM)

Table A.2 Implementation Schedule of Water Quality Mitigation Measures

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
Water Quality - Construction Phase									
<i>General</i>									
3.7.2	2.9.2	The Contractor shall observe and comply with the Water Pollution Control Ordinance (WPCO) and its subsidiary regulations. The Contractor shall carry out the works in such a manner as to minimise adverse impacts on the water quality during execution of the works. In particular the Contractor shall arrange his method of working to minimise the effects on the water quality within and outside the site and on the transport routes.	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.3	2.9.3	The Contractor shall follow the practices, and be responsible for the design, construction, operation and maintenance of all the mitigation measures below and as specified in ProPECC PN 1/94 - Construction Site Drainage. The design of the mitigation measures shall be submitted by the Contractor to the Engineer for approval. All discharge from the construction works should meet the discharge standards stipulated under the WPCO "Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters".	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.4	2.9.4	<p><i>Site Preparation / Clearance</i></p> <p>Proper construction site drainage management measures should be implemented to control site runoff and drainage, and thereby prevent high sediment loadings from reaching nearby water bodies. Site runoff and wastewater should not be discharged into nearby water bodies without proper treatment.</p>	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94
3.7.5	2.9.5	Turbid water from construction sites must be treated to minimise the solids content before being discharged. Advice on the handling and disposal of site discharge is given in the ProPECC Note PN 1/94 – “Construction Site Drainage”.	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94
3.7.6	2.9.6	In general, surface runoff from construction sites should be discharged into water bodies via adequately designed silt removal facilities such as sand traps, silt traps and sedimentation tanks. Channels or earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Sufficient numbers of pumps and tanks of adequate capacity should be provided on-site. Perimeter channels at site boundaries should be provided to intercept storm run-off from outside the site so that it will not wash across the site. Catchpits and perimeter channels should be	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.7	2.9.7	<p>constructed in advance of earthworks.</p> <p>Silt removal facilities and diversion channels should be maintained and the deposited silt and grit should be removed regularly, especially at the onset of and after each rainstorm to ensure proper functioning of these facilities at all times.</p>	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94
3.7.8	2.9.8	<p>Measures should be taken to prevent the washing away of construction materials, soil, silt or debris into the nearby water bodies. Open stockpiles susceptible to erosion should be covered with tarpaulin or similar fabric and provided with containment such as bunds, sand bag barriers or equivalent measures, especially during the wet season (April – September) or when heavy rainstorm is predicted. Runoff to watercourses should be intercepted by minimising flat exposed areas of permeable soil, and by forming pits or diversion channels into which runoff can flow to suitable treatment facilities before discharge.</p>	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94
3.7.9	2.9.9	<p><i>Drilling Works</i></p> <p><i>Launching site at Cheung Chau</i></p> <p>The proposed launching site at Cheung Chau should be paved with a slight fall towards land to prevent site runoff from directly flowing to the</p>	To minimize adverse water quality impact from	Proposed launching site at Cheung Chau /	Construction Contractor		√		Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.10	2.9.10	<p>sea. The launching site should be provided with an adequately designed site drainage system to contain and treat polluted site runoff and wastewater. Adequate numbers of tank with sufficient capacity should be provided on-site to collect, store and treat drilling fluids, cuttings and/or chemicals. These tanks should be surrounded by bunds and regularly inspected and maintained to avoid leakage.</p>	drilling works	during construction					
3.7.10	2.9.10	<p>During directional drilling, excavated spoil (cuttings) will be carried as a slurry with the drilling fluid to emerge at Cheung Chau. The slurry should be treated to remove the cuttings and recycled as drilling fluid. Cuttings should be stored in containers prior to removal and disposal as construction & demolition material to public fill reception facilities.</p>	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor	√			Water Pollution Control Ordinance
3.7.11	2.9.11	<p>If temporary storage of cuttings is required for later reuse, this should be undertaken in Cheung Chau. Care should be taken in the storage of cuttings especially during the wet season and the storage area should be covered and banded to prevent silty runoff entering water bodies.</p>	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor	√			Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.12	2.9.12	A schematic layout plan of the proposed launching site and drainage measures at Cheung Chau is shown in Figure 3.3 to demonstrate the launching site has adequate land area to setup the necessary construction equipment, auxiliary equipment, site offices and drilling fluid containment, recovery and treatment systems. In general, the site will be divided into clean area and dirty area. The clean area will be used to house the site offices, storage area and other non-polluting uses. The dirty area will be the main drilling works site consisting of the drilling rig, entry pit, mud tank, drilling pipes storage, drilling fluid recycling and treatment systems, stockpiling area and wastewater treatment systems.	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.13	2.9.13	The entire dirty area should be surrounded by a 0.5 m tall concrete bund to fully contain and prevent site runoff from discharging into the marine waters untreated as well as to prevent surface runoff from entering the site. The entry pit should be further surrounded by a 0.3 m tall concrete bund for added protection to contain and avoid spillage of drilling fluid. All site runoff should be diverted to an adequately designed wastewater treatment system for treatment before discharge.	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor		√		Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.14	2.9.14	The perimeter of the clean area should be surrounded with 300 mm u-channel to collect and divert all site runoff for treatment before discharge. Bund should be provided to prevent surrounding surface runoff from entering the site.	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor	√			Water Pollution Control Ordinance
3.7.15	2.9.15	After separating the cuttings, bentonite slurry should be re-circulated for reuse in the drilling works. By adopting a forward reaming approach all slurry treatment and drilling fluid recycling systems should be located and managed on Cheung Chau.	To minimize adverse water quality impact from drilling works	Proposed launching site at Cheung Chau / during construction	Construction Contractor	√			Water Pollution Control Ordinance
3.7.16	2.9.16	<i>Reception Site at Lantau</i> The pilot hole and reaming should be stopped approximately 50 m short of the final exit point at Chi Ma Wan in order to prevent any release of slurry in to the marine environment. Prior to drilling the final 50 m, the reamed hole should be thoroughly cleaned with water to remove all cuttings and drilling fluid. The final 50 m of drilling should be completed using water instead of bentonite in order to prevent the release of bentonite at the exit pit. Approximately 0.3 m high concrete bund should be constructed around the exit pit to contain the drilling fluid, which is mainly silty water and generated when the drill head bores through the rock at Lantau during the	To minimize adverse water quality impact from drilling works	Proposed reception site at Lantau / during construction	Construction Contractor	√			Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.17	2.9.17	<p>final drilling process. The exact level of the concrete bund should be determined on site to ensure that it will not be lower than the ground level of the launching site at Cheung Chau.</p> <p>The use of containment structure such as earth bund, sand bag barriers wrapped with geotextile fabric or similar material, diversion channels or other similar techniques should be installed surrounding the site boundary at Lantau during the wet season to intercept storm runoff from outside the site so that it will not wash across the site (or into the exit pit).</p>	To minimize adverse water quality impact from drilling works	Proposed reception site at Lantau / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.18	2.9.18	To provide further protection, silt curtain should be installed before commencement of works at Lantau to minimize the water quality impact. The design and installation should be certified by the Environmental Team (ET), verified by the Independent Environmental Checker (IEC) and approved by the Engineer to ensure the intended protection can be achieved. The Contractor should regularly inspect and maintain the silt curtain to ensure its effectiveness.	To minimize adverse water quality impact from drilling works	Proposed reception site at Lantau / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.20	2.9.20	<i>Management Plans and Monitoring</i> The Contractor should submit a Drainage	To minimize adverse	All works site /	Construction		√		Water Pollution

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		Management Plan detailing the temporary drainage measures along with the proposed measures to ameliorate the potential water quality impacts to the Environmental Team (ET) for certification, the Independent Environmental Checker (IEC) for verification and to the Engineer for approval before commencement of the construction works.	water quality impact during construction	during construction	Contractor				Control Ordinance
3.7.21	2.9.21	The Contractor should also submit a Drilling Fluid Management Plan outlining expected volume of water, the type of soil and an estimated quantity of bentonite, full details of plans for monitoring drilling fluid flow (out and return) and pressure, wastewater discharge, slurry containment, treatment, recycling and transport, and the approved disposal site. The plan should also contain details of contingency plans for dealing with frac-out or other inadvertent release of slurry. Contingency plans should include the provision of standby pumps, containment booms, vacuum unit and tanks on site to contain and remove turbid, muddy water should incidental frac-outs occur.	To minimize adverse water quality impact during construction in particular during drilling works	All works site / during construction	Construction Contractor	√			Water Pollution Control Ordinance
3.7.22	2.9.22	Regular monitoring of suspended solids and turbidity should be conducted during construction works. Any exceedance of water quality in the nearby water bodies caused by site runoff should be rectified in accordance with EM&A programme	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor	√			Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.23	2.9.23	for this Project. <i>Concreting Work</i> Runoff should be carefully channelled and treated to prevent concrete-contaminated water from entering water bodies. Adjustment of pH can be achieved by adding a suitable neutralising reagent to wastewater prior to discharge.	To minimize adverse water quality impact during construction (in particular concreting works)	All works site / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.24	2.9.24	Any exceedance of the acceptable range of pH levels in nearby water bodies caused by site runoff containing concrete should be monitored and rectified under the EM&A programme for this Project.	To minimize adverse water quality impact during construction (in particular concreting works)	All works site / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.25	2.9.25	<i>Site Workshop or Depot</i> <i>General Construction Works</i> Site workshop or depot including storage of chemicals and chemical waste should be located at the proposed launching site in Cheung Chau only. No workshop or depot should be located at the proposed reception site in Lantau.	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		Water Pollution Control Ordinance
3.7.26	2.9.26	Any Contractor generating waste oil or other chemicals as a result of his activities should	To minimize adverse water quality impact	All works site / during	Construction Contractor		√		Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.27	2.9.27	<p>register as a chemical waste producer and provide a safe designated storage area for chemicals on site. The storage site should be located away from existing water bodies.</p> <p>All compounds in works areas should be located on areas of hard standing surface with provision of diversion channels and settlement ponds where necessary to allow interception and controlled release of settled / treated water. Hard standing compounds should drain via an oil interceptor. The oil interceptor should be regularly inspected and cleaned to avoid wash-out of oil during storm conditions. A bypass should be provided to avoid overload of the interceptor's capacity. To prevent spillage of fuels or other chemicals to water bodies, all fuel tanks and storage areas should be sited on sealed areas within a bund of a capacity equal to 110% of the storage capacity of the largest tank. Where temporary storage of chemicals or fuel drums outside the storage area is necessary, drip tray should be provided. Disposal of the waste oil should be carried out by a licensed collector. Good housekeeping practices should be implemented to minimise careless spillage and to keep the storage and the work space in a tidy and clean condition. Appropriate training including safety codes and relevant manuals should be given to the personnel who regularly handle the chemicals on site.</p>	<p>during construction</p> <p>To minimize adverse water quality impact during construction</p>	<p>construction</p> <p>All works site / during construction</p>	<p>Construction Contractor</p>				<p>Water Pollution Control Ordinance</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.28	2.9.28	<p><i>Emergency Contingency Plan</i></p> <p>The Contractor should prepare an Emergency Contingency Plan (spill response plan) for the Project to contain and remove accidental spillage of drilling fluids, chemicals and all hazardous materials on-site including fuels at short notice and to prevent or to minimize the quantities of contaminants from entering the nearby water bodies and affecting the sensitive habitats. The Contractor should submit the Emergency Contingency Plan to the ET for review & comment and to the Engineer for approval. The Plan should include, but not limited to, the following:</p> <ul style="list-style-type: none"> (i) potential emergency situations (ii) chemicals or hazardous materials used on-site (and their location) (iii) emergency response team (iv) emergency action plans and procedures (v) list of emergency telephone hotlines (vi) locations and types of emergency response equipment (vii) training plan and emergency drill (viii) schedules for review and audit. 	<p>To prevent or minimize the quantities of contaminants entering the nearby water bodies and affecting the habitats in case of accidental spillage of chemicals and hazardous materials</p>	<p>All works site / during construction</p>	<p>Construction Contractor</p>	<p>√</p>			<p>Water Pollution Control Ordinance</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.29	2.9.29	<p><i>General Guidance for Handling Spillage / Leakage</i></p> <p>In the event that accidental spillage or leakage of hazardous substances / chemical wastes takes place, the response procedures as listed below should be followed. It should be noted that the procedures below are not exhaustive. The Contractor should propose other response procedures in the emergency contingency plan based on actual site conditions as well as the particular types and quantities of chemicals or hazardous substances used, handled and stored on-site.</p> <ul style="list-style-type: none"> • Contact person in charge or nominated person immediately and initiate action plans based on the emergency contingency plan. • Oil leakage or spillage should be contained and cleaned up immediately. Waste oil should be collected and stored for recycling or disposal in accordance with the Waste Disposal Ordinance. • Instruct untrained personnel to keep at a safe distance well away from the spillage area. • If the spillage / leakage is severe or is causing hazard to life, initiate emergency evacuation and call the emergency services. • Only trained persons equipped with suitable protective clothing and equipment should be allowed to enter and clean up the waste 	To prevent or minimize the quantities of contaminants entering the nearby water bodies and affecting the habitats in case of accidental spillage of chemicals and hazardous materials	All works site / during construction	Construction Contractor		√		Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		<p>spillage / leakage area.</p> <ul style="list-style-type: none"> Where the spillage / leakage is contained in the enclosed storage area, the waste can be transferred back into suitable containers by suitable handheld equipment, such as hand operated pumps, scoops or shovels. If the spillage / leakage quantity is small, it can be covered and mixed with suitable absorbing materials such as absorbent tissue paper, pads, dry soft sand or vermiculite. The resultant slurry should be treated as chemical waste and transferred to suitable containers for disposal. For spillage / leakage into nearby water bodies, immediate action is required to contain the spillage / leakage. Appropriate structural, physical barrier or secondary containment (e.g. containment booms) should be deployed to contain the spill and if possible to prevent contaminated water from dispersing away from the source. Suitable liquid absorbing materials such as absorbent tissue paper, pads or rolls should be used to recover the spilt substances. The resultant slurry should be treated as chemical waste and transferred to suitable containers for disposal. For spillage / leakage in other areas, immediate action is required to contain the spillage / leakage. Suitable liquid absorbing materials such as absorbent tissue paper, pads, dry soft sand or vermiculite should be used to cover the spill. The resultant slurry should be 							

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		<p>treated as chemical waste and transferred to suitable containers for disposal.</p> <ul style="list-style-type: none"> Areas that have been contaminated by chemical waste spillage / leakage should be cleaned. While water is a soluble solvent for aqueous chemical wastes and water soluble organic waste, kerosene or turpentine should be used for organic chemical wastes that are not soluble in water. The waste from the cleanup operation should be treated and disposed of as chemical waste. In incidents where the spillage / leakage may result in significant contamination of an area or risk of pollution, the Environmental Protection Department and other relevant departments should be informed immediately. 							
3.7.30	2.9.30	<p><i>Presence of Additional Population (Workers)</i></p> <p>Sewage arising from the additional construction workers on site should be collected in a suitable storage facility, such as portable chemical toilets. An adequate number of portable toilets should be provided for the construction workforce. The portable toilets should be maintained in a state that will not deter the workers from using them. Wastewater collected should be discharged into foul sewers and collected by licensed collectors.</p>	To minimize adverse water quality impact during construction	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94 Water Pollution Control Ordinance
3.7.31	2.9.31	<p>The collected wastewater from sewage facilities and also from eating areas or washing facilities of site offices should be disposed to foul sewer. If</p>	To minimize adverse water quality impact	All works site / during construction	Construction Contractor		√		ProPECC PN 1/94

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		there is no foul sewer in the vicinity, a septic tank and soakaway system or for larger flow, a sewage treatment plant should be provided. All domestic sewage discharges (except into foul sewer) are controlled under the WPCO. The Contractor must apply for a discharge licence from EPD and must comply with the terms and conditions of a valid WPCO licence.	during construction						Water Pollution Control Ordinance
3.7.32	2.9.32	<i>Sterilization of Water Main Prior to Commissioning</i> Effluent from the sterilization of water main should be treated including dechlorination by physical process e.g. adsorption by activated carbon filter, or chemical process e.g. neutralisation by dechlorination agent dosing to ensure compliance with the discharge requirements stipulated in the TM-DSS. Adequate tanks with sufficient capacity should be provided to allow proper treatment of the effluent prior to discharge.	To minimize adverse water quality impact during construction in particular during sterilization of the completed water main	All works site / during construction	Construction Contractor	√			ProPECC PN 1/94 Water Pollution Control Ordinance
3.7.33	2.9.33	The sterilization of the water main and the dechlorination process should be conducted at the launching site at Cheung Chau. As the site at Cheung Chau is designated for secondary recreational contact, the sterilization of the main should be scheduled during the dry season. The	To minimize adverse water quality impact during construction in particular during sterilization of the completed water main	All works site / during construction	Construction Contractor	√			ProPECC PN 1/94 Water Pollution Control Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.34	2.9.34	<p>Contractor should submit for the Engineer approval, details of the dechlorination process and any chemicals including dosage to be used.</p> <p>The Contractor should provide a dechlorination plant of sufficient capacity to contain and treat the sterilising water with high chlorine concentration before discharge. Details of the specification of the dechlorination plant should be submitted to the Engineer for approval. They should include but not limited to the following:</p> <ul style="list-style-type: none"> the nominal flow rate shall not be less than 36 cubic meter per hour; the plant shall be capable of dechlorinating water with chlorine level up to 40 mg/litre; the maximum chlorine level of dechlorinated water shall be <0.2 mg/litre; the recommended contact time if dechlorination by adsorption with activated carbon filter is proposed; a water meter or other measuring device shall be installed at the inlet pipe of the dechlorination plant to measure the amount of water treated, in cubic metres; and sensors and data loggers for continuous measurement and record of chlorine level shall be installed at the inlet and outlet pipe of the dechlorination plant. 	<p>To minimize adverse water quality impact during construction in particular during sterilization of the completed water main</p>	<p>All works site / during construction</p>	<p>Construction Contractor</p>	<p>√</p>			<p>ProPECC PN 1/94</p> <p>Water Pollution Control Ordinance</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
3.7.35	2.9.35	<i>In-situ</i> testing of total residual chlorine should be conducted every hour at the discharge point to ensure the chlorine concentration does not exceed the stipulated maximum level when dechlorinated water is being discharged.	To minimize adverse water quality impact during construction in particular during sterilization of the completed water main	All works site / during construction	Construction Contractor	√			ProPECC PN 1/94 Water Pollution Control Ordinance
3.7.36	2.9.36	If the dechlorinated water exceed the allowed concentration, discharge must be suspended and the water should be circulated to a standby tank for further dechlorination and testing. The location of the sampling point will depends on the discharge point to be proposed by the Contractor. The Contractor should submit details of the proposed sampling location, frequency and equipment for verification by the ET Leader and approval by the Engineer before commencement of the sterilization work of the completed water main. The proposed sampling location(s) should be submitted to EPD for reference.	To minimize adverse water quality impact during construction in particular during sterilization of the completed water main	All works site / during construction	Construction Contractor	√			ProPECC PN 1/94 Water Pollution Control Ordinance
Water Quality - Operational Phase									

* D=Design, C=Construction, O=Operation
 N/A Not applicable

Table A.4 Implementation Schedule of Waste Management Measures

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
Waste - Construction Phase									
<i>General</i>									
7.6.1	5.1.1	The HKSAR Government's construction and demolition waste management policy follows the same hierarchy as for other wastes, i.e. in order of desirability: avoidance, minimisation, recycling, treatment and safe disposal of waste. During the construction period the Contractor, Engineer and environmental specialists (Environmental Team, Independent Environmental Check) should work closely together with a view to reduce the volumes of materials requiring removal and final disposal.	To reduce the volumes of materials requiring removal and final disposal	All works site / during construction	Construction Contractor, Engineer, Environmental Team and Independent Environmental Check	√			Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process
7.6.2	5.1.2	Upon appointment, the main Contractor of each construction contract should prepare and implement an Environmental Management Plan (EMP) in accordance with ETWB TCW No. 19/2005 – "Environmental Management on Construction Sites" which should describe the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from the construction activities. The EMP should incorporate site specific factors, such as the designation of areas for segregation and temporary storage of reusable and recyclable materials. The waste management plan now becomes part of the EMP. The EMP should be submitted to the Engineer for approval. The	Waste reduction, reuse, recycling and proper disposal of waste	All works site / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.3	5.1.3	<p>Contractor should implement the waste management practices in the EMP throughout the construction stage of the Project. The EMP should be reviewed regularly and updated (preferably monthly) by the Contractor. The EMP should take into account the recommended mitigation measures in the approved EIA Report.</p> <p>The Contractor should refer to the Construction and Demolition Material Management Plan (C&DMMP) to be conducted during the design stage of this Project to facilitate him in the preparation of the EMP. The C&DMMP should be endorsed by WSD's Vetting Committee and approved by the Public Fill Committee (PFC). WSD's Vetting Committee will monitor the implementation of the C&DMMP and report to Public Fill Committee in accordance with ETWB TCW No. 33/2002 during construction.</p>	<p>Waste reduction, reuse, recycling and proper disposal of waste</p>	<p>All works site / during construction</p>	<p>Construction Contractor</p>	<p>√</p>			<p>Waste Disposal Ordinance ETWB TCW No. 19/2005</p>
7.6.4	5.1.4	<p>The Contractor should nominate an appropriate person, such as site agent or environmental officer, to be responsible for collection and effective disposal of all wastes generated at the site to an approved facility. Training of construction staff should be undertaken by the Contractor about the concept of site cleanliness and appropriate waste management procedures. The Contractor should develop and provide toolbox talk for on-site sorting of C&D materials to enhance worker's awareness in handling, sorting, reuse and recycling of C&D</p>	<p>Waste reduction, reuse, recycling and proper disposal of waste</p>	<p>All work sites / during construction</p>	<p>Construction Contractor</p>	<p>√</p>			<p>Waste Disposal Ordinance ETWB TCW No. 19/2005</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.5	5.1.5	<p>materials. Requirements for staff training should be included in the EMP.</p> <p>Good planning and site management practice should be employed to eliminate over ordering or mixing of construction materials to reduce wastage. Proper storage and site practices will minimise the damage or contamination of construction materials. Regular cleaning and maintenance of the waste storage area should be provided.</p>	<p>Waste reduction, reuse, recycling and proper disposal of waste</p>	<p>All work sites / during construction</p>	<p>Construction Contractor</p>	√			<p>Waste Disposal Ordinance ETWB TCW No. 19/2005</p>
7.6.6	5.1.6	<p>Where waste generation is unavoidable, the potential for recycling or reuse should be rigorously explored. If wastes cannot be recycled, disposal routes described in the EMP should be followed. A recoding system for the amount of waste generated, recycled and disposed (including the disposal sites) should be implemented. In order to monitor the disposal of C&D material and solid wastes at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be included. One may make reference to ETWB TCW No. 31/2004 for details.</p>	<p>Waste reduction, reuse, recycling and proper disposal of waste</p>	<p>All work sites / during construction</p>	<p>Construction Contractor</p>	√			<p>Waste Disposal Ordinance ETWB TCW No. 19/2005, 31/2004</p>
7.6.7	5.1.7	<p>Imported soft fill and rocks, if required, should be source from CEDD's fill bank, other projects or other approved sources instead of using new materials. Approval from the Engineer and all other relevant parties should be obtained by the Contractor before importation of the fill materials.</p>	<p>Waste reduction, reuse, recycling and proper disposal of waste</p>	<p>All work sites / during construction</p>	<p>Construction Contractor</p>	√			<p>Waste Disposal Ordinance ETWB TCW No. 19/2005</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.8	5.1.8	The main staging area of the works should be located at the proposed launching site in Cheung Chau. Storage of equipment, materials, chemical waste and general refuse as well as the drilling fluid recycling system should also be located in Cheung Chau.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.9	5.1.9	<i>On-site Sorting, Reuse and Recycling</i> All waste materials should be segregated into categories covering: <ul style="list-style-type: none"> excavated materials suitable for public filling facilities; remaining C&D waste for landfill; spent bentonite for public filling facilities chemical waste; and general refuse for landfill. 	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.10	5.1.10	Proper segregation and disposal of construction waste should be implemented. Separate containers should be provided for inert and non-inert wastes.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.11	5.1.11	The reuse of excavated materials within this Project should be adopted as far as practicable. The opportunity of reusing the material in other projects in Cheung Chau should also be explored.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during detailed design and construction	Detailed Design Engineer / Construction Contractor	√	√		Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.12	5.1.12	Sorting is important to recover materials for reuse and recycling. Specific area should be allocated for on-site sorting of C&D materials and to provide a temporary storage area for those sorted materials such as metals, concrete, timber, plastics, glass, excavated spoils, bricks / tiles and waste papers. If area is limited, all C&D materials should at least be sorted on-site into inert and non-inert component. Non-inert materials (C&D waste) such as bamboo, timber, vegetation, packaging waste and other organic materials should be reused and recycled wherever possible and disposed of to designated landfill only as a last resort. Inert materials (public fill) such as concrete, stone, clay, brick, soil, asphalt and the like should be separated and reuse in this or other projects (subject to approval by the relevant parties in accordance with the ETWB TCW No. 31/2004) before disposed of at a public filling facility operated by Civil Engineering and Development Department (CEDD). Steel and other metals should be recovered from demolition waste stream and recycled.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 31/2004

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.13	5.1.13	The reuse of inert materials such as soil, rock and broken concrete should be maximised. Waste should be separated into fine, soft and hard materials. With the use of a crusher coarse material can be crushed to make it suitable for use as fill material where fill is required in the works. This minimises the use of imported material and maximises use of the C&D material produced.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.14	5.1.14	Prior to export of material from the site, the potential for it to be reused should be assessed. Most C&D material can easily be reused with minimum processing. Waste separation methods should be followed to ensure that C&D waste is separated at source. Suitable soft materials should be used for landscaping and grading of embankments. Fine material should be separated out and used as topsoil.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.15	5.1.15	The feasibility of using recycled aggregates in lieu of virgin materials should be rigorously considered during the detailed design and construction stages as stipulated in WBTC No. 12/2002 and ETWB TCW No. 24/2004. In general, recycled aggregates are suitable for use as fill materials in earthworks, road sub-base formation, and drainage works. Recycled aggregates can also be used in concrete (up to Grade 35) for mass concrete walls and other minor structures such as planter boxes, toe wall	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 24/2004 WBTC No. 12/2002

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		planters and pavement, etc.							
7.6.16	5.1.16	<p><i>Site Clearance / Demolition Materials</i></p> <p><i>Excavated Materials</i></p> <p>All C&D materials should be sorted on-site into inert and non-inert components by the Contractor. Non inert materials (C&D waste) such as wood, glass and plastic should be reused and recycled before disposal to a designated landfill as a last resort (currently assume to be the WENT Landfill) via the Cheung Chau Refuse Transfer Station. Inert materials (public fill) should be reused on-site or in other projects approved by relevant parties in accordance with the ETWB TCW No. 31/2004 before disposed of at public fill reception facilities. Steel and other metals if any should be recovered from C&D materials and recycled.</p>	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√		Waste Disposal Ordinance ETWB TCW No. 19/2005, 31/2004	
7.6.17	5.1.17	Good quality reusable topsoil should be stockpiled for later landscaping works. Stockpiles should be less than 2 m in height, formed to a safe angle of repose and hydroseeded or covered with tarpaulin to prevent erosion during the rainy season and to minimise dust generation.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√		Waste Disposal Ordinance ETWB TCW No. 19/2005	
7.6.18	5.1.18	Control measures for temporary stockpiles on-site should be taken in order to minimize the noise,	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during	Construction Contractor	√		Waste Disposal Ordinance	

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		<p>generation of dust, pollution of water and visual impact. These measures include:</p> <ul style="list-style-type: none"> • surface of stockpiled soil should be regularly wetted with water especially during dry season; • disturbance of stockpiled soil should be minimized; • stockpiled soil should be properly covered with tarpaulin especially when heavy rain storms are predicted; • stockpiling areas should be enclosed where space is available; • stockpiling location should be away from the water bodies; and • an independent surface water drainage system equipped with silt traps should be installed at the stockpiling area. 	disposal of waste	construction					ETWB TCW No. 19/2005
7.6.19	5.1.19	The identification of final disposal sites for C&D materials generated by the construction works will be considered during the detailed design stage of the Project when the volume and types of C&D materials can be more accurately estimated. The Public Fill Committee of CEDD should be consulted on designated outlets (e.g. public fill reception facility) for public fill, whilst EPD should	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 34/2002 WBTC No. 12/2000

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.20	5.1.20	be consulted on landfills for C&D waste. The public fill to be disposed to public fill reception facilities must consist entirely of inert construction materials. Disposal of C&D waste to landfill must not have more than 50% by weight of inert material. The C&D waste delivered for landfill disposal should contain no free water and the liquid content should not exceed 70% by weight.							
7.6.21	5.1.21	In order to avoid dust or odour impacts, any vehicle leaving a works area carrying C&D waste or public fill should have their load covered before leaving the construction site.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005 WBTC No. 19/2001
		C&D materials should be disposed of at designated public fill reception facilities or landfills. Reuse of public fill materials at other construction projects is subject to the approval of the relevant project proponents, Engineer and/or other relevant authorities, such as LandsD, Pland, etc. Furthermore, unauthorized disposal of C&D materials in particular on private agricultural land is prohibited and may be subject to relevant enforcement and regulating actions. The Contractor shall refer and strictly follow the trip-ticket system for the disposal of C&D materials as stipulated in	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005, 31/2004

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
		the ETWB TCW No. 31/2004.							
7.6.22	5.1.22	<i>Bentonite</i> Bentonite slurry used in the drilling works should be treated and recycled at the works area in Cheung Chau. Any bentonite that is not suitable for recycling should be suitably dewatered before disposed of at public fill reception facilities.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005 WBTC No. 19/2001
7.6.23	5.1.23	<i>Chemical Waste</i> Where the construction processes produce chemical waste, the Contractor must register with EPD as a chemical waste producer. Wastes classified as chemical wastes are listed in the Waste Disposal (Chemical Waste) (General) Regulation. These wastes are subject to stringent disposal routes. EPD requires information on the particulars of the waste generation processes including the types of waste produced, their location, quantities and generation rates. A nominated contact person must be registered with EPD. An updated list of licensed chemical waste collector can be obtained from EPD.	Waste reduction, reuse, recycling and proper disposal of chemical waste	All work sites / during construction	Construction Contractor	√			Waste Disposal (Chemical Waste) (General) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste
7.6.24	5.1.24	Storage, handling, transport and disposal of chemical	Waste reduction, reuse,	All work sites / during	Construction	√			Waste Disposal (Chemical Waste)

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.25	5.1.25	waste should be arranged in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published by EPD, and should be collected by a licensed chemical waste collector. Suitable containers should be used for specific types of chemical wastes, containers should be properly labelled (English and Chinese in accordance with instructions prescribed in Schedule 2 of the Regulations), resistance to corrosion, stored safely and closely secure. Stored volume should not be kept more than 450 liters unless the specification has been approved by the EPD. Storage area should be enclosed by three sides by a wall, partition of fence that is at least 2 m height or height of tallest container with adequate ventilation and space.	recycling and proper disposal of chemical waste Waste reduction, reuse, recycling and proper disposal of chemical waste	construction All work sites / during construction	Contractor Construction Contractor		√		(General) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste Waste Disposal (Chemical Waste) (General) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste
7.6.26	5.1.26	Hard standing, impermeable surfaces draining via oil interceptors should be provided in works area compounds. Interceptors should be regularly emptied to prevent release of oils and grease into the surface water drainage system after accidental spillages. The interceptor should have a bypass to prevent flushing during periods of heavy rain. Oil and fuel bunkers should be banded and/or enclosed	Waste reduction, reuse, recycling and proper disposal of chemical waste	Work sites / During construction	Construction Contractor		√		Waste Disposal (Chemical Waste) (General) Regulation Code of Practice on the Packaging and Labelling and Storage of

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						D	C	O	
7.6.27	5.1.27	on three sides to prevent discharge due to accidental spillages or breaches of tanks. Bunding should be of sufficient capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste, whichever is largest. Waste collected from any grease traps should be collected and disposed of by a licensed contractor.							Chemical Waste
		Lubricants, waste oils and other chemical wastes are likely to be generated during the maintenance of vehicles and mechanical equipment. Used lubricants should be collected and stored in individual containers which are fully labelled in English and Chinese and stored in a designated secure place. If possible, such waste should be sent to oil recycling companies, and the empty oil drums collected by appropriate companies for reuse or refill.	Waste reduction, reuse, recycling and proper disposal of chemical waste	All work sites / during construction	Construction Contractor	√			Waste Disposal (General Waste) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste
7.6.28	5.1.28	The registered chemical waste producer (i.e. the contractor) has to arrange for the chemical waste to be collected by licensed collectors. The licensed collector should regularly take chemical waste to a licensed chemical waste treatment facility (such as the Chemical Waste Treatment Centre in Tsing Yi). A trip ticket system operates to control the movement of chemical wastes.	Waste reduction, reuse, recycling and proper disposal of chemical waste	All work sites / during construction	Construction Contractor	√			Waste Disposal (General Waste) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste

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						D	C	O	
7.6.29	5.1.29	No lubricants, oils, solvents or paint products should be allowed to discharge into water courses, either by direct discharge, or as contaminants carried in surface water runoff from the construction site.	Waste reduction, reuse, recycling and proper disposal of chemical waste	All work sites / during construction	Construction Contractor		√		Waste Disposal (Chemical Waste) (General) Regulation Code of Practice on the Packaging and Labelling and Storage of Chemical Waste
7.6.30	5.1.30	Chemical waste should be stored in the works compound at Cheung Chau, no chemical waste should be stored in the works site at Lantau.	To minimize impacts on Lantau South Country Park	The work site at Lantau / during construction	Construction Contractor		√		EIAO-TM
7.6.31	5.1.31	The Contractor should prepare an Emergency Contingency Plan (spill response plan) for the Project to contain and remove accidental spillage of drilling fluids, chemicals and all hazardous materials on-site including fuels at short notice and to prevent or to minimize the quantities of contaminants from entering the nearby water bodies and affecting the sensitive habitats. Details of the requirements are presented in Chapter 3 of the EIA.	To minimize impacts from accidental spillage of drilling fluids and chemicals on-site	All work sites / during construction	Construction Contractor		√		EIAO-TM
		<i>General Works Waste</i>							

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						D	C	O	
7.6.32	5.1.32	<i>Concrete Waste</i> Dry concrete waste (considered as public fill) should be sorted out from the other wastes and recycled for reuse or sorted out for disposal at designated public filling facilities.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 33/2002
7.6.33	5.1.33	<i>Wooden Materials</i> All wooden materials used on-site should be kept separate from other wastes to avoid damage and to facilitate reuse. Timber which cannot be reused should be sorted out from other waste and stored separately from all inert waste before being disposed of to landfill.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 33/2002
7.6.34	5.1.34	Reusable steel or concrete panel shutters, fencing and hoarding and signboard should be used as a preferred alternative to items made of wood, to minimise wastage of wood. Attention should be paid to WBTC No. 19/2001 - Metallic Site Hoardings and Signboards to reduce the amount of timber used on construction sites. Metallic alternatives to timber are readily available and should be used rather than new timber. Precast concrete units should be adopted wherever feasible to minimize the use of timber formwork.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 33/2002

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.35	5.1.35	Only waste material need be taken to a landfill. It should be separated from recyclable wood and steel materials. As for all waste types these materials should be reused on-site or other approved sites before disposal is considered as an option. Disposal to landfill should only be considered as a final option. Contractors are responsible for storage of re-useable materials on-site.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005, 33/2002
7.6.36	5.1.36	<i>Municipal Waste</i> General refuse generated on-site should be stored in enclosed bins or skips and collected separately from other construction and chemical wastes and disposed of at designated landfill. A temporary refuse collection point should be set up by the contractor to facilitate the collection of refuse by licensed contractors. The removal of waste from the site should be arranged on a daily or at least on every second day by the Contractor to minimise any potential odour impacts, minimise the presence of pests, vermin and other scavengers and prevent unsightly accumulation of waste.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor	√			Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.37	5.1.37	For the works within Lantau South Country Park, the Contractor should ensure that all general refuse including food scraps and packaging materials generated by the workers are properly packed and removed from site daily at the end of each work shift.	To minimize impacts on Lantau South Country Park	The work site at Lantau / during construction	Construction Contractor	√			EIAO-TM

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
7.6.38	5.1.38	No refuse should be left in the works area at Lantau. The recyclable component of the municipal waste generated by the workforce, such as aluminium cans, paper and cleansed plastic containers should be separated from other waste. Provision and collection of recycling bins for different types of recyclable waste should be set up by the Contractor. The contractor should also be responsible for arranging recycling companies to collect these materials.	Waste reduction, reuse, recycling and proper disposal of waste	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005
7.6.39	5.1.39	The burning of refuse on-site is prohibited under the Air Pollution Control Ordinance (APCO) (Cap.311).	Waste reduction, reuse, recycling and proper disposal of waste as well as air pollution control	All work sites / during construction	Construction Contractor		√		Waste Disposal Ordinance ETWB TCW No. 19/2005 Air Pollution Control Ordinance
Waste – Operation Phase									
		Nil							

* D=Design, C=Construction, O=Operation
 N/A Not applicable

Table A.5 Implementation Schedule of Construction Noise Mitigation Measures

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
Noise - Construction Phase									
<i>Level 1 Mitigation – Use of Quiet Plant</i>									
8.6.2	6.8.2	The quiet plant used in the construction noise calculation is shown in Table 8.4 and Appendix 8.1 of the EIA. The Contractor can propose other suitable alternative equipment with similar or lower sound power level.	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor	√			Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process
8.6.3	6.8.3	The use of quiet plant is considered to be the most effective ways of alleviating construction noise impact. The Contractor should use quiet plant with sound power level lower than that stipulated in the TM-GW as the Level 1 mitigation for construction noise.	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor	√			Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process
8.6.4	6.8.4	The use of mini or lower power rating equipment (e.g. mini excavator) should also be considered where practical. This technique would be feasible and practical at some locations given the limited space available for using large size construction equipment and the small scale works involved such as the land-based water main in Cheung Chau.	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor	√			Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
8.6.5	6.8.5	The Contractor should take note of ETWB TCW No. 19/2005 – Environmental Management on Construction Sites which sets out the policy and procedures requiring contractors to, among others, adopt Quality Powered Mechanical Equipment (QPME).	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor		√		Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process ETWB TCW No. 19/2005
8.6.6 Table 8.4	6.8.6 Table 6.4	A list of quiet powered mechanical equipment (PME) recommended for use during construction phase is tabulated in Table 8.4 of the EIA.	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor		√		Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process ETWB TCW No. 19/2005
8.6.8	6.8.8	<i>Level 2 Mitigation - Use of Temporary Noise Barriers</i> Since NSR 2 (as with most of the NSRs within the Project area) are typically low-rise village houses	To protect NSRs from noise during construction	The proposed launching site at Cheung Chau as	Construction Contractor		√		Environmental Impact Assessment Ordinance

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
8.6.9	6.8.9	<p>of not more than 3 storeys (NSR 1 is one storey), it would be effective to have noise screening structures or temporary noise barriers purposefully-built along the site boundary to provide additional protection to NSRs close to the construction site boundary. This could be in the form of purposefully-built site hoarding constructed from appropriate materials with a minimum superficial density of 7 kg/m². The noise barrier should have a vertical height of at least 4 m with a small cantilevered upper portion if necessary ensuring that the operating equipment can be shielded from the view of the NSRs. The temporary noise barrier should have no gaps or opening at joints. The Contractor should regularly inspect and maintain the noise barrier to ensure its effectiveness.</p> <p>For the construction works which have the potential to exceed the noise standards on nearby NSR and whose line of sight cannot be effectively blocked by the temporary noise barrier, movable (mobile) barriers should be provided. Movable barriers of at least 2.5 m height with a small cantilevered upper portion and skid footing can be located within a few meters of stationary plant (e.g. generator) and within about 5 m or more of a mobile equipment (e.g. excavator), such that the line of sight to the NSR is blocked by the barriers.</p>	To protect NSRs from noise during construction	All works site for NSRs whose line of sight cannot be effectively blocked by the temporary noise barriers / during construction	Construction Contractor	√			<p>Technical Memorandum on EIA Process</p> <p>Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process</p>

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
8.6.13	6.8.13	<p><i>Good Site Practices</i></p> <p>In general, potential construction noise impact can be minimised or avoided by imposing a combination of the following good site practices as mitigation measures:</p> <p>(a) Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction period.</p> <p>(b) Construction plant should be sited away from NSRs.</p> <p>(c) Machines and plant that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum.</p> <p>(d) Equipment known to emit sound strongly in one direction should be orientated such that the noise is directed away from nearby NSRs.</p> <p>(e) Material stockpiles and other structures (such as site offices) should be effectively utilised to shield on-site construction activities.</p> <p>(f) The Contractor shall devise, arrange methods of working and carrying out the works in such manner as to minimise noise impacts on the surrounding environment, and shall provide experienced personnel with suitable training to ensure that these measures are implemented properly.</p> <p>(g) In the event that new schools are built near</p>	To protect NSRs from noise during construction	All works site / during construction	Construction Contractor		√		Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages:*			Relevant Legislation & Guidelines
						D	C	O	
8.6.16	6.8.16	<p>the works area, the Contractor should minimize construction noise exposure to the schools (especially during examination periods). The Contractor should liaise with the school and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract and to avoid noisy activities during these periods.</p> <p><i>Public Relations Strategy</i></p> <p>To maintain an effective communication channel with the public, a 24-hour hotline system should be established by the project office for the Contractor to receive any enquiry and complaint lodged by the public in respect of the Project. Upon receipt of enquiry / complaint, the Contractor (or its Environmental Team) should investigate the causes of the incident and take the appropriate action to rectify the situation. Periodic newsletters, information leaflets, notices or other means of communication should be provided to the affected villages, communities, and residents advising them the current progress, the schedule of works in future, the potential environmental impacts arising from the works and the corresponding mitigation measures. It is considered that such a close relation between the local communities and the project site office could ensure speedy resolution of any</p>	To promote good public relation and maintain effective communication during construction	All works site / during construction	Project Office (Engineer) & Construction Contractor	√			Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process

EIA Ref	EM&A Ref	Recommended Mitigation Measures	Objectives of the Recommended Measures and Main Concerns to addressed	Location / Timing	Implementation Agent	Implementation Stages*			Relevant Legislation & Guidelines
						D	C	O	
8.6.19	6.8.17	environmental non-compliance and maintain an environmental standard acceptable to the local communities during construction. All the above construction noise mitigation measures should be implemented by the Contractor during the construction phase of the works. The location of the temporary noise barriers (including any mobile barriers) should be further reviewed by the Contractor during the construction stage based on the latest construction programme and contemporary conditions, including any changes with respect to NSRs. The Contractor should design, construct, operate and maintain the mitigation measures throughout the construction stage and as required by the Engineer. Before commencement of the works, the Contractor should submit to the Engineer for approval (as part of their method statement) details of the mitigation measures to be employed under the works. The Contractor's proposed mitigation measures should also be certified by the ET Leader and verified by the IEC to ensure the intended noise reduction effectiveness can be achieved.	To protect NSRs from noise during construction and to ensure the Contractor will properly implement the mitigation measures	All works site / during construction	Construction Contractor		√		Environmental Impact Assessment Ordinance Technical Memorandum on EIA Process

* D=Design, C=Construction, O=Operation
 N/A Not applicable