PROJECT NO.: TCS/00553/11

CONTRACT NO. DC/2009/22
DRAINAGE IMPROVEMENT WORKS IN SHUEN WAN

CONTRACT NO. DC/2010/02 –
DRAINAGE IMPROVEMENT IN SHUEN WAN AND SHEK WU WAI

FINAL ENVIRONMENTAL MONITORING & AUDIT SUMMARY REPORT UNDER EP-303/2008

PREPARED FOR
KWAN LEE-KULY JOINT VENTURE

Quality Index

Date	Reference No.	Prepared By	Approval By
9 September 2016	TCS00553/11/600/R0487v2	Nicola Hon (Environmental Consultant)	T. W. Tam (Environmental Team Leader)

Version	Date	Description
1	23 August 2016	First Submission
2	9 September 2016	Amended against the IEC's comments on 5 Sep 2016

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14 September 2016

Drainage Services Department
Drainage Projects Division
44 & 45/F., Revenue Tower
5 Gloucester Road,
Wan Chai, Hong Kong

By Fax (2827 8700) and Post

Attention: Mr. H.K.Chan and Mr. Max Tai

Dear Sirs,

Re: Agreement No. DP 01/2010
Services as Independent Environmental Checker for the Drainage Improvement Works in Sha Tin and Tai Po under Contract No. DC/2009/22 & DC/2010/02
Final Environmental Monitoring and Audit Summary Report

Reference is made to Environment Team's submission of the Final Environmental Monitoring and Audit Report by Email on 13 September 2016 (entitled "DC/2009/22 & DC/2010/02 – Final EM&A Summary Report").

Please be informed that we have no comment on the captioned report. We hereby write to verify the captioned submission.

Thank you very much for your kind attention and please do not hesitate to contact Mr. Tony Cheng (3465-2822) should you have any queries.

Yours faithfully,

Tony Cheng
Independent Environmental Checker

c.c.	AUES	Attn: Mr. T. W. Tam	By Fax: 2959 6079
	Kwan Lee-Kuly JV	Attn: Mr. W. K. Chan	By Fax: 2674 6688

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EXECUTIVE SUMMARY

ES.01. The EM&A programme of Construction Phase for designated works of *DSD Contract No. DC/2009/22- Drainage Improvement in Shuen Wan* (hereafter "Contract 1") and *DC/2010/02 - Drainage Improvement in Shuen Wan* (hereafter "Contract 2") under Environmental Permit No.EP-303/2008 was commenced on March 2011 and July 2011 respectively and terminated on November 2014 and 31 March 2015 respectively upon agreement of the IEC and RE.

ES.02. Follow to the completion of Construction Phase of both Contracts, the EM&A programme of Operation Phase for Contract 1 and Contract 2 was commenced on December 2014 and April 2015 respectively upon agreement of the IEC and RE and EPD.

ES.03. This is the Final EM&A Summary Report for the Construction Phase and Operation Phase under EP-303/2008 which summarizes the key environmental monitoring results throughout the construction phase during March 2011 to March 2015 (hereinafter the "Construction Period") as well as the operation phase during December 2014 to March 2016 (hereinafter the "Operation Period").

ES.04. In the Construction Period, two limit level exceedances of construction noise were recorded in June 2012. Investigation report for the exceedance was conducted by the ET and it was concluded that the exceedances were related to the sheetpile work under the Project. The Contractor was reminded to strictly implement all noise mitigation measures as recommended in the EM&A Manual and no further noise exceedances were recorded.

ES.05. In the Operation Period, only hydrological characteristics and ecology monitoring are required to carry out as per the EM&A Manual requirement. The hydrological characteristics of water depth and water flow rate as compared baseline monitoring period, the operation phase water depth and volumetric flow rate has insignificant change.

ES.06. For water quality, 1432, 1155 and 673 Action/ Limit exceedances were recorded for DO, turbidity and SS respectively during the Construction Period. All the exceedances of DO were concluded as not project related as there were no DO depletion activities being carried out. For turbidity and SS, investigation result revealed that the exceedances were partially due to rainfall and most of exceedances were due to natural variation and not caused by the works under the Project

ES.07. For hydrological characteristics, the water depth and water flow rate as compared baseline monitoring period have no significant changes and no exceedances were triggered during the Construction Period.

ES.08. Apart from water quality monitoring, monitoring results in general consistently fluctuated below the corresponding A/L Levels. Though numerous exceedances were recorded for water quality monitoring, all exceedances were concluded as not project related which implying the implemented environmental mitigation measures under the EM&A program was effective.

ES.09. No breaches of environmental regulations and requirements stipulated in the EIA and the associated EM&A Manual were recorded during the regular site inspection.

ES.10. During the construction period, there was one (1) environmental complaint received for the project and it was settled immediately. There were no documented notifications of summons and successful prosecutions received during the Construction Period. Thus, no associated mitigation action was needed.

ES.11. In general, monitoring results indicated that the implemented environmental mitigation measures were effective to alleviate adverse environmental impacts generated from the construction of the Project, confirming that the EIA predictions on the environmental impacts and the associated recommendations on the environmental mitigation measures were precise.

ES.12. The management of liquid and solid waste generated from the construction under the Project complied with the liquid and solid waste regulations or guidelines as well as the Contractor's Environmental Management Plan and the associated Waste Management Plan approved by the Engineer prior to implementation.

ES.13. The environmental protection performance of the construction works under the Project was in general satisfactory.

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1 INTRODUCTION

BACKGROUND

1.01 ***Kwan Lee-Kuly Joint Venture*** (hereinafter 'KLKJV') has been awarded by Drainage Services Department (hereinafter 'DSD') of the Contract No. DC/2010/02 - Drainage Improvement in Shuen Wan and Shek Wu Wai (hereinafter 'the Project'). For the Project, construction works at Tung Tsz Road Shuen Wan is part of the Drainage Improvement works amongst Shatin and Tai Po and it is defined as a "Designated Project" which controlled under Environmental Permit EP-303/2008. On the other hand, Shek Wu Wai San Tin is a non-designated project work.

1.02 The Works at Tung Tsz Road Shuen Wan was divided two DSD Contracts i.e. DC/2009/22 (hereinafter called the "Contract 1") and DC/2010/02 (hereinafter called the "Contract 2"). The Project site boundary is shown in ***Annex A***. The construction works of Contract 1 was commenced in ***March 2011*** and finished in ***November 2014***. Moreover, the construction works of Contract 2 was commencement in ***July 2011*** and finished in ***March 2015.***

1.03 Pursuant to the requirement of the EP, Actioned-United Environmental Services and Consulting was commissioned as the ET (hereinafter "AUES" or "the ET") to implement the EM&A program for construction of Contract 2 and Environmental Pioneers & Solutions Limited was the ET of Contract 1.

1.04 The baseline monitoring was performed by the Environmental Pioneers & Solutions Limited (ET of Contract 1) in late 2010 to early 2011. The Action and Limit Levels environmental performance criteria for the project were established in the Baseline Monitoring Report which conducted by the ET of Contract 1 and it was submitted to the EPD for approval.

1.05 The EM&A for construction phase of the Project was commenced in March 2011 and terminated on 31 March 2015 upon agreement with the IEC and ER.

1.06 Follow to the completion of Construction Phase of both Contracts, the EM&A programme of Operation Phase for Contract 1 and Contract 2 was commenced on December 2014 and April 2015 respectively upon agreement of the IEC and RE and EPD.

1.07 This is the Final EM&A Summary Report for the Construction Phase and Operation Phase, presenting details of the EM&A program and the associated monitoring results, including comparison and contrast between monitoring results and the EIA predictions to review monitoring methodology, practicality and effectiveness of the EIA process and the EM&A program.

2 PROJECT ORGANIZATION AND CONSTRUCTION PROGRESS

PROJECT ORGANIZATION AND MANAGEMENT STRUCTURE

2.01 Organization structure and contact details of the Contractor and relevant parties with respect to the on-site environmental management are shown in ***Annex B***.

WORKS UNDERTAKEN DURING THE CONSTRUCTION PERIOD

2.02 The master construction program is enclosed in ***Annex C.***

SUMMARY OF ENVIRONMENTAL STATUS

2.03 A summary of the relevant permits, licences, and/or notifications on environmental protection for this Project 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 17 October 2011
2	Chemical Waste Producer Registration (WPN5213-727-K2972-02)	Approved on 28 October 2011
3	Water Pollution Control Ordinance (Discharge License) WT00009528-2011	Valid to 31 July 2016
4	Billing Account for Disposal of Construction Waste (Account No.: 7012838)	Effective

3 SUMMARY OF EM&A PROGRAM REQUIRMENT

3.01 The requirements for EM&A for Drainage Works under EP-303/2008 are summarized as follows.

MONITORING PARAMETERS

3.02 The monitoring parameters required for the Works during construction phase and operation phase are summarized in ***Tables 3-1 and 3-2***.

Table 3-1 Summary of Monitoring Parameters for Construction Phase

Environmental Aspect	Parameters	
Construction Noise	• A-weighted equivalent continuous sound pressure level (30min) (hereinafter 'Leq(30min)' during the normal working hours; and • A-weighted equivalent continuous sound pressure level (5min) (hereinafter 'Leq(5min)' for construction work during the restricted hours.	
Water Quality	• In Situ Measurement	Temperature, Dissolved Oxygen, Dissolved Oxygen Saturation, pH and Turbidity
	• Laboratory Analysis	Suspended Solids (hereinafter 'SS')
Hydrological Characteristics	The water flow and depth measurement onsite	
*Ecology	Monitor and audit the proper implementation of mitigation measures stipulated in EIA report and the updated EM&A Manual	
Landscape & Visual	Inspect and audit the implementation and maintenance of landscape and visual mitigation measures	

*Remarks: * the monitoring is carried out by IEC*

Table 3-2 Summary of Monitoring Parameters for Operation Phase

Environmental Aspect	Requirement / Parameter
Hydrological Characteristics Monitoring	• In-situ measurement including water flow and depth
(*) Ecological Monitoring and Audit	• Monitor and inspect including the vegetation, fauna (includes avifauna, herpetofauna, odonate and butterfly) and Stream (includes fish and macroinvertebrates)
($^{\#}$) Landscape and Visual Monitoring	• Inspect and audit the implementation and maintenance of landscape and visual mitigation measures

Remarks:
(*) the monitoring is carried out by IEC
($^{\#}$) The monitoring is carried out by the registered Landscape Architect

MONITORING LOCATIONS

3.03 Monitoring locations for EM&A under EP-303/2008 have been identified in the EM&A Manual. They are shown in ***Annex D***.

3.04 ***Table 3-3*** summarizes all the monitoring locations under the Works.

Table 3-3 Monitoring Locations

Aspect	Location ID	Address
Construction Noise	M1	14, Shuen Wan Chim Uk
	AL1	Joint Village Office for Villages in Shuen Wan, Tai PO
	M2	150, San Tau Kok
	M3	31, Wai Ha
	M4	Block 15, T rèasure Spot Garden

Aspect	Location ID	Address
Water Quality	(#) W1	Between the Shuen Wan Marsh and ECA • Co-ordinates: E839301, N836386 • Existing River Bed Level: +1.75mPD).
	W2	Between Tolo Harbour and Proposed Penstock • Co-ordinates: E839542, N836184 • Exiting River Bed Level: +1.48mPD)
	(*) W3	Upstream of Tung Tze Shan Road • Co-ordinates: E838760, N836714 • Exiting River Bed Level: +5.08mPD)
	W4	Wai Ha Village 29D • Co-ordinates: E838865, N836621 • Exiting River Bed Level: +4.05mPD)
Hydrological	H1	Between the Shuen Wan Marsh and ECA • Coordinates: E839306, N836379)
	H2	Route 10 Sam Kung Temple • Coordinates: E839163, N836433
	H3	Upstream of Tung Tze Shan Road • Coordinates: E838760, N836714
	H4	Wai Ha Village 29D • Coordinates: E838865, N836621
Ecology	Areas within 100m of the works boundary under Contract 1 and Contract 2	
Landscape & Visual	As within and adjacent to the construction sites and works areas under the Contract 1 and Contract 2	

Remarks:
(#) Control Station of Contract 1, however impact station of Contract 2
(*) Control Station of Contract 2

MONITORING FREQUENCY OF CONSTRUCTION PHASE

3.05 The impact monitoring should be conducted during the construction phase to ensure the environmental conditions comply with the environmental quality criteria i.e. A/L Levels. The impact monitoring frequency as stipulated in the EM&A Manual is summarized below.

Construction Noise

Frequency: Once a week during 0700-1900 on normal weekdays for $L_{eq(30min)}$

If the construction work is undertake at restricted hour, the monitoring frequency of construction noise will be conducted in accordance with the related Construction Noise Permit requirement issued by EPD as follow

Duration: Throughout the construction period when the major construction activities are undertaken

Water Quality

Frequency: Three times a week. The interval between 2 sets monitoring are not less than 36 hours

Duration: Throughout construction phase of Contract 2 to underway (in accordance with the Updated EM&A Manual Section 4.27).

Hydrological Characteristics

Frequency: Once per week at mid-flood and mid-ebb tides

Duration: During the construction phase of Contract 2 to undertake; and one year after the construction is complete as operation phase monitoring (in accordance with the Updated EM&A Manual Section 4.32).

Ecology

3.06 In according with Section 6.17 of the Updated EM&A Manual, ecological monitoring should be conducted by the Independent Environmental Checker (hereinafter 'IEC') bi-monthly during the construction period. Monitoring programme details should be agreed with the Agriculture, Fisheries and Conservation Department (AFCD). Moreover, the IEC should submit reports on the findings of each monitoring trip, and a final report summarizing the monitoring results over the entire monitoring period to AFCD and Environmental Protection Department (EPD). Hence, no monitoring or surveying should be carried out by ET of the Project.

Landscape & Visual

3.07 According to Section 7.4 of the Updated EM&A Manual, site inspection bi-weekly should be performed to check the implementation and maintenance of landscape and visual mitigation measures whether to full realize.

MONITORING FREQUENCY OF OPERATION PHASE

3.08 According to the updated EM&A Manual, frequency and duration of the Operation Phase monitoring are summarized below.

Hydrological Characteristics

Frequency: Once per week at mid-flood and mid-ebb tides

Duration: One year after the construction is complete as operation phase monitoring (in accordance with the Updated EM&A Manual Section 4.32).

Ecology

3.09 In according with Section 6.17 of the Updated EM&A Manual, the Operation Phase ecological monitoring would be to conduct by the Independent Environmental Checker (hereinafter 'IEC'). Regular checking and monitoring by quarter month would be performed for one year duration

Landscape & Visual

3.10 According to Section 7.5 of the Updated EM&A Manual, all landscape and visual mitigation measures would be monitored quarterly during the first year of the Operation Phase to check on the effectiveness of the mitigations.

MONITORING EQUIPMENT

Noise Monitoring

3.11 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 noise monitoring. The sound level meter shall be checked with an acoustic calibrator. The wind speed shall be check with a portable wind speed meter, which capable to measure wind speed in m/s.

Water Quality Monitoring

3.12 **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 DO level in the range of 0 – 20mg L-1 and 0 – 200% saturation; and temperature of 0 – 45 degree Celsius.

3.13 **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.

3.14 **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.

3.15 **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.

3.16 **Water Depth Detector** – A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. The unit can either be hand held or affixed to the bottom of the work boat.

3.17 **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).

3.18 **Suspended Solids Analysis** – Analysis of suspended solids shall be carried out in a HOKLAS or other international accredited laboratory.

Hydrological Characteristics

3.19 **Water Depth Detector** - A portable, battery-operated echo sounder shall be used for the determination of water depth at each designated monitoring station.

3.20 **Stream water flow Equipment** –A portable, battery-operated flow meter should be used for the determination of water flow rate at each designated monitoring location and record in m^3/s.

3.21 The monitoring equipment using for the Project's EM&A program were proposed by the ET and verified by the IEC prior commencement of the monitoring. Details of the equipment used for impact monitoring are listed in ***Table 3-4***.

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	
Water Depth Detector	Eagle Sonar
Water Sampler	A transparent PVC cylinder / bucket
Thermometer & DO meter	YSI DO Meter 550A or YSI Professional Plus or YSI Sonde6820 / 650MDS
pH meter	YSI pH10N or YSI Professional Plus or YSI Sonde 6820 / 650MDS
Turbidimeter	Hach 2100Q or YSI Sonde 6820 / 650MDS
Sample Container	High density polythene bottles (provided by laboratory)
Storage Container	'Willow' 33-litre plastic cool box
Suspended Solids	HOKLAS-accredited laboratory (ALS Technichem (HK) Pty Ltd)
Hydrological Characteristics	
Water flow meter	GLOBAL WATER model FP211
Water Depth Detector	Eagle Sonar or an appropriate steel ruler or rope with appropriate weight

MONITORING METHODOLOGY

Noise Monitoring

3.22 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

3.22 Sound level meter as listed in ***Table 3-3*** 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)*.

3.23 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}). $Leq_{(30min)}$ in six consecutive $Leq_{(5min)}$ measurements were used as the monitoring parameter for the time period between 0700-1900 hours on weekdays; and also $Leq_{(15min)}$ in three consecutive $Leq_{(5min)}$ measurements is used as monitoring parameter for other time periods (e.g. during restricted hours), if necessary.

3.24 During the course of 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.

3.25 Prior to noise measurement, the accuracy of the sound level meter is checked by an acoustic calibrator which generated a known sound pressure level at a known frequency. The checking was performed before and after the noise measurement.

Water Quality

3.26 Water quality monitoring are conducted at the depth below:-

- Three depths: 1m below water surface, 1m above river bed and at mid-depth when the water depth exceeds 6m, or
- If the water depth is between 3m and 6m, two depths: 1m below water surface and 1m above river bed, and or
- If the water depth is less than 3m, 1 sample at mid-depth is taken

3.27 Water depths are determined prior to measurement and sampling, using a portable battery operated depth detector, brand named 'Eagle Sonar', if the depths exceed 1.5 meter. If the depth between 1.5 meter and 1 meter, plastic tape measurement tied with appropriate weight are used the depth estimation. For the depth well below 1 meter, an appropriate steel ruler or rope with appropriate weight are used for the depth measurement.

3.28 A transparent PVC cylinder, with a capacity of not less than 2 litres, is used for water sampling. The water sampler is lowered into the water body at a predetermined depth. The trigger system of the sampler is activated with a messenger and opening ends of the sampler are closed accordingly then the sample of water is collected. If the water depth is less than 500mm, a water bucket is be used as a water sampler to minimize the possibility of the latching system disturbing sediment during water sampling

3.29 A portable YSI DO Meter 550A or YSI Professional Plus is used for in-situ DO measurement. The DO meter is capable of measuring DO in the range of 0 - 20 mg/L and 0 - 200 % saturation and checked against water saturated ambient air on each monitoring day prior to monitoring. Although the DO Meter automatically compensates ambient water temperature to a standard temperature of 20^0C for ease of comparison of the data under the changing reality, the temperature readings of the DO Meter are be recorded in the field data sheets. The equipment calibration is performed on quarterly basis.

3.30 A portable YSI pH10N Meter or or YSI Professional Plus is used for in-situ pH measurement. The pH meter is capable of measuring pH in the range of 0 – 14 and readable to 0.1. Standard buffer solutions of pH 7 and pH 10 are used for calibration of the instrument before and after measurement. The equipment calibration is performed on quarterly basis.

3.31 A portable Hach 2100Q Turbidity Meter is be used for in-situ turbidity measurement. The turbidity meter is capable of measuring turbidity in the range of 0 – 1000 NTU. The equipment calibration is performed

on quarterly basis.

3.32 Water samples are contained in screw-cap PE (Poly-Ethylene) bottles, which are provided and pretreated and 'PE' (Poly-Ethylene) sampling bottles provided and pre-treated according to corresponding analytical requirements. Where appropriate, the sampling bottles are rinsed with the water to be contained. Water sample is then transferred from the sampler to the sample bottles.

3.33 One liter or 500 mL water sample are collected from each depth for SS determination. The collected samples are stored in a cool box maintained at 4^0C and delivered to laboratory upon completion of the sampling by end of each sampling day.

3.34 All water samples are analyzed with Suspended Solids (SS) as specified in the updated *EM&A Manual* by a local HOKLAS-accredited testing laboratory (ALS Technichem (HK) Pty Ltd HOKLAS registration no. 66). SS are determined by the laboratory upon receipt of the water samples using HOKLAS accredited analytical method. The detection limits and testing method are shown below in ***Table 3-5***.

Table 3-5 Testing Method and Detection limit of Suspended Solids

Determinant	Testing Method	Detection Limit
Suspended solid	Determination use HOKLAS accredited analytical methods namely ALS Method EA-025 (based on APHA 2540 D)	2mg/L

Hydrological Characteristics

3.35 A portable, water flow meter, brand named "*GLOBAL WATER model FP211*" are used to determine the water current flow at the designated monitoring stations. A water flow velocity is measured at mid depth of current water body or 0.5m below water level.

3.36 Water depths are determined prior to measurement, using a portable battery operated depth detector, brand named 'Eagle Sonar', if the depths exceed 1.5 meter. If the depth between 1.5 meter and 1 meter, plastic tape measurement tied with appropriate weight are used the depth estimation. For the depths well below 1 meter, an appropriate steel ruler or rope with appropriate weight are used for the depth measurement.

OTHERS MONITORING IMPLEMENTATION FOR PROJECT

Ecology

3.37 Ecological monitoring and reporting should be performed by IEC. The equipment and procedures were described in the Final Ecological Monitoring Report in ***Annex H***

Landscape and Visual

3.38 A registered Landscape Architect as member of the ET is employed by the Contractor to undertake site inspection. Site inspection will undertake once every three months during the first year of the Operation Phase to check on the effectiveness of the mitigations.

ENVIRONMENTAL QUALITY PERFORMANCE LIMITS

3.39 The re-established performance criteria for construction noise, water quality and hydrological, namely Action and Limit levels is used for the Project are listed in ***Tables 3-6, 3-7,*** and ***3-8***.

Table 3-6 Action and Limit Levels for Construction Noise

Location	Time Period	Action Level in dB(A)	Limit Level in dB(A)
M1, AL1, M2, M3,	Daytime 0700 – 1900 hrs on normal weekdays	When one documented	75* dB(A)

M4	1900 – 2300 on all days and 0700 – 2300 on general holidays (including Sundays)	complaint is received	66/65/70 dB(A)**
	2300 – 0700 al all days		45/50/55 dB(A)**

*Note: * Reduces to 70dB(A) for schools and 65dB(A) during the school examination periods.*
*** To be selected based on the Area Sensitivity Rating of A/B/C, and the conditions of the applicable CNP(s) must be followed*

Table 3-7 Action and Limit Levels for Water Quality

Parameter	Performance Criteria	Impact Station		
		W1	W2	W4
DO Concentration (mg/L)	Action Level	7.27	7.26	9.27
	Limit Level	4.00	4.00	4.00
pH	Action Level	NA	NA	NA
	Limit Level	6 - 9	6 - 9	6 - 9
Turbidity (NTU)	Action Level	4.77	2.46	3.32
	Limit Level	5.26	3.42	4.52
Suspended Solids (mg/L)	Action Level	9.73	8.89	6.98
	Limit Level	10.77	9.75	7.66

Notes:
- *The proposed Action/Limit Levels of DO are established to be used 5%-ile/1%-ile of all the baseline data;*
- *The proposed Action/Limit Levels of Turbidity and SS are established to be used 95%-ile/99%-ile of all the baseline data;*
- *For DO, non-compliance of the water quality limits occur is when monitoring result lower than the action/limit levels;*
- *For turbidity and SS, non-compliance of the water quality limits occurs is when monitoring result higher than the limits; and*
- *For pH, non-compliance of the quality limit occur is when monitoring result lower than 6 and higher than 9; and*
- *All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered necessary*

Table 3-8 Action and Limit Levels for Hydrological Characteristics

Parameter	Acceptance Criteria	Monitoring Station	
		H1	H2
Water Depth (m)	Action Level	0.08	0.08
	Limit Level	0.06	0.06
Volumetric Flow Rate (Q), m3/s	Action Level	120% of control station's water flow rate on the same day of measurement	120% of control station's water flow rate on the same day of measurement
	Limit Level	140% of control station's water flow rate on the same day of measurement	140% of control station's water flow rate on the same day of measurement

3.40 The locations H3 and H4 are a reference measurement point in order to monitor any changes in the hydrological characteristics of Wai Ha River arising from the work Contract 2 to affect the Shuen Wan Marsh.

3.41 Should non-compliance of the environmental quality criteria occurs, remedial actions will be triggered

according to the Event and Action Plan enclosed in ***Annex E***.

3.42 No performance criteria i.e. Action and Limit levels of hydrological is used for the Operation Phase. The locations H3 and H4 are a reference measurement point in order to monitor any changes in the hydrological characteristics of Wai Ha River arising from the work Contract 2 to affect the Shuen Wan Marsh

EQUIPMENT CALIBRATION

3.43 The sound level meter and calibrator are calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme in yearly basis.

3.44 All the water quality monitoring equipment such as the DO, pH and Turbidity meters are calibrated by HOKLAS accredited laboratory of three month intervals.

3.45 A portable, water flow meter, brand named "*GLOBAL WATER model FP211*" is calibrated in yearly basis.

DATA MANAGEMENT AND DATA QA/QC CONTROL

3.46 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.

3.47 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.

4 MONITORING RESULTS AND DISCUSSION

CONSTRUCTION NOISE MONITORING (CONSTRUCTION PHASE)

4.01 Construction noise monitoring was carried out at Locations M1 and AL1 during the EM&A period from 10 March 2011 to 30 March 2015. For Locations M2, M3 and M4, noise monitoring was carried out from 20 July 2011 to 30 March 2015.

Monitoring Results

4.02 The sound meter was set in a free field situation at the all designated monitoring locations, therefore a façade correction of +3 dB(A) has been added according to acoustical principles and EPD guidelines.

4.03 A summary of the monitoring results and breaches of noise A/L levels during the Construction Period are tabulated in ***Tables 4-1 to 4-5 and 4-6*** and the relevant graphical plots are presented in ***Annex F***.

Table 4-1 Construction Noise Monitoring Results at AL1, dB(A)

Time Period	AL1		
	Min	Max	Total Events
2011	53.0	70.1	40
2012	51.8	69.1	51
2013	61.1	70.4	50
2014	60.5	69.8	46
2015	57.0	67.9	14
Full Period	**51.8**	**70.4**	**201**
Recorded Date	29-Feb-12	10-Jul-13	--

Table 4-2 Construction Noise Monitoring Results at M1, dB(A)

Time Period	M1		
	Min	Max	Total Events
2011	47.5	70.3	40
2012	51.4	73.2	51
2013	60.9	70.4	50
2014	55.6	65.3	46
2015	58.3	65.2	14
Full Period	**47.5**	**73.2**	**201**
Recorded Date	15-Dec-11	13-Jun-12	--

Table 4-3 Construction Noise Monitoring Results at M2, dB(A)

Time Period	M2		
	Min	Max	Total Events
2011	58.6	74.5	24
2012	63.8	80.8	53
2013	63.8	74.8	51
2014	50.6	68.7	48
2015	55.4	66.0	14
Full Period	**50.6**	**80.8**	**190**
Recorded Date	10-Oct-14	27-Jun-12	--

Table 4-4 Construction Noise Monitoring Results at M3, dB(A)

Time Period	M3		
	Min	Max	Total Events
2011	52.4	72.4	24
2012	56.8	72.6	53
2013	53.2	74.9	51

2014	53.0	68.9	48
2015	53.8	66.0	14
Full Period	**52.4**	**74.9**	**190**
Recorded Date	22-Nov-11	21-Aug-13	--

Table 4-5 Construction Noise Monitoring Results at M4, dB(A)

Time Period	M4		
	Min	Max	Total Events
2011	48.8	74.4	24
2012	48.7	73.4	53
2013	49.1	71.8	51
2014	45.0	68.6	48
2015	47.4	53.3	14
Full Period	**45.0**	**74.4**	**190**
Recorded Date	11-Apr-14	25-Oct-11	--

Table 4-6 Summary of the Nose Monitoring Action/Limit Level exceedances

Location	Nose Monitoring Action/Limit Level exceedances		
	Action Level	Limit Level	Investigation
AL1	0	0	NA
M1	0	0	NA
M2	0	**2**	Related to the sheetpile work under the Project.
M3	0	0	NA
M4	0	0	NA
Full Period	**0**	**2**	**NA**

4.04 During the Construction Period, no environmental complaint against construction noise was registered, indicating no Action Level exceedance was documented. However, two (2) Limit Level exceedances were recorded at Location M2 on 20 and 27 June 2012. Investigation report for the exceedance was conducted by the ET and it was concluded that the exceedances were related to the sheetpile work under the Project. The Contractor was reminded to strictly implement all noise mitigation measures as recommended in the EM&A Manual and no further noise exceedances were recorded.

LOCAL STREAM WATER QUALITY MONITORING (CONSTRUCTION PHASE)

4.05 According to the EM&A Manual proposal, there are four designated locations for water quality monitoring. Water quality monitoring at W1 and W2 were started on 10 March 2011 upon the Contract 1 commenced and terminated on 30 March 2015. For Locations W3 and W4, monitoring was carried out upon Contract 2 started from 20 July 2011 till 30 March 2015.

4.06 In view of numerous non-project related DO exceedance, the ET of Contract 1 proposed to change of Limit Level for DO concentration from 7.27mg/L to 4.0mg/L and it was accepted by EPD and the change was effective since June 2012.

Monitoring Results

4.07 A summary of the monitoring results the breaches in water quality A/L levels during the Construction Period are tabulated in ***Tables 4-7 to 4-10*** and the relevant graphical plots are presented in ***Annex F.***

Table 4-7 Summary of the Water Quality Monitoring Result for W1

Year	No of sampling days	Exceedance	DO (mid ebb + mid flood)	Turbidity	SS
2011	124	Min	2.88	0.00	1.0
		Max	8.82	93.00	22.00

		Mean	6.09	9.8	5.56
		Action Level	19	5	1
		Limit Level	94	66	10
2012	152	Min	3.47	0.00	0.00
		Max	10.86	218.30	130.00
		Mean	6.32	9.29	9.60
		Action Level	150	12	11
		Limit Level	30	113	66
2013	150	Min	4.02	0.03	2.00
		Max	9.93	92.80	107.00
		Mean	6.51	9.11	12.15
		Action Level	227	7	13
		Limit Level	0	106	86
2014	139	Min	4.01	1.16	2.00
		Max	11.57	46.05	63.00
		Mean	7.04	6.31	5.76
		Action Level	185	15	3
		Limit Level	0	90	26
2015	37	Min	5.42	2.52	2.00
		Max	9.39	20.40	12.00
		Mean	7.18	7.77	5.36
		Action Level	43	6	1
		Limit Level	0	52	4
Total	602	Action Level	615	45	29
		Limit Level	124	427	192

Table 4-8 Summary of the Water Quality Monitoring Result for W2

Year	No of sampling days	Exceedance	DO	Turbidity	SS
2011	114	Min	2.40	0.00	1.00
		Max	8.47	72.90	18.00
		Mean	6.08	6.27	5.37
		Action Level	28	15	2
		Limit Level	60	41	9
2012	152	Min	5.72	0.00	0.00
		Max	9.41	450.10	320.00
		Mean	7.27	14.03	10.09
		Action Level	79	17	4
		Limit Level	4	111	33
2013	143	Min	6.78	0.80	1.00
		Max	85.00	134.70	59.00
		Mean	8.18	4.30	6.86
		Action Level	45	75	3
		Limit Level	0	51	29
2014	131	Min	5.30	2.93	1.00
		Max	8.98	87.00	44.00
		Mean	7.48	7.36	5.91
		Action Level	49	3	2
		Limit Level	0	128	16
2015	37	Min	5.55	2.06	2.00
		Max	9.40	26.00	12.00
		Mean	7.13	7.65	5.78
		Action Level	26	2	1
		Limit Level	0	33	2
Total	577	Action Level	227	112	12
		Limit Level	139	464	201

Table 4-9 Summary of the Water Quality Monitoring Result for W3 (control station)

Year	No of sampling days	Exceedance	DO	Turbidity	SS
2011	65	Min	4.44	0.92	2.00
		Max	7.91	28.75	63.00
		Mean	6.15	3.18	5.14
2012	154	Min	3.95	0.79	2.00
		Max	9.35	192.00	179.00
		Mean	6.16	5.03	6.81
2013	150	Min	3.07	0.03	2.00
		Max	9.87	136.50	180.00
		Mean	6.92	7.00	9.81
2014	139	Min	5.03	1.00	2.00
		Max	9.61	223.50	143.00
		Mean	7.32	6.39	5.32
2015	37	Min	6.69	0.80	1.99
		Max	8.88	10.70	13.00
		Mean	7.63	4.52	3.54

Table 4-10 Summary of the Water Quality Monitoring Result for W4

Year	No of sampling days	Exceedance	DO	Turbidity	SS
2011	65	Min	5.01	0.68	2.00
		Max	8.39	50.55	272.00
		Mean	6.16	5.06	9.23
		Action Level	0	6	5
		Limit Level	65	13	0
2012	154	Min	4.08	0.98	2.00
		Max	9.38	171.50	160.00
		Mean	6.13	4.97	6.21
		Action Level	90	12	3
		Limit Level	63	27	17
2013	150	Min	3.95	0.03	1.99
		Max	11.76	347.00	189.00
		Mean	7.07	12.47	13.04
		Action Level	141	11	3
		Limit Level	1	52	50
2014	139	Min	5.12	1.09	2.00
		Max	9.93	145.50	84.00
		Mean	7.42	5.43	4.96
		Action Level	136	27	2
		Limit Level	0	25	10
2015	37	Min	6.94	1.09	2.00
		Max	10.45	8.47	6.00
		Mean	8.28	3.92	3.08
		Action Level	33	8	0
		Limit Level	0	13	0
Total	545	Action Level	260	64	13
		Limit Level	129	130	77

4.08 During the Construction Period, the number of Action Level and Limit Level were summarized in ***Tables 4-7 4-8 and 4-10.*** NOEs for exceedances were issued to the respective parties and investigations have

been conducted by ET in specified time. During the Construction Period, all the exceedances of DO were concluded as not project related as there were no DO depletion activities being carried out. For turbidity and SS, investigation revealed that the exceedances were partially due to rainfall and most of exceedances were due natural variation and not caused by the works under the Project.

HYDROLOGICAL CHARACTERISTICS MONITORING (CONSTRUCTION PHASE AND OPERATION PHASE)

4.09 Hydrological characteristics monitoring is required for both Construction and Operation Phase. There was 4 months overlapped of the Construction Phase of Contract 2 and Operation Phase of Contract 1 during December 2014 and March 2015. Since all construction works under the Project was finished in March 2015, the operation phase data would be covered April 2015 to March 2016.

4.10 The summary result of the hydrological characteristics measurements during Construction Phase are presented in ***Tables 4-11 and 4-12***.

Table 4-11 Summary of monitoring results of hydrological characteristics Water Depth, m (Construction Phase)

Year		H1 (Flood)	H1 (Ebb)	H2 (Flood)	H2 (Ebb)	H3 (Flood)	H3 (Ebb)	H4 (Flood)	H4 (Ebb)
2011	Min	0.06	0.08	0.09	0.06	0.06	0.08	0.20	0.20
	Max	0.49	0.67	0.70	0.73	0.43	0.49	0.50	0.40
	Mean	0.20	0.22	0.39	0.43	0.20	0.21	0.31	0.31
2012	Min	0.10	0.06	0.06	0.06	0.20	0.20	0.20	0.20
	Max	1.03	0.72	0.54	0.48	0.40	0.50	0.50	0.50
	Mean	0.36	0.27	0.24	0.19	0.28	0.28	0.32	0.30
2013	Min	0.24	0.12	0.24	0.12	0.05	0.05	0.03	0.04
	Max	0.60	0.36	0.60	0.48	0.50	0.50	0.91	0.85
	Mean	0.42	0.21	0.38	0.24	0.24	0.24	0.24	0.24
2014	Min	0.24	0.12	0.24	0.12	0.13	0.08	0.10	0.08
	Max	0.69	0.61	0.60	0.54	0.49	0.43	0.45	0.40
	Mean	0.42	0.31	0.37	0.27	0.33	0.28	0.28	0.24
2015	Min	0.34	0.34	0.27	0.28	0.25	0.24	0.24	0.24
	Max	0.45	0.45	0.37	0.36	0.39	0.38	0.36	0.35
	Mean	0.42	0.40	0.32	0.31	0.35	0.34	0.27	0.26
Total no. of event		163	186	163	186	193	193	193	193

Table 4-12 Summary of monitoring results of hydrological characteristics of Average Volumetric flow rate (Q), m^3/s (Construction Phase)

Year		H1 (Flood)	H1 (Ebb)	H2 (Flood)	H2 (Ebb)	H3 (Flood)	H3 (Ebb)	H4 (Flood)	H4 (Ebb)
2011	Min	0.015	0.075	0.377	0.377	0.134	0.238	0.060	0.071
	Max	0.229	0.375	1.531	2.297	2.012	1.788	0.411	0.329
	Mean	0.106	0.145	0.678	0.777	0.822	0.847	0.191	0.199
2012	Min	0.075	0.050	0.060	0.060	0.149	0.149	0.110	0.110
	Max	0.750	0.750	6.845	3.014	1.788	2.235	0.617	0.822
	Mean	0.183	0.232	0.849	0.782	0.757	0.827	0.299	0.283
2013	Min	0.075	0.075	0.377	0.377	0.031	0.043	0.019	0.012
	Max	0.300	0.375	2.638	1.884	1.017	1.022	0.549	0.488
	Mean	0.183	0.187	1.206	1.130	0.387	0.411	0.134	0.137

2014	Min	0.075	0.075	0.146	0.100	0.029	0.004	0.019	0.003
	Max	2.970	2.376	2.261	2.261	2.920	3.293	0.899	0.877
	Mean	0.536	0.443	1.020	0.960	1.005	0.627	0.263	0.168
2015	Min	0.187	0.248	0.127	0.132	0.373	0.179	0.132	0.066
	Max	1.452	0.836	0.174	0.150	1.132	0.805	0.296	0.197
	Mean	0.821	0.569	0.149	0.143	0.580	0.446	0.170	0.130
Total no. of event		163	186	163	186	193	193	193	193

4.11 There were no exceedances recorded at hydrological characteristics including water depth and Average Volumetric flow rate throughout the construction period.

4.12 The summary result of the hydrological characteristics measurements during Operation Phase are presented in ***Tables 4-13 and 4-14***.

Table 4-13 Summary of monitoring results of hydrological characteristics Water Depth, m (Operation Phase)

Operation Period (Apr 2015 to Mar 2016)	H1 (Flood)	H1 (Ebb)	H2 (Flood)	H2 (Ebb)	H3 (Flood)	H3 (Ebb)	H4 (Flood)	H4 (Ebb)
Min	0.20	0.20	0.20	0.26	0.25	0.23	0.24	0.20
Max	0.58	0.56	0.39	0.38	0.50	0.90	0.44	0.42
Mean	0.46	0.44	0.32	0.31	0.37	0.37	0.32	0.31
Total no. of event	53	53	53	53	53	53	53	53

Table 4-11 Summary of monitoring results of hydrological characteristics of Average Volumetric flow rate (Q), m3/s (Operation Phase)

Operation Period (Apr 2015 to Mar 2016)	H1 (Flood)	H1 (Ebb)	H2 (Flood)	H2 (Ebb)	H3 (Flood)	H3 (Ebb)	H4 (Flood)	H4 (Ebb)
Min	0.45	0.42	0.09	0.12	0.20	0.19	0.07	0.06
Max	2.57	2.20	1.45	0.62	2.35	2.01	0.67	0.61
Mean	0.81	0.75	0.31	0.28	0.76	0.72	0.22	0.20
Total no. of event	53	53	53	53	53	53	53	53

4.13 The hydrological characteristics of water depth and water flow rate as compared baseline monitoring period, the operation phase water depth and volumetric flow rate has insignificant change.

RESULTS OF ECOLOGICAL MONITORING (CONSTRUCTION PHASE AND OPERATION PHASE)

4.14 According to updated EM&A Manual Section 6.17, bi-monthly ecological monitoring is conducted by the IEC – Ramboll Environ Hong Kong Limited. In brief, the monitoring tasks include regular check on the retained and transplanted trees and shrubs, monitoring on fauna groups and aquatic fauna within the works area and any ecologically sensitive area within 100 m of the works boundary.

4.15 The final report for the ecological monitoring is presented in Annex H.

DISCUSSION

4.16 The EIA has predicted that with implementation of the recommended environmental mitigation measures, adverse environmental impacts can be eliminated or mitigated to acceptable levels, i.e. levels of the measured parameters will not exceed the environmental quality performance criteria (i.e. A/L Levels) as

stipulated and summarized in the EM&A Manual. Comparison of the EIA prediction with the compliance of the Project with the environmental quality performance criteria (i.e. A/L Levels) demonstrated that EIA prediction for construction noise was in general precise in which the monitoring results in general consistently fluctuated below the corresponding A/L Levels. For water quality, there were numerous of non-compliance (exceedance) recorded with occasional higher peaks synchronizing and they were concluded as due to variations of the ambient conditions or affected by rainfall which were not predicted in the EIA.

4.17 Trends of the monitored parameters closely synchronized with the trends of the corresponding ambient environmental conditions of the area, indicating that the acquired monitoring results carried necessary statistical power to categorically identify or confirm the absence of adverse environmental impacts attributable to the works throughout the whole construction period of the Project. The implemented EM&A program and the associated methodology is therefore considered effective

4.18 In general, monitoring results indicated that the implemented environmental mitigation measures were effective to alleviate adverse environmental impacts generated from the construction of the Project, confirming that the EIA predictions on the environmental impacts and the associated recommendations on the environmental mitigation measures were precise. In addition, the environmental mitigation measures recommended in the EIA are proven to be cost effective.

5 WASTE MANAGEMENT

5.01 Waste management is routinely carried out by the on-site Environmental Officer or Environmental Supervisor.

RECORDS OF WASTE QUANTITIES

5.02 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.

5.03 The quantities of waste for disposal in the Construction Period are summarized in ***Tables 5-1*** and ***5-2***.

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

Type of Waste	Quantity						Disposal Location
	2011	2012	2013	2014	2015	Total	
C&D Materials (Inert) ('000m^3)	0.8655	2.21	1.692	6.456	0	11.2235	-
Reused in this Contract (Inert) ('000m^3)	0	0	0	0	0	0	The Contract Site
Reused in other Projects (Inert) ('000m^3)	0.7855	0	0	0	0	0.7855	Other Project
Disposal as Public Fill (Inert) ('000m^3)	0.08	2.21	1.692	0	0	3.982	Tuen Mun Area 38
Imported Fill ('000m^3)	0	0	0	6.456	0	6.456	--

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

Type of Waste	Quantity						Disposal Location
	2011	2012	2013	2014	2015	Total	
Recycled Metal ('000kg)	0	0	0	0	0	0	Recycle Company
Recycled Paper/Cardboard Packing ('000kg)	0	0	0	0	0	0	Recycle Company
Recycled Plastic ('000kg)	0	0	0	0	0	0	Recycle Company
Chemical Wastes ('000kg)	0	0	0	0	0	0	Licensed Collector
General Refuses ('000m^3)	0.065	0.12	0.11175	0.12	0.120	0.53675	NENT Landfill

5.04 The Monthly Summary Waste Flow Tables provided by the Contractor can found in ***Annex G***.

6 SITE INSPECTION AND AUDIT

6.01 According to the Environmental Monitoring and Audit Manual, weekly environmental site inspections was carried out by ET joined with the Contractor and ER to confirm the environmental performance.

6.02 No non-compliance with environmental regulations and standards was identified during the site inspection and audit throughout the whole construction period of the Project.

6.03 Defects carrying minor or no environmental significance were sometime found during the site inspection and audit. They were generally rectified in-situ or within the required time period by the next inspection.

6.04 Findings of the environmental site inspection and audit further confirmed that the environmental controls established by the Contractor and the environmental mitigation measures recommended in the EIA were appropriate.

LANDSCAPE AND VISUAL INSPECTION

6.05 The Landscape and Visual Monitoring of the Project is conducted to fulfill Clauses 5.2 and 5.4 of EP-303/2008 and the monitoring requirements in accordance with Section 7 of the approved updated EM&A Manual (approved by EPD on December 2010) of the Project.

6.06 Landscape and Visual Monitoring of the Project was conducted in a biweekly basis for checking the design, implementation and maintenance of the landscape and visual mitigation measures throughout the construction phase. Observations of any potential conflicts between the proposed mitigation measures and the project works carried out by the Contractors were recorded. Recommendation and advice on proper implementation of the landscape mitigation measures have been provided to the Contractor for minimizing any potential impacts on the landscape and visual elements.

6.07 The following landscape and visual mitigation measures were implemented during the construction phase of the project to minimize the potential impacts:

- Visual Screen – Use of hoardings as visual screens for the construction in the works areas;
- Contaminant/ Sediment Control – Use of temporary barriers, covers and drainage provision around the construction works as contaminant/ sediment control to prevent the contaminants and sediments from entering the sensitive water-based habitats;
- Pollution Control – Implementation of pollution control measures to minimize any adverse environmental impacts to the surrounding habitats;
- Liaison with Nursery– Liaison with the nursery operator as necessary to minimize any adverse impact to the daily operation and plant holding capacity of the nursery;
- Existing Trees within Works Area – Maintenance and protection of the existing trees, especially their crowns, trunks and roots, within work sites; and
- Construction Light – Provision of construction light should be controlled at night to avoid excessive glare to the surrounding villages and to Plover Cove.

6.08 The recommendations and reminders given to the Contractor were properly followed in each reporting month throughout the construction period.

7 NON-COMPLIANCE, ENVIRONMENTAL COMPLAINT, NOTIFICATIONS OF SUMMONS AND PROSECUTION

NON-COMPLIANCE

7.01 No non-compliance was identified during regular site inspection and environmental audit. No associated remedial actions were recommended.

ENVIRONMENTAL COMPLAINT

7.02 During the Construction Period, one (1) environmental complaint was received by EPD on 12 February 2014 regarding the stockpile was observed storage under the project DC/2010/02. It is concerned that the stockpile would damage the conservation area and illegal occupancy the area after the construction. Investigation was conducted by the ET and it was concluded that mitigation measure for the stockpile as provided by the Contractor has fulfilled the EM&A Manual requirement and there was no evidence to show that the stockpile would damage the conservation area and reinstatement works will commence in mid-2014.

7.03 Summary of environmental complaint for is presented in ***Table 7-1*** below.

Table 7-1 Statistical Summary of Environmental Complaints

Reporting Period	Environmental Complaint Statistics		
	Frequency	Cumulative	Complaint Nature
2011	0	0	NA
2012	0	0	NA
2013	0	0	NA
2014	**1**	**1**	Air quality (1)
2015	0	**1**	NA

NOTIFICATIONS OF SUMMONS AND SUCCESSFUL PROSECUTIONS

7.04 No notifications of summons and successful prosecutions were recorded during the Construction Period. No associated remedial actions were recommended. Summary of environmental summons and prosecutions are presented in ***Table 7-2 & 7-3*** below.

Table 7-2 Statistical Summary of Environmental Summons

Reporting Period	Environmental Summons		
	Frequency	Cumulative	Complaint Nature
2011	0	0	NA
2012	0	0	NA
2013	0	0	NA
2014	0	0	NA
2015	0	0	NA

Table 7-3 Statistical Summary of Environmental Prosecutions

Reporting Period	Environmental Prosecutions		
	Frequency	Cumulative	Complaint Nature
2011	0	0	NA
2012	0	0	NA
2013	0	0	NA
2014	0	0	NA
2015	0	0	NA

8 IMPLEMENTATION STATUS OF MIFIGATION MEASURES

8.01 According to the Updated Environmental Monitoring and Audit Manual, mitigation measures recommended for the Construction Phases and implemented by the Contractor are summarized as follows.

Noise Mitigation Measure

(a) Only well-maintained plant should be operated on-site and plant shall be serviced regularly during the construction program;

(b) Silencers or mufflers on construction equipment should be utilized and shall be properly maintained during the construction program;

(c) Mobile plant, if any, should be sited as far from NSRs as possible;

(d) Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;

(e) Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs;

(f) Material stockpiles and other structures should be effectively utilized, wherever practicable, in screening noise from on-site construction activities;

(g) Use of quieter plants to carry out the construction tasks proposed for the Project;

(h) Use about 3.5m high of temporary noise barriers as screened the noisy PMEs to carry out construction of box culvert and site clearance.

(i) Low Impact Method, such as using PMEs smaller in size and to be enclosed by noise enclosure, should be adopted for the construction of box culvert and pipe laying in Wai Ha; and

(j) Use of noise enclosure during the works area for pipe laying in Wai Ha.

Dust Mitigation Measure

(a) Use of regular watering to reduce dust emissions from exposed site surfaces and unpaved road, with complete coverage, particularly during dry weather;

(b) Use of frequent watering for particularly dusty static construction areas and areas close to ASRs;

(c) Tarpaulin covering of all dusty vehicle loads transported to, from and between site location;

(d) Establishment and use of vehicle wheel and body washing facilities at the exit points of the site;

(e) Routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs;

(f) Stockpiled excavated materials should be covered with tarpaulin and should be removed offsite within 24 hours to avoid any odour nuisance arising.

Local Stream Water Quality Mitigation Measure

(a) Before commencing any site formation work, all sewer and drainage connections shall be sealed to prevent debris, soil, sand etc. from entering public sewers/drains;

(b) Temporary ditches shall be provided to facilitate run-off discharge into appropriate watercourses, via a silt retention pond. No site run-off shall enter the fishponds at Shuen Wan;

(c) Sand/silt removal facilities such as sand traps, silt traps and sediment basins shall be provided to remove sand/silt particles from runoff to meet the requirements of the Technical Memorandum standard under the Water Pollution Control Ordinance. The design of silt removal facilities shall be based on the guidelines provided in ProPECC PN 1/94. All drainage facilities and erosion and sediment control structures shall be inspected monthly and maintained to ensure proper and efficient operation al all times and particularly during rainstorms

(d) Water pumped out from excavated pits shall be discharged into sill removal facilities;

(e) During rainstorms, exposed slope/soil surfaces shall be covered by a tarpaulin or other means. Other measures that need to be implemented before, during, and after rainstorms as summarized in

ProPECC PN 1/94 shall be followed

(f) Exposed soil areas shall be minimized to reduce potential for increased siltation and contamination of runoff

(g) Earthwork final surfaces shall be well compacted and subsequent permanent work or surface protection shall be immediately performed to reduce the potential of soil erosion;

(h) Open stockpiles of construction materials or construction wastes on-site shall be covered with tarpaulin or similar fabric during rainstorms;

(i) For the construction of the box culvert next to the existing channel of the Wai Ha River, sand bags should be deployed around the boundary of the works trench to prevent muddy water ingress into the adjacent CA or Wai Ha River. Sand bags should also be used to surround the excavated trench. Generally, the sand bags will be placed up to a height 01 300mm to provide adequate allowance for the built-up water level during rainstorm event. With sand bags in place surface runoff will be intercepted and flow to Wai Ha River or collected by the existing drainage system as usual;

(j) For the construction of the box culvert in the extreme northeast corner of Shuen Wan Marsh Conservation Area sand bags should be deployed along the limit of the works area to prevent muddy water ingress into the CA. Sand bags should be placed to a height 0.1 at least 300mm from ground level and +2.5 mPD (whichever is greater) to provide adequate allowance for the built-up water level during rainstorm events Unpolluted surface runoff within the works area should then be collected and directed into the existing drainage system;

(k) Sheet-piles, which would be installed around the works trench near the Conservation Area, would be extended above ground level for about 2m to serve as hoardings to isolate the works site;

(l) Tarpaulin sheets would be used to cover the excavation areas during heavy rainstorms. This would prevent the ingress of rainwater into the trench minimizing the risk of muddy water getting into Wai Ha River and the adjacent Conservation Area;

(m) Any concrete washing water would be contained inside the works site surrounded by the extended sheet piles. A pump sump at the bottom 0f the trench would be provided to pump any excess water during concrete washing;

(n) Stockpiling the excavated materials adjacent to the Conservation Area would not be allowed. The excavated materials would be either removed off site immediately after excavation, or stockpile at location(s) away from the Conservation Area. The stockpile locations shall be approved by the site engineer;

(o) Debris and refuse generated on-site should be collected, handled and disposed of properly to avoid entering the Wai Ha River and fish ponds at Shuen Wan. Stockpiles of cement and other construction materials should be kept covered when not being used.

(p) Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities to prevent spillage of fuels and solvents to nearby water bodies, all fuel tanks and storage areas should be provided with locks and be sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity 01 the largest tank The bund should be drained of rainwater after a rain event

(q) Temporary sanitary facilities, such as portable chemical toilets, should be employed on-site. A licensed contractor would be responsible for appropriate disposal and maintenance of these facilities;

(r) The excavation works within the upstream end of the existing river channel of the Wai Ha River for the construction of the proposed box culvert should be carried out in dry condition. Containment measures such as bunds and barriers shall be used within the affected length of the river channel and the excavation works restricted to within an enclosed dry section of the channel. The excavation works within Wai Ha River shall be restricted to the period from October to April.

Waste Mitigation Measures

(a) The Contractor shall observe and comply with the Waste Disposal Ordinance (WDO) and its subsidiary regulations.

(b) The Contractor shall submit to the Engineer for approval a Waste Management Plan with appropriate mitigation measures including the allocation of an area for waste segregation and shall ensure that the day-to-day site operations comply with the approved waste management plan.

(c) The Contractor shall minimize the generation of waste from his work. Avoidance and minimization of waste generation can be achieved through changing or improving design and practices, careful planning and good site management.

(d) The reuse and recycling of waste shall be practised as far as possible. The recycling materials shall include paper/cardboard, timber and metal etc.

(e) The Contractor shall ensure that Construction and Demolition (C&D) materials are sorted into public fill (inert portion) and C&D waste (non-inert portion). The public fill which comprises soil, rock, concrete, brick, cement plaster/mortar, inert building debris, aggregates and asphalt shall be reused in earth filling, reclamation or site formation works. The C&D waste which comprises metal, timber, paper, glass, junk and general garbage shall be reused or recycled where possible and, as the last resort, disposal of at landfills.

(f) The Contractor shall record the amount of wastes generated, recycled and disposed of (including the disposal sites). The Contractor shall use a trip ticket system for the disposal of C&D materials to any designated public filling facility and/or landfill.

(g) In order to avoid dust or odour impacts, any vehicles leaving a works area carrying construction waste or public fill shall have their load covered.

(h) To avoid the excessive use of wood, reusable steel shutters shall be used as a preferred alternative to formwork and falsework where possible.

(i) The Contractor shall observe and comply with the Waste Disposal (Chemical Waste) (General) Regulation. The Contractor shall apply for registration as chemical waste producer under the Waste Disposal (Chemical Waste) (General) Regulation when chemical waste is produced. All chemical waste shall be properly stored, labeled, packaged and collected in accordance with the Regulation.

Ecology

- To minimize sedimentation, de-silting should be limited to the dry season
- Waste material produced during de-silting should be disposed of in a timely and appropriate manner

Landscape and visual

- Viewing area formation by planting with shrubs, grasses and benches along the area
- Architectural design of the pump house will help it fit into the existing suburban, natural to semi-natural surroundings
- Landscape design of pump house by providing sufficient planting around its boundary fence
- Enhancement planting along Tung Tsz Road with shrubs / trees of suitable species to help protect the stream and marshes;
- Construction of box culvert should be with at least 1.0m soil depth for enhancement planting
- Transplanting of existing affected trees to adjacent locations should be carried out
- Preparation for transplanting is needed to allow sufficient time for root pruning and rootball preparation prior to transplanting

Reinstatement of affected area should be carried out to check that the works areas are properly reinstated

9 CONCLUSIONS

CONCLUSIONS

9.01 This is the Final EM&A Summary Report for the Construction Phase and Operation Phase under EP-303/2008 which summarizes the key environmental monitoring results throughout the construction phase during March 2011 to March 2015 (hereinafter the "Construction Period") as well as the operation phase during December 2014 to March 2016 (hereinafter the "Operation Period").

9.02 In the Construction Period, two limit level exceedances of construction noise were recorded in June 2012. Investigation report for the exceedance was conducted by the ET and it was concluded that the exceedances were related to the sheetpile work under the Project. The Contractor was reminded to strictly implement all noise mitigation measures as recommended in the EM&A Manual and no further noise exceedances were recorded.

9.03 For water quality, 1432, 1155 and 673 Action/ Limit exceedances were recorded for DO, turbidity and SS during the construction period. All the exceedances of DO were concluded as non-project related as there were no DO depletion activities being carried out. For turbidity and SS, the exceedances were partially due to rainfall and most of exceedances were due to natural variation and not related to works under the Project.

9.04 For hydrological characteristics, the water depth and water flow rate as compared baseline monitoring period have no significant changes and no exceedances were triggered during the construction period.

9.05 In the Operation Period, only hydrological characteristics and ecology monitoring are required to carry out as per the EM&A Manual requirement. The hydrological characteristics of water depth and water flow rate as compared baseline monitoring period, the operation phase water depth and volumetric flow rate has insignificant change. The ecology monitoring and the Landscape and Visual inspection were carried out quarterly during the Operation Period and no abnormalities were recorded.

9.06 No breaches of environmental regulations and requirements stipulated in the EIA and the associated EM&A Manual were recorded during the regular site inspection.

9.07 A total of one (1) environmental complaint was received during the construction period and operation period and it was settled immediately. There were no documented notifications of summons and successful prosecutions received during the Construction Period. Thus, no associated mitigation action was needed.

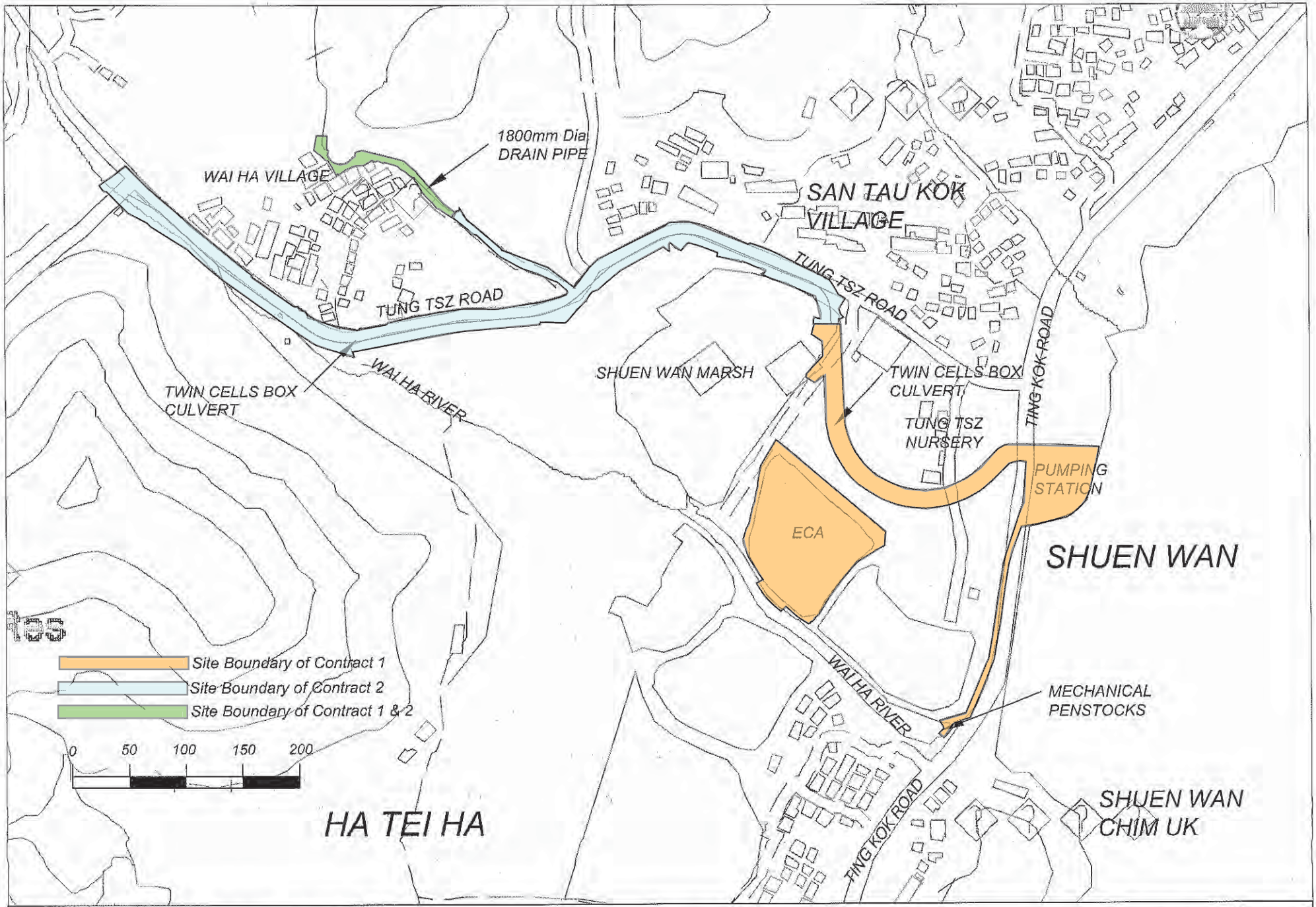
9.08 During the construction period and operation period, there were no notifications of summons and successful prosecutions and no public concern/environmental complaint received by the EPD.

9.09 Throughout the construction period and operation period, the monitoring results and the site inspections were fully complied the EP requirement. It revealed that the environmental controls established by the Contractor and the environmental mitigation measures recommended in the EIA were appropriate and effective.

9.10 The EM&A programme effectively monitored the environmental impacts from the construction phase of the Project and no particular recommendation was advised for the improvement of the programme.

Annex A

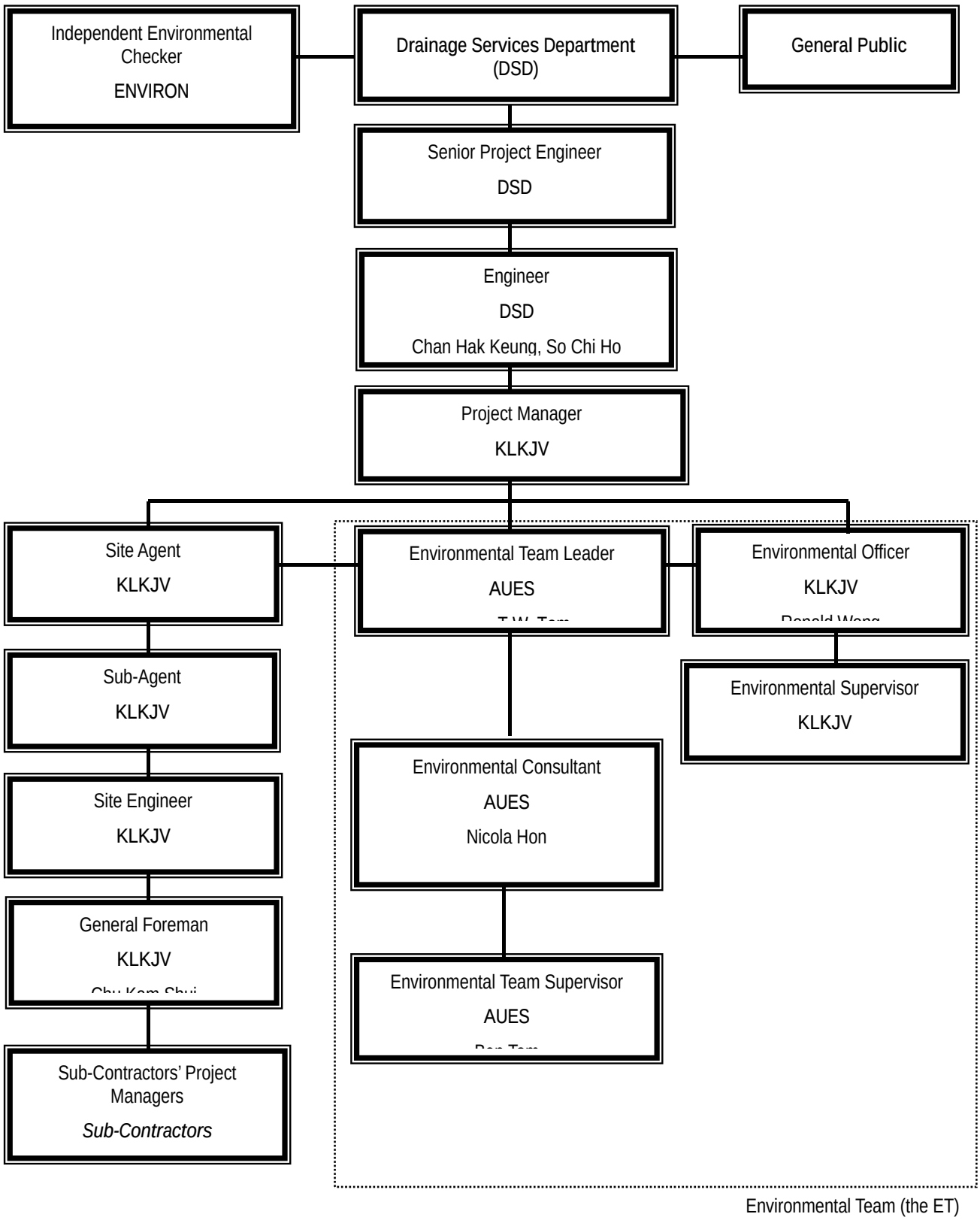
Location Plan for the Works under EP-303/2008



Site Location Plan of DSD Contract 1 and Contract at Shuen Wan

ANNEX B

ENVIRONMENTAL MANAGEMENT ORGANIZATION AND COMMUNICATION LINES



Environmental Management Organization

Contact Details of Key Personnel

Organization	Project Role	Name of Key Staff	Tel No.	Fax No.
DSD	Employer	Mr. Luk Wai Hung	2594 7400	2827 8700
DSD	Senior Engineer	Mr. Lau Wing Wah	2594 7402	2827 8700
DSD	Engineer	Mr. Chan Hak Keung	2594 7596	2827 8700
DSD	Engineer	Mr. So Chi Ho	2594 7356	2827 8700
DSD	Senior Inspector	Mr. Tso Si On	6778 2708	2827 8700
ENVIRON	Independent Environmental Checker	Mr. Tong Cheng	3465-2888	3465-2899
KLKJV	Project Director	Mr. Poon Chi Yeung Francis	2674 3888	2674 9988
KLKJV	Project Manager	Mr. Jeff Chan	2674 3888	2674 9988
KLKJV	Sub- Agent	Mr. Anthony Chan	2674 3888	2674 9988
KLKJV	Site Forman	Mr. Chu Kam Shui	2674 3888	2674 9988
KLKJV	Environmental Officer	Mr. Ronald Wong	2674 3888	2674 9988
AUES	Environmental Team Leader	Mr. T.W. Tam	2959-6059	2959-6079
AUES	Environmental Consultant	Miss. Nicola Hon	2959-6059	2959-6079
AUES	Environmental Supervisor	Mr. Ben Tam	2959-6059	2959-6079

Legends:

DSD (Employer) – Drainage Services Department

DSD (Engineer) – Drainage Services Department

KLKJV (Main Contractor) – Kwan Lee-Kuly Joint Venture

ENVIRON (IEC) – ENVIRON Hong Kong Limited

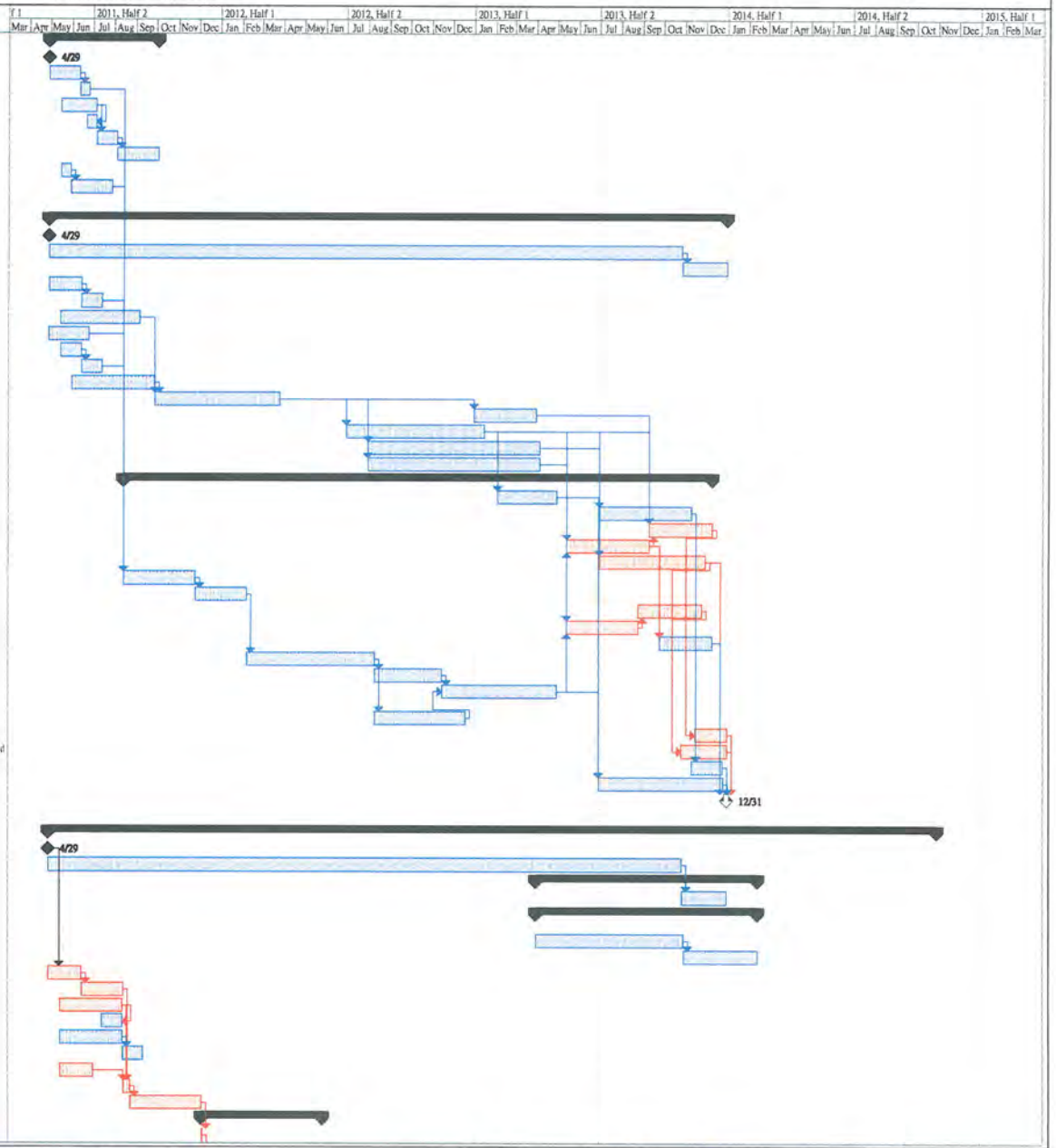
AUES (ET) – Action-United Environmental Services & Consulting

ANNEX C

MASTER CONSTRUCTION PROGRAMME

Contract No.: DC/2010/02
Contract Title: Drainage Improvement Works in Shuen Wan and Shek Wu Wai
Updated Programme (No. 6)

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Preliminary Works**	**158 days**	**Fri 11 Apr 29**	**Mon 11 Oct 3**	
2	Commencement of Works	0 days	Fri 11 Apr 29	Fri 11 Apr 29	
3	Site Clearance	44 days	Fri 11 Apr 29	Sat 11 Jun 11	
4	Record Survey	14 days	Sun 11 Jun 12	Sat 11 Jun 25	3
5	Design & Construction of Hoarding	51 days	Mon 11 May 16	Tue 11 Jul 5	
6	Signboard (Type B)	14 days	Wed 11 Jun 22	Tue 11 Jul 5	5FF
7	Design & Approval of Engineer's Site Office	30 days	Wed 11 Jul 6	Thu 11 Aug 4	5
8	Construction of Engineer's Site Office	60 days	Fri 11 Aug 5	Mon 11 Oct 3	7
9	Pre-construction Condition Survey	14 days	Mon 11 May 16	Sun 11 May 29	
10	Relocation of Existing Shrines (2 Nos.)	60 days	Mon 11 May 30	Thu 11 Jul 28	9
11					
12	**Section I (Construction Works in Shuen Wan)**	**978 days**	**Fri 11 Apr 29**	**Tue 13 Dec 31**	
13	**Commencement of Works**	0 days	Fri 11 Apr 29	Fri 11 Apr 29	
14	**Original Contract Period**	913 days	Fri 11 Apr 29	Sun 13 Oct 27	
15	**Extension of Time - due to Inclement Weather**	65 days	Mon 13 Oct 28	Tue 13 Dec 31	14
16	Design of TTA	47 days	Fri 11 Apr 29	Tue 11 Jun 14	
17	Submission of TTA to TMLG for Approval	30 days	Wed 11 Jun 15	Thu 11 Jul 14	16
18	Excavation Permit	115 days	Mon 11 May 16	Wed 11 Sep 7	
19	Submission & approval of caluclation & MS for BC (including trench ELS/slope)	58 days	Fri 11 Apr 29	Sat 11 Jun 25	
20	Notify EPD on commencement (one month advance notice)	30 days	Mon 11 May 16	Tue 11 Jun 14	
21	Tree Felling	30 days	Wed 11 Jun 15	Thu 11 Jul 14	20
22	Utility detection and diversion programme	120 days	Wed 11 Jun 1	Wed 11 Sep 28	
23	Utilities coordination	180 days	Thu 11 Sep 29	Mon 12 Mar 26	18,22
24	Tempory disconnection of fire hydrant (Bay 7)	90 days	Tue 13 Jan 1	Sun 13 Mar 31	23
25	CLP's overhead pole diversion (bay 1 to Bay 15)	199 days	Sun 12 Jul 1	Tue 13 Jan 15	23
26	Relocation/ diversion of light post (near Bay 13)	248 days	Wed 12 Aug 1	Fri 13 Apr 5	23
27	Relocation/ diversion of light post (near Bay 32)	248 days	Wed 12 Aug 1	Fri 13 Apr 5	23
28	**Construction of Single Cell (approx. 724m)**	**849 days**	**Mon 11 Aug 15**	**Tue 13 Dec 10**	
29	**Intake of Box Culvert - in progress**	86 days	Mon 13 Feb 4	Tue 13 Apr 30	25
30	from CH167 to CH127 (Bay 1,2,3,4,5)	133 days	Mon 13 Jul 1	Sat 13 Nov 10	25
31	from CH127 to CH152 (Bay 6,7)	91 days	Wed 13 Sep 11	Tue 13 Dec 10	32,24,25
32	from CH152 to CH200 (Bay 8,9,10,11)	119 days	Wed 13 May 15	Tue 13 Sep 10	41,25
33	from CH200 to CH297 (Bay 12,13,14,15,16,17,18,19)	153 days	Mon 13 Jul 1	Sat 13 Nov 30	26,25
34	**from CH297 to CH334 (Bay 20,21,22) completed**	**103 days**	**Mon 11 Aug 15**	**Fri 11 Nov 25**	**17,19,21,10,4**
35	**from CH334 TO CH395 (Bay 23,24,25,26,27) completed**	**74 days**	**Sat 11 Nov 26**	**Tue 12 Feb 7**	**34**
36	from CH395 to CH419 (Bay 28,29)	92 days	Mon 13 Aug 26	Mon 13 Nov 25	37
37	From CH419 to CH455 (Bay 30,31,32)	103 days	Wed 13 May 15	Sun 13 Aug 25	41,27
38	from CH455 to CH480 (Bay 33,34)	76 days	Thu 13 Sep 26	Tue 13 Dec 10	32FS+15 days
39	**from CH480 to CH541 (Bay 35,36,37,38,39) completed**	**185 days**	**Wed 12 Feb 8**	**Fri 12 Aug 10**	**35**
40	**from CH541 to CH577 (Bay 40,41,42) completed**	97 days	Sat 12 Aug 11	Thu 12 Nov 15	39
41	**from CH577 to CH674 (Bay 43,44,45,46,47,48,49,50) in progress**	166 days	Fri 12 Nov 16	Tue 13 Apr 30	40,42FS-44 days
42	**from CH674 to CH732 (Bay 51,52,53,54,55) completed**	131 days	Sat 12 Aug 11	Wed 12 Dec 19	39
43	RCP (above Bay 6)	46 days	Sat 13 Nov 16	Tue 13 Dec 31	31FS-25 days
44	CCTV Inspection	66 days	Sun 13 Oct 27	Tue 13 Dec 31	36FS-30 days,33FS-35 d
45	Installation of Type 2 Railing at Upstream (CH67 to CH240)	45 days	Mon 13 Nov 11	Wed 13 Dec 25	30
46	Landscape Softwork	180 days	Sun 13 Jun 30	Thu 13 Dec 26	29,41FS+60 days
47	**Completion of Section I**	0 days	Tue 13 Dec 31	Tue 13 Dec 31	46,45,43,44,33,38
48					
49	**Section II (Construction Works in Shek Wu Wai)**	**1281 days**	**Fri 11 Apr 29**	**Thu 14 Oct 30**	
50	Commence of Works	0 days	Fri 11 Apr 29	Fri 11 Apr 29	
51	Original Contract Period	913 days	Fri 11 Apr 29	Sun 13 Oct 27	
52	**Extension of Time**	**320 days**	**Mon 13 Apr 1**	**Fri 14 Feb 14**	
53	EOT due to inclement weather	65 days	Mon 13 Oct 28	Tue 13 Dec 31	51
54	**Utilities in conflict with Construction of Box Culvert at downstream**	**320 days**	**Mon 13 Apr 1**	**Fri 14 Feb 14**	
55	utilities diversions	213 days	Mon 13 Apr 1	Wed 13 Oct 30	
56	construction of remaining works	107 days	Thu 13 Oct 31	Fri 14 Feb 14	55
57	Design of TTA	48 days	Fri 11 Apr 29	Wed 11 Jun 15	50
58	Submission of TTA to TMLG for Approval	60 days	Thu 11 Jun 16	Sun 11 Aug 14	57
59	Excavation Permit	90 days	Mon 11 May 16	Sat 11 Aug 13	
60	Temp. Work Design	30 days	Fri 11 Jul 15	Sat 11 Aug 13	59FF
61	Site Investigation for Utilities	90 days	Mon 11 May 16	Sat 11 Aug 13	
62	Submit Program for Utilities Diversion	30 days	Sun 11 Aug 14	Mon 11 Sep 12	61
63	Site Clearance and Tree Felling	48 days	Mon 11 May 16	Sat 11 Jul 2	
64	Implement Stage 1 of TTA	10 days	Mon 11 Aug 15	Wed 11 Aug 24	58,59,63
65	Temp. Steel Decking and temporary carriageway	102 days	Thu 11 Aug 25	Sun 11 Dec 4	64
66	**Box Culvert Construction**	**175 days**	**Mon 11 Dec 5**	**Sun 12 May 27**	
67	Implement Stage 2 of TTA	1 day	Mon 11 Dec 5	Mon 11 Dec 5	65

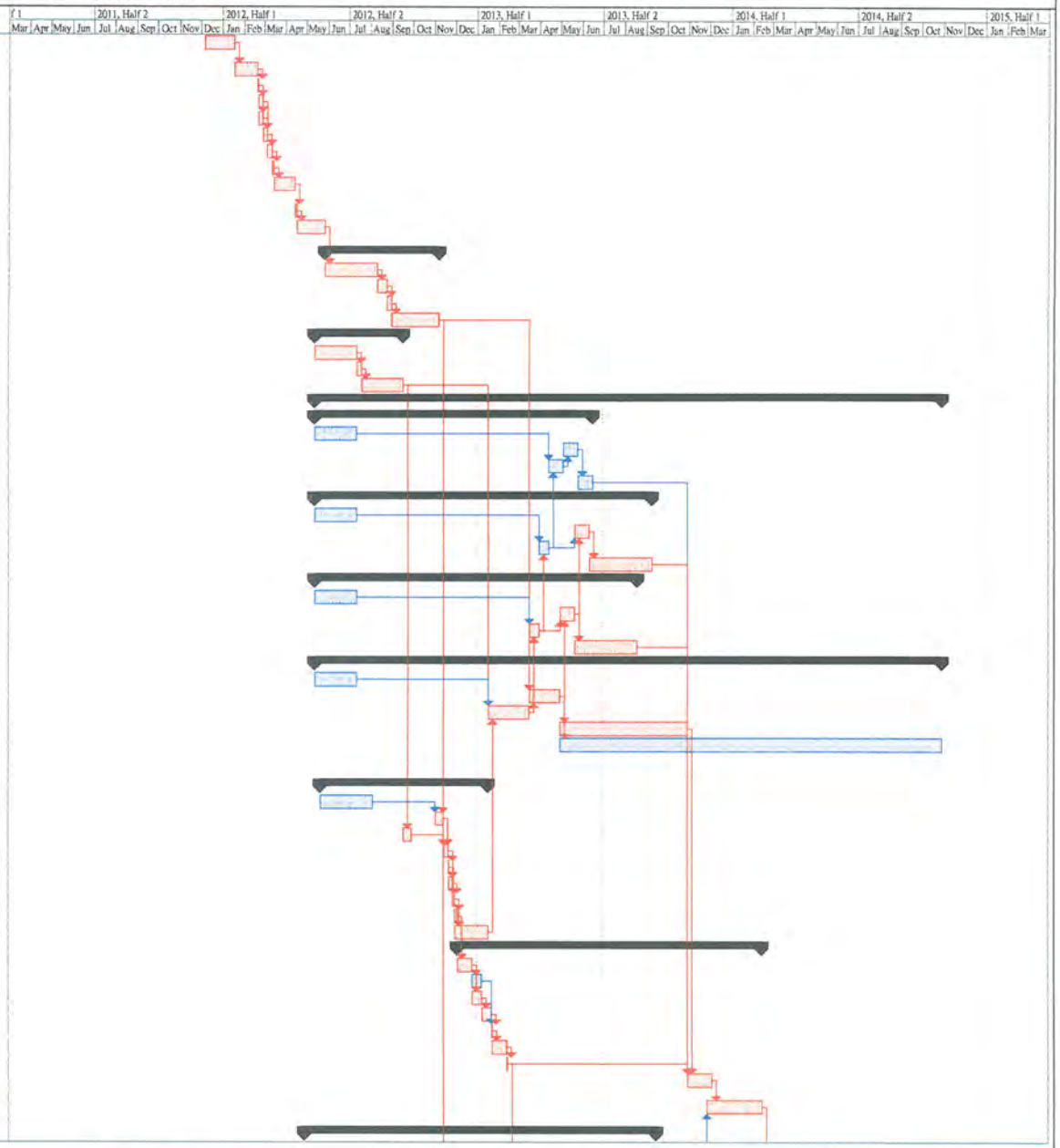


Data Date: 09 Jan 2013
Printed on : 30 March 2013

Task | Milestone | Rolled Up Task | Rolled Up Milestone | Split | Project Summary | Inactive Task | Deadline
Critical Task | Summary | Rolled Up Critical Task | Rolled Up Progress | External Tasks | Group By Summary | Progress

Contract No.: DC/2010/02
Contract Title: Drainage Improvement Works in Shuen Wan and Shek Wu Wai
Updated Programme (No. 6)

ID	Task Name	Duration	Start	Finish	Predecessors
68	Construction of Box Culvert along Castle Peak Road (West Bound) including demolition of ex. BC	43 days	Tue 11 Dec 6	Tue 12 Jan 17	67
69	Temporary carriageway for stage 3 TTA	33 days	Wed 12 Jan 18	Sun 12 Feb 19	68
70	Implement Stage 3 of TTA	1 day	Mon 12 Feb 20	Mon 12 Feb 20	69
71	Trial pit for utilities	7 days	Tue 12 Feb 21	Mon 12 Feb 27	70
72	Construction of steel footbridge	7 days	Tue 12 Feb 21	Mon 12 Feb 27	70
73	Installation of steel sheet piles	6 days	Tue 12 Feb 28	Sun 12 Mar 4	72,71
74	Temporary support for utilities	7 days	Mon 12 Mar 5	Sun 12 Mar 11	73
75	Demolish Exisiting Box Culvert (East Bound)	3 days	Mon 12 Mar 12	Wed 12 Mar 14	74
76	Construction of Base Slab & Wall of Box Culvert along Castle Peak Road (East Bound)	30 days	Thu 12 Mar 15	Fri 12 Apr 13	75
77	Remove Temporary flow diversion	3 days	Sat 12 Apr 14	Mon 12 Apr 16	76
78	Construction of 3.5m wide top slab of box culvert along Castle Peak Road (East Bound)	41 days	Tue 12 Apr 17	Sun 12 May 27	77
79	**Construction of RW1 wing wall portion**	**164 days**	**Mon 12 May 28**	**Wed 12 Nov 7**	
80	CLP (overhead pole) - cable laying	75 days	Mon 12 May 28	Fri 12 Aug 10	78
81	CLP (overhead pole) - changing over	14 days	Sat 12 Aug 11	Fri 12 Aug 24	80
82	CLP (overhead pole) - removal of overhead pole	7 days	Sat 12 Aug 25	Fri 12 Aug 31	81
83	Retaining wall RW1 - wing wall portion	68 days	Sat 12 Sep 1	Wed 12 Nov 7	82
84	**Construction of RW2 (wing wall)**	**127 days**	**Mon 12 May 14**	**Mon 12 Sep 17**	
85	PCCW - XP application	60 days	Mon 12 May 14	Thu 12 Jul 12	
86	PCCW - demolition of existing joint box/ cable drawpit	7 days	Fri 12 Jul 13	Thu 12 Jul 19	85
87	Retaining wall RW2 (wing wall)	60 days	Fri 12 Jul 20	Mon 12 Sep 17	86
88	**Utilities Diversion by UU**	**900 days**	**Mon 12 May 14**	**Thu 14 Oct 30**	
89	**CLP (2no. 11kV cables)**	**399 days**	**Mon 12 May 14**	**Sun 13 Jun 16**	
90	CLP (2 no. 11kV cables) - XP application	60 days	Mon 12 May 14	Thu 12 Jul 12	
91	CLP (2 no. 11kV cables) - ducting & cable works (near RW1)	21 days	Mon 13 May 6	Sun 13 May 26	92
92	CLP (2 no. 11kV cables) - ducting & cable works (near RW2)	21 days	Mon 13 Apr 15	Sun 13 May 5	90,97
93	CLP (2 no. 11kV cables) - changing over	21 days	Mon 13 May 27	Sun 13 Jun 16	91
94	**NWT**	**484 days**	**Mon 12 May 14**	**Mon 13 Sep 9**	
95	NWT - XP application	60 days	Mon 12 May 14	Thu 12 Jul 12	
96	NWT - manholes & ducting construction works (near RW1)	21 days	Wed 13 May 22	Tue 13 Jun 11	97,101
97	NWT - manholes & ducting construction works (near RW2)	14 days	Mon 13 Apr 1	Sun 13 Apr 14	95,102
98	NWT - diversion & changing over	90 days	Wed 13 Jun 12	Mon 13 Sep 9	96
99	**HGC**	**463 days**	**Mon 12 May 14**	**Mon 13 Aug 19**	
100	HGC - XP application	60 days	Mon 12 May 14	Thu 12 Jul 12	
101	HGC - manholes & ducting construction works (near RW1)	21 days	Wed 13 May 1	Tue 13 May 21	102,106
102	HGC - manholes & ducting construction works (near RW2)	14 days	Mon 13 Mar 18	Sun 13 Mar 31	100,107
103	HGC - diversion & changing over	90 days	Wed 13 May 22	Mon 13 Aug 19	101
104	**PCCW**	**900 days**	**Mon 12 May 14**	**Thu 14 Oct 30**	
105	PCCW - XP application	60 days	Mon 12 May 14	Thu 12 Jul 12	
106	PCCW - manholes & ducting construction works (near RW1)	44 days	Mon 13 Mar 18	Tue 13 Apr 30	83,107
107	PCCW - manholes & ducting construction works (near RW2)	59 days	Fri 13 Jan 18	Sun 13 Mar 17	87,105,119
108	PCCW - diversion & changing over (local cables)	183 days	Wed 13 May 1	Wed 13 Oct 30	106
109	PCCW - diversion & changing over (overseas cables - about 4 nos.) - to be hanged up for construction of remaining Box Culvert	548 days	Wed 13 May 1	Thu 14 Oct 30	106
110	**WSD**	**241 days**	**Tue 12 May 22**	**Thu 13 Jan 17**	
111	WSD - material delivery	75 days	Tue 12 May 22	Sat 12 Aug 4	
112	WSD - pipes frabrication, installation & laying (near RW1)	12 days	Sat 12 Nov 3	Wed 12 Nov 14	83FS-5 days,111
113	WSD - pipes frabrication, installation & laying (near RW2)	12 days	Tue 12 Sep 18	Sat 12 Sep 29	87
114	WSD - excavation of connection points	7 days	Thu 12 Nov 15	Wed 12 Nov 21	112,113
115	WSD - inspection of connection points with WSD	1 day	Thu 12 Nov 22	Thu 12 Nov 22	114
116	WSD - swabling/ flushing/ sterilization	6 days	Thu 12 Nov 22	Tue 12 Nov 27	114
117	WSD - shutdown & commissioning by WSD	3 days	Wed 12 Nov 28	Fri 12 Nov 30	116,115
118	WSD - removal of disused pipes/ reinstatement	4 days	Sat 12 Dec 1	Tue 12 Dec 4	117
119	WSD - diversion of 3 nos. dia.25 pipes	48 days	Sat 12 Dec 1	Thu 13 Jan 17	117
120	**Remaining box culvert**	**437 days**	**Wed 12 Dec 5**	**Fri 14 Feb 14**	
121	Construction of top slab of box culvert for East Bound	21 days	Wed 12 Dec 5	Tue 12 Dec 25	118
122	Construction of temp. footway at downstream	14 days	Wed 12 Dec 26	Tue 13 Jan 8	121
123	Backfilling and removal of temporary works	14 days	Wed 12 Dec 26	Tue 13 Jan 8	121
124	Temporary road surface for East Bound	14 days	Wed 13 Jan 9	Tue 13 Jan 22	123
125	Resume the east bound traffic	1 day	Wed 13 Jan 23	Wed 13 Jan 23	122,124
126	Temporary road surface for West Bound	21 days	Thu 13 Jan 24	Wed 13 Feb 13	125
127	Resume Castle Peak Road traffic for both direction	1 day	Thu 13 Feb 14	Thu 13 Feb 14	126
128	Construction of remaining top slab of box culvert and footpath at downstream	35 days	Thu 13 Oct 31	Wed 13 Dec 4	127,108,93,98,103
129	Implementation of TTA, Permanent road surface & Paving block for footpath and associated works	79 days	Thu 13 Nov 28	Fri 14 Feb 14	128FS-7 days,136
130	**Retaining Wall RW1 & Access Ramp**	**505 days**	**Sun 12 Apr 29**	**Sun 13 Sep 15**	



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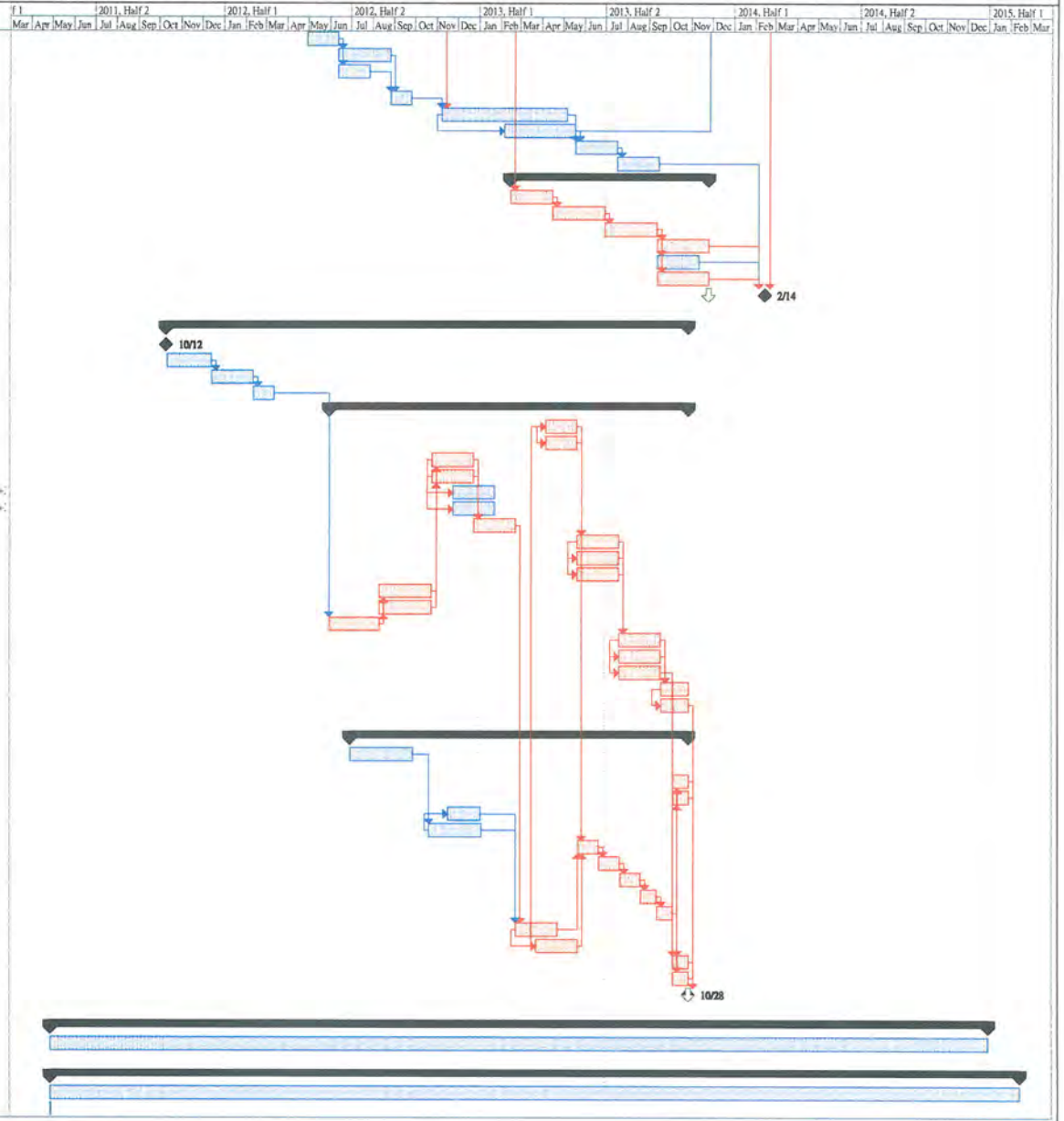
Contract No.: DC/2010/02
Contract Title: Drainage Improvement Works in Shuen Wan and Shek Wu Wai
Updated Programme (No. 6)

ID	Task Name	Duration	Start	Finish	Predecessors
131	Design & submission of TTA (San Tin Tsuen Road) for construction RW1	45 days	Sun 12 Apr 29	Tue 12 Jun 12	
132	Relocation of fire hydrant	75 days	Wed 12 Jun 13	Sun 12 Aug 26	131
133	Coordination with RMO & TD to finalize the implementation date of TTA at San Tin Tsuen Road	45 days	Wed 12 Jun 13	Fri 12 Jul 27	131
134	Implementation of TTA at San Tin Tsuen Road	30 days	Mon 12 Aug 27	Tue 12 Sep 25	132,133
135	Construction of RW1	180 days	Thu 12 Nov 8	Mon 13 May 6	83,134
136	Construction of access ramp	102 days	Wed 13 Feb 6	Sat 13 May 18	135SS+90 days
137	Construction of concrete parapet	60 days	Sun 13 May 19	Wed 13 Jul 17	136,135
138	Installation of railing and vehicular gate	60 days	Thu 13 Jul 18	Sun 13 Sep 15	137
139	**Retaining Wall RW3 & RW4**	**284 days**	**Fri 13 Feb 15**	**Mon 13 Nov 25**	
140	Removal of steel road bridge at upstream	60 days	Fri 13 Feb 15	Mon 13 Apr 15	127
141	Construction of RW4	75 days	Tue 13 Apr 16	Sat 13 Jun 29	140
142	Construction of RW3	75 days	Sun 13 Jun 30	Thu 13 Sep 12	141
143	UU diversion/ permanent works	74 days	Fri 13 Sep 13	Mon 13 Nov 25	142
144	Installation of Type 2 railing and construction of flood wall	60 days	Fri 13 Sep 13	Mon 13 Nov 11	142
145	Reinstatement of footpath and planter areas	74 days	Fri 13 Sep 13	Mon 13 Nov 25	142
146	**Completion of Section II**	0 days	Fri 14 Feb 14	Fri 14 Feb 14	145,138,143,144,129
147					
148	**Section III (Construction Works in Wai Ha Village)**	**748 days**	**Wed 11 Oct 12**	**Mon 13 Oct 28**	
149	Commence of Works	0 days	Wed 11 Oct 12	Wed 11 Oct 12	
150	Design of 2.4m x 0.9m Box Culvert	63 days	Thu 11 Oct 13	Wed 11 Dec 14	
151	Submission of design & works proposal for Approval	60 days	Thu 11 Dec 15	Sun 12 Feb 12	150
152	Site Clearance & trial pits	30 days	Mon 12 Feb 13	Tue 12 Mar 13	151
153	**Construction of Box Culvert (approx. 200m) Bay 1 to Bay 16**	**515 days**	**Fri 12 Jun 1**	**Mon 13 Oct 28**	
154	Bay 1	45 days	Sun 13 Apr 7	Tue 13 May 21	185SS+14 days
155	Bay 2	45 days	Sun 13 Apr 7	Tue 13 May 21	154SS
156	Bay 3	60 days	Fri 12 Oct 26	Mon 12 Dec 24	164,165
157	Bay 4	60 days	Fri 12 Oct 26	Mon 12 Dec 24	164,165
158	Bay 5	60 days	Sun 12 Nov 25	Wed 13 Jan 23	156SS+30 days,157SS+
159	Bay 6	60 days	Sun 12 Nov 25	Wed 13 Jan 23	156SS+30 days,157SS+
160	Bay 7	60 days	Tue 12 Dec 25	Fri 13 Feb 22	156,157
161	Bay 8	60 days	Wed 13 May 22	Sat 13 Jul 20	154,155
162	Bay 9	60 days	Wed 13 May 22	Sat 13 Jul 20	161SS
163	Bay 10	60 days	Wed 13 May 22	Sat 13 Jul 20	161SS
164	Bay 11	75 days	Sun 12 Aug 12	Thu 12 Oct 25	166
165	Bay 12	75 days	Sun 12 Aug 12	Thu 12 Oct 25	166
166	Bay 13	72 days	Fri 12 Jun 1	Sat 12 Aug 11	152
167	Bay 14	60 days	Sun 13 Jul 21	Wed 13 Sep 18	161,162,163
168	Bay 15	60 days	Sun 13 Jul 21	Wed 13 Sep 18	167SS
169	Bay 16	60 days	Sun 13 Jul 21	Wed 13 Sep 18	167SS
170	Bay 17	40 days	Thu 13 Sep 19	Mon 13 Oct 28	167,168,169
171	Bay 18 and Outfall	40 days	Thu 13 Sep 19	Mon 13 Oct 28	170SS
172					
173	**Construction of box culvert (1m x 1m) Bay 1 to Bay 8 (approx. 95m)**	**485 days**	**Sun 12 Jul 1**	**Mon 13 Oct 28**	
174	Notification to villagers regarding traffic arrangement for construction of 1m x 1m box culvert	90 days	Sun 12 Jul 1	Fri 12 Sep 28	
175	Intake headwall	23 days	Sun 13 Oct 6	Mon 13 Oct 28	183
176	Bay 1	23 days	Sun 13 Oct 6	Mon 13 Oct 28	183
177	Bay 2	47 days	Sun 12 Nov 18	Thu 13 Jan 3	178SS+27 days
178	Bay 3	75 days	Mon 12 Oct 22	Fri 13 Jan 4	174
179	Bay 4	30 days	Thu 13 May 23	Fri 13 Jun 21	154,155,184,185
180	Bay 5	30 days	Sat 13 Jun 22	Sun 13 Jul 21	179
181	Bay 6	30 days	Mon 13 Jul 22	Tue 13 Aug 20	180
182	Bay 7	23 days	Wed 13 Aug 21	Thu 13 Sep 12	181
183	Bay 8	23 days	Fri 13 Sep 13	Sat 13 Oct 5	182
184	Bay 9	60 days	Sat 13 Feb 23	Tue 13 Apr 23	177,178,160
185	Bay 10	60 days	Sun 13 Mar 24	Wed 13 May 22	184SS+29 days
186	CCTV inspection of box culvert	23 days	Sun 13 Oct 6	Mon 13 Oct 28	183,169
187	Grouting of existing 900mm storm drain	23 days	Sun 13 Oct 6	Mon 13 Oct 28	183
188	**Completion of Section III**	0 days	Mon 13 Oct 28	Mon 13 Oct 28	171,175,176,186,187
189					
190	**Section IV (Portion A1 and A2, Shuen Wan)**	**1343 days**	**Fri 11 Apr 29**	**Wed 14 Dec 31**	
191	Landscape Establishment Works and preservation & protection of trees	1343 days	Fri 11 Apr 29	Wed 14 Dec 31	
192					
193	**Section V (Portion B, Shek Wu Wai)**	**1388 days?**	**Fri 11 Apr 29**	**Sat 15 Feb 14**	
194	Landscape Establishment Works and preservation & protection of trees	1388 days	Fri 11 Apr 29	Sat 15 Feb 14	
195		1 day?	Fri 11 Apr 29	Fri 11 Apr 29	

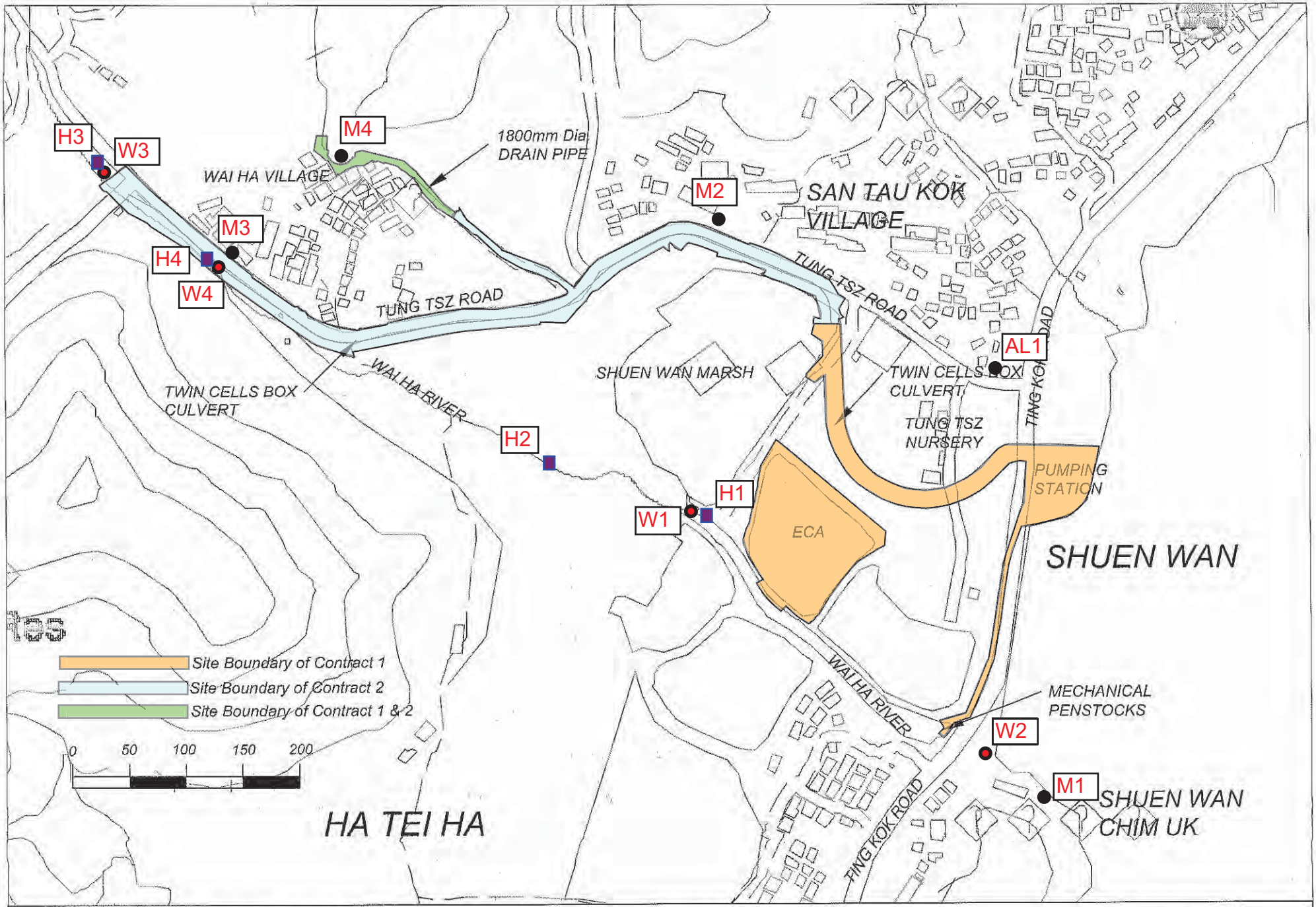


Data Date: 09 Jan 2013
Printed on : 30 March 2013

Task | Milestone | Rolled Up Task | Rolled Up Milestone | Split | Project Summary | Inactive Task | Deadline
Critical Task | Summary | Rolled Up Critical Task | Rolled Up Progress | External Tasks | Group By Summary | Progress

ANNEX D

MONITORING LOCATIONS



All Environmental Monitoring Locations

ANNEX E

EVENT / ACTION PLAN

Event Action Plan for Construction Noise

EVENT	ACTION			
	ET Leader	IEC	ER	Contractor
Action Level	1. Notify IEC and Contractor 2. Carry out investigation. 3. Report the results of investigation to the IEC, ER and Contractor. 4. Discuss with the Contractor and formulate remedial measures 5. Increase monitoring frequency to check mitigation effectiveness.	1. Review the analyzed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose 'remedial measures for the analyzed noise problem 4. Check remedial measures are properly implemented.	1. Submit noise mitigation proposals to IEC 2. Implement noise mitigation proposals
Limit Level	1. Notify IEC, ER, EPD and Contractor 2. Identify source. 3. Repeat measurements to confirm findings 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented 6. Inform IEC, ER and EPD the causes and 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.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions 2. Review Contractor's' remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analyzed noise problem 4. Check remedial measures properly implemented. 5. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

Event and action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
		ACTION LEVEL		
Action level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Repeat measurement on next day of exceedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Action level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exeedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures
		LIMIT LEVEL		
Limit level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform EPD, IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit Level.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Limit level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform EPD, IEC, Contractor and Engineer; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, Engineer 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.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures; 5. Consider and if necessary instruct Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit Level.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check all plant and equipment; 4. Consider changes in working methods; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures; 7. As directed by the Engineer, slow down or stop all or part of the construction activities until no exceedance of Limit level.

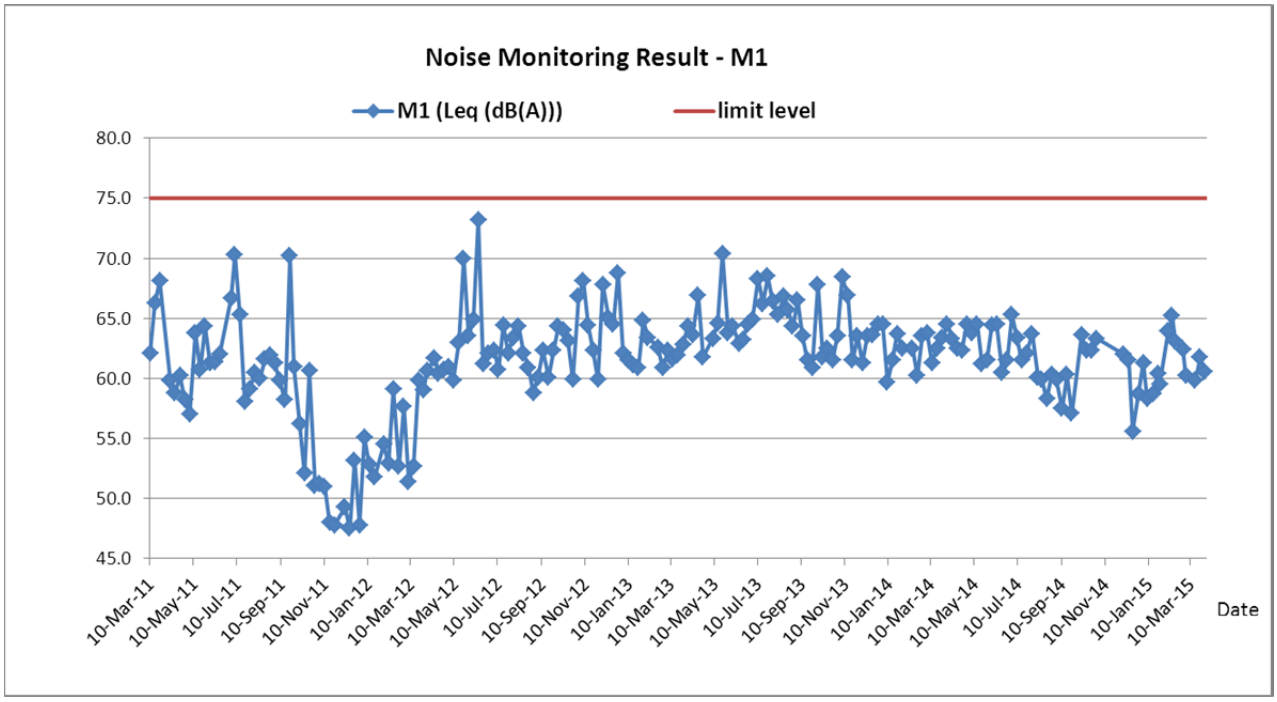
Event and action Plan for Hydrological Characteristics

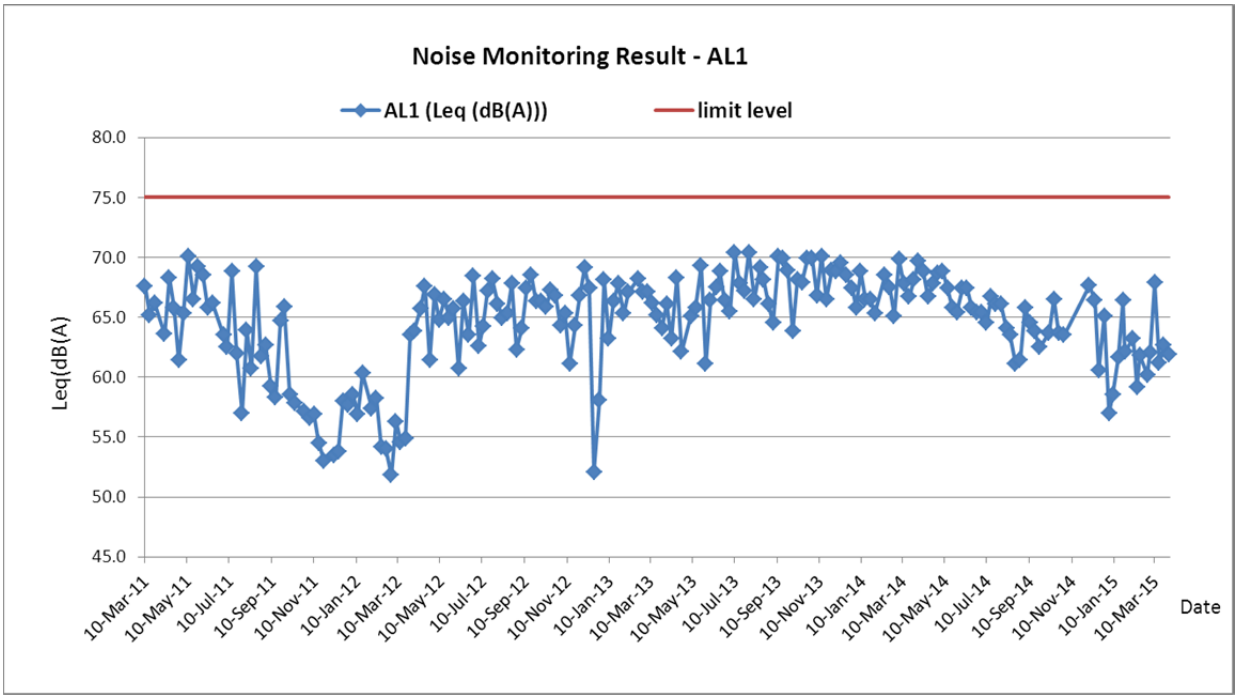
Event	ET Leader	IEC	ER	Contractor
ACTION LEVEL				
Action level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Repeat measurement on next day of exceedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Action level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform IEC, Contractor and Engineer; 4. Check monitoring data, Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented. 7. Prepare to increase the monitoring frequency to daily; 8. Repeat measurement on next day of exeedance.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Make agreement on mitigation measures to be implemented; 3. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures
LIMIT LEVEL				
Limit level being exceeded by one sampling day	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform AFCD, IEC, Contractor and Engineer; 4. Check monitoring data, and Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency to daily until no exceedance of Limit level.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures.
Limit level being exceeded by more than two consecutive sampling days	1. Repeat in-situ measurements to confirm findings; 2. Identify reasons for non-compliance and source(s) of impact; 3. Inform AFCD, IEC, Contractor and Engineer; 4. Check monitoring data and Contractor's working methods and any excavation works or dewatering processes; 5. Discuss mitigation measures with IEC, Engineer 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.	1. Discuss mitigation measures with ET, Engineer and Contractor; 2. Review proposals on mitigation measures submitted by Contractor and advise the Engineer accordingly; 3. Assess effectiveness of implemented mitigation measures.	1. Discuss proposed mitigation measures with IEC, ET and Contractor; 2. Request Contractor to critically review the working methods; 3. Make agreement on mitigation measures to be implemented; 4. Assess effectiveness of implemented mitigation measures; 5. Consider and if necessary instruct Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit Level.	1. Inform Engineer and confirm in writing notification of the non-compliance; 2. Rectify unacceptable practice; 3. Check working methods and any excavation works or dewatering processes; 4. Consider changes in working methods and plans; 5. Discuss with ET, IEC and Engineer and propose mitigation measures to IEC and Engineer within three working days; 6. Implement agreed mitigation measures; 7. As directed by the Engineer, slow down or stop all or part of the construction activities until no exceedance of Limit level.

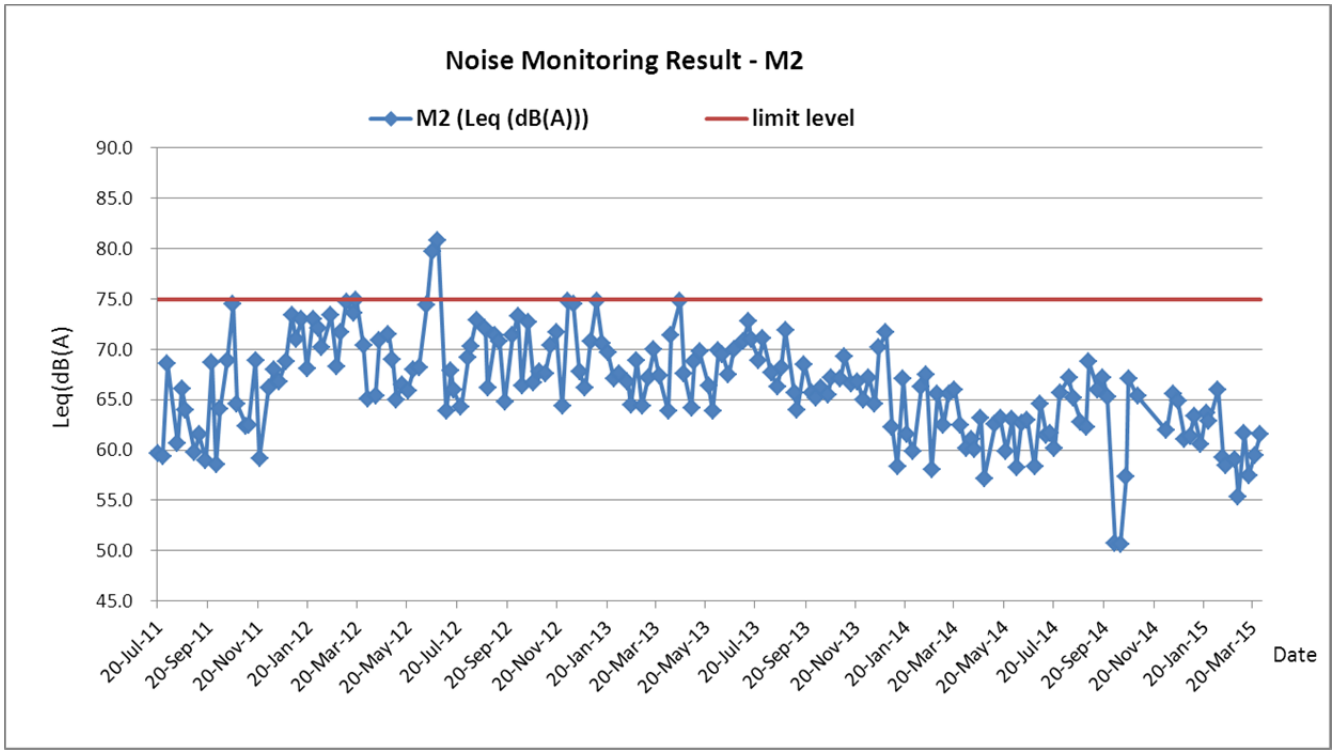
ANNEX F

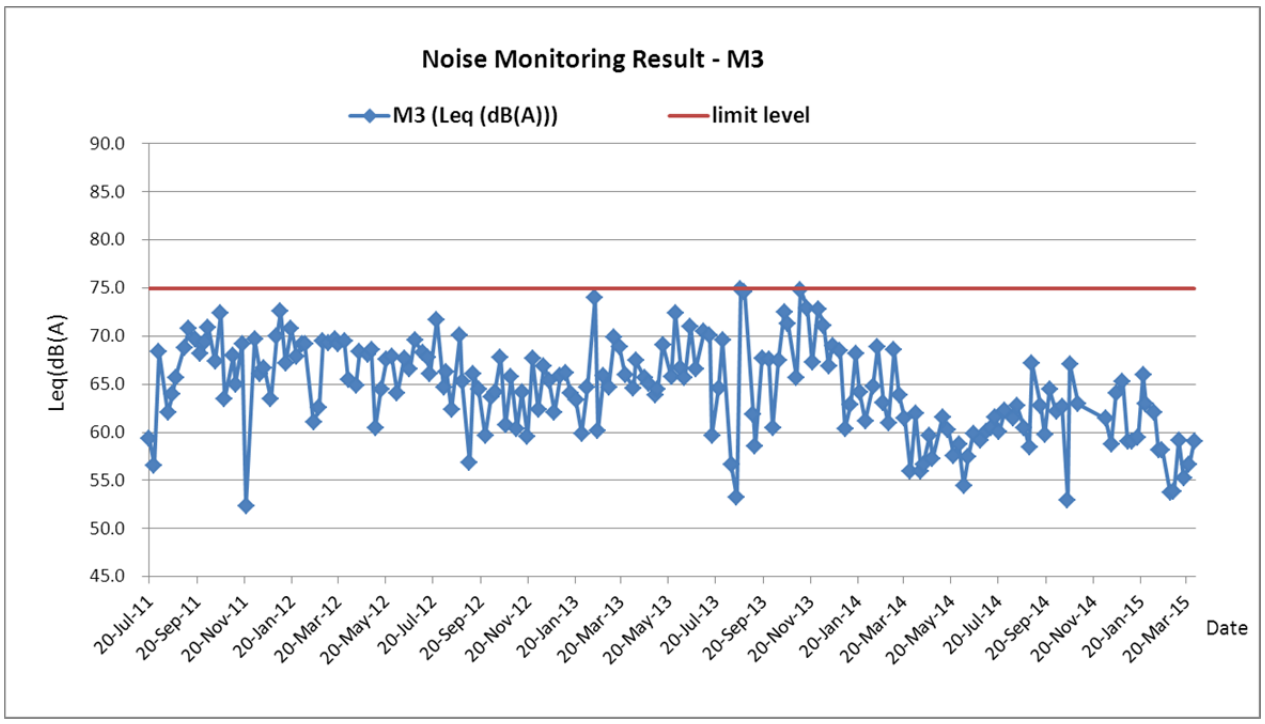
GRAPHICAL PLOT OF ENVIRONMENTAL MONITORING RESULTS

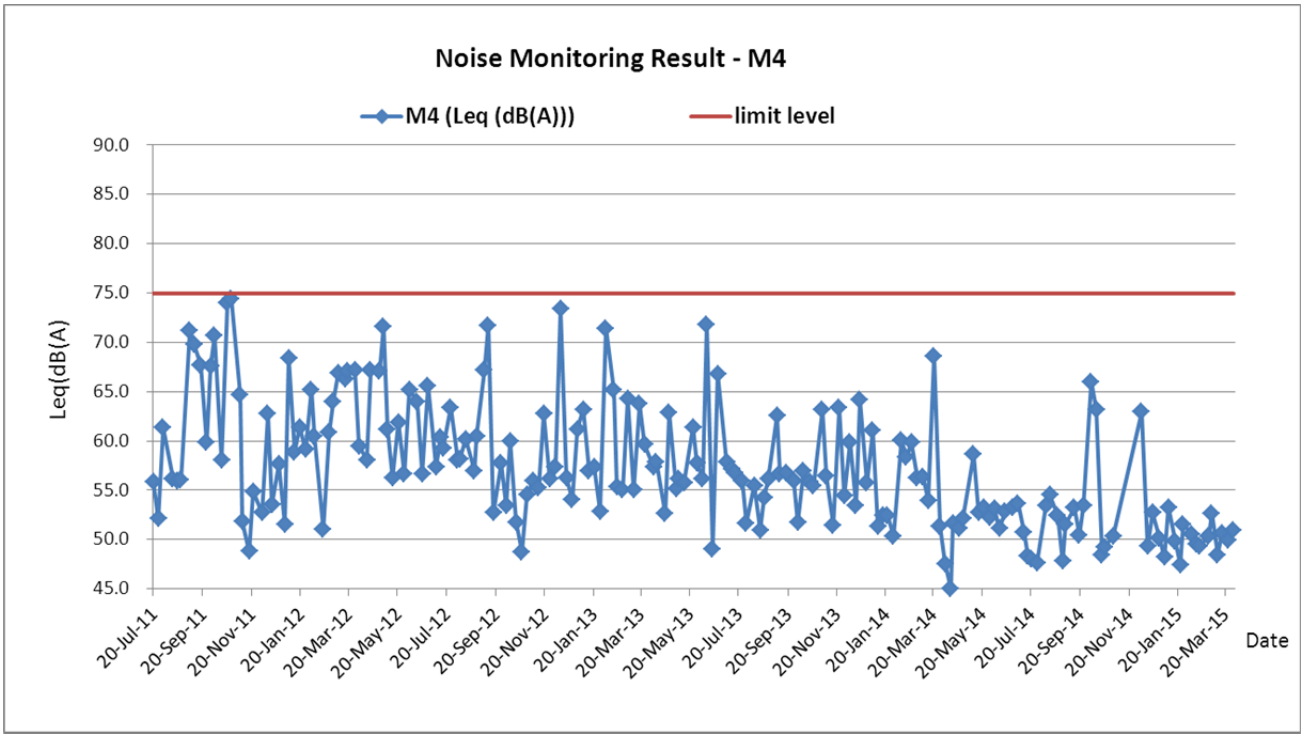
Construction Noise



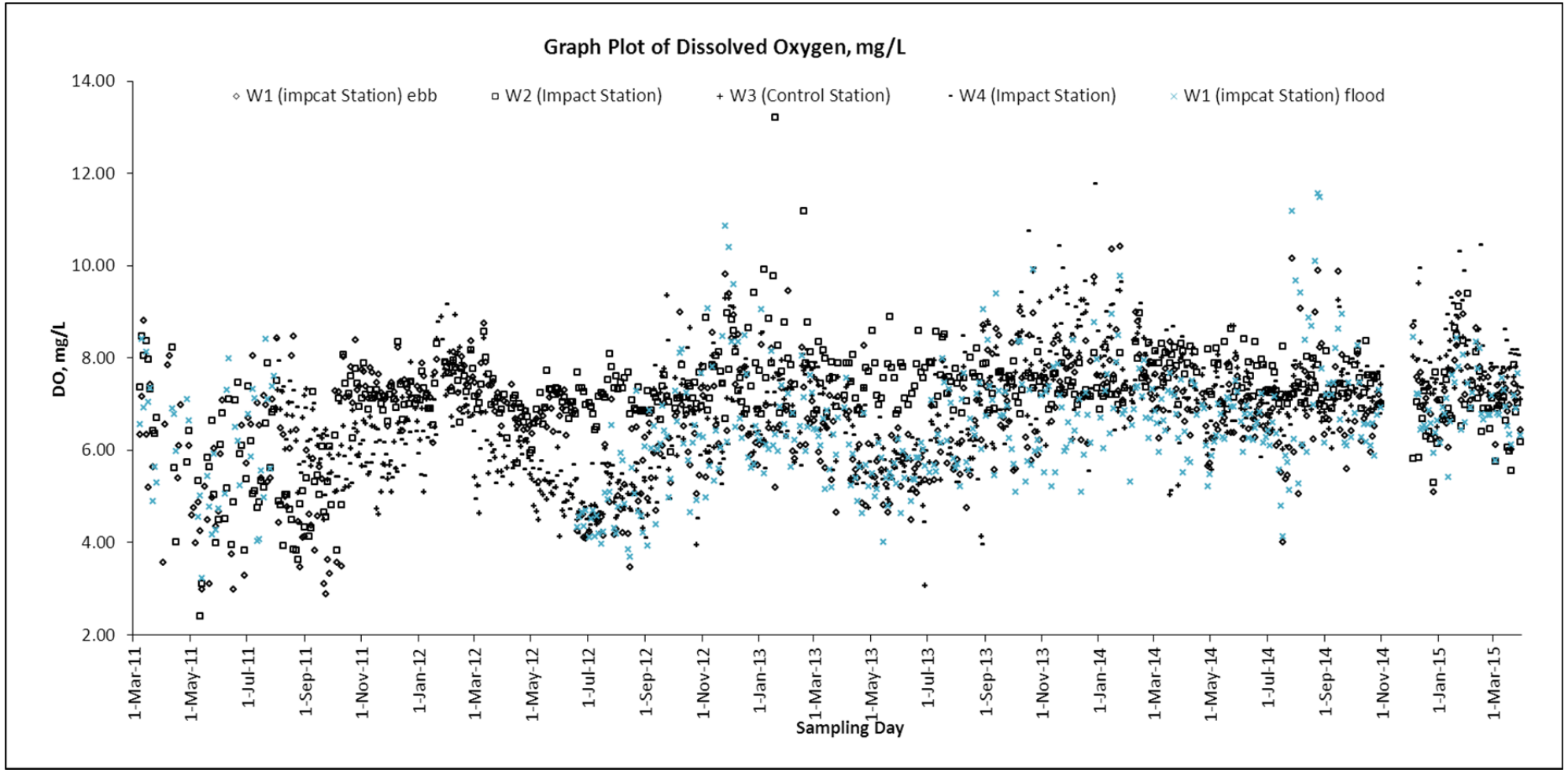


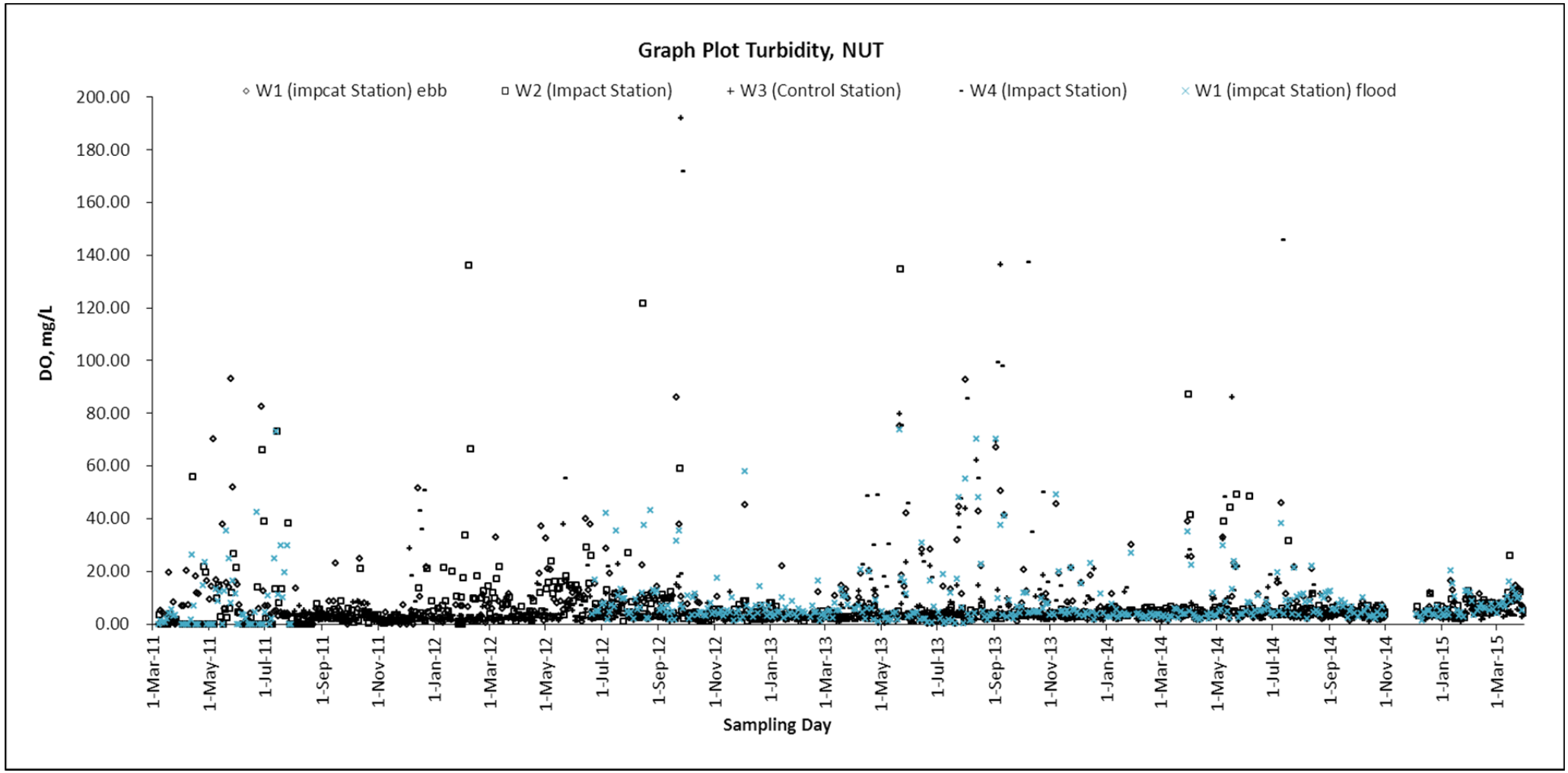

Noise Monitoring Result - M2
M2 (Leq (dB(A)))
limit level
Leq(dB(A)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
20-Jul-11
20-Sep-11
20-Nov-11
20-Jan-12
20-Mar-12
20-May-12
20-Jul-12
20-Sep-12
20-Nov-12
20-Jan-13
20-Mar-13
20-May-13
20-Jul-13
20-Sep-13
20-Nov-13
20-Jan-14
20-Mar-14
20-May-14
20-Jul-14
20-Sep-14
20-Nov-14
20-Jan-15
20-Mar-15
Date


Noise Monitoring Result - M3
M3 (Leq (dB(A)))
limit level
Leq(dB(A)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
20-Jul-11
20-Sep-11
20-Nov-11
20-Jan-12
20-Mar-12
20-May-12
20-Jul-12
20-Sep-12
20-Nov-12
20-Jan-13
20-Mar-13
20-May-13
20-Jul-13
20-Sep-13
20-Nov-13
20-Jan-14
20-Mar-14
20-May-14
20-Jul-14
20-Sep-14
20-Nov-14
20-Jan-15
20-Mar-15
Date


Noise Monitoring Result - M4
M4 (Leq (dB(A)))
limit level
Leq(dB(A)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
20-Jul-11
20-Sep-11
20-Nov-11
20-Jan-12
20-Mar-12
20-May-12
20-Jul-12
20-Sep-12
20-Nov-12
20-Jan-13
20-Mar-13
20-May-13
20-Jul-13
20-Sep-13
20-Nov-13
20-Jan-14
20-Mar-14
20-May-14
20-Jul-14
20-Sep-14
20-Nov-14
20-Jan-15
20-Mar-15
Date

Water Quality




Graph Plot Turbidity, NUT
W1 (impcat Station) ebb
W2 (Impact Station)
W3 (Control Station)
W4 (Impact Station)
W1 (impcat Station) flood
DO, mg/L
200.00
180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
1-Mar-11
1-May-11
1-Jul-11
1-Sep-11
1-Nov-11
1-Jan-12
1-Mar-12
1-May-12
1-Jul-12
1-Sep-12
1-Nov-12
1-Jan-13
1-Mar-13
1-May-13
1-Jul-13
1-Sep-13
1-Nov-13
1-Jan-14
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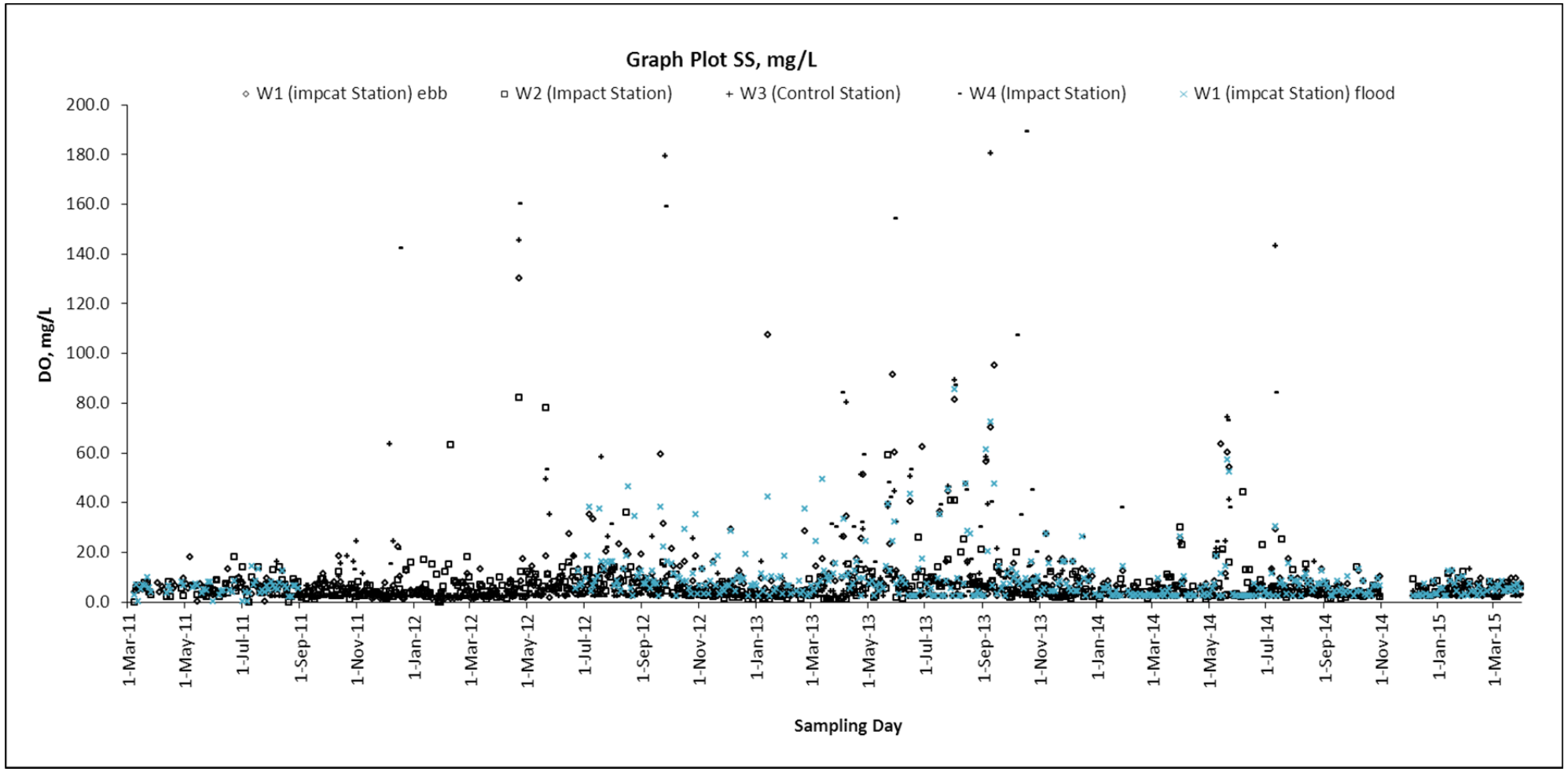
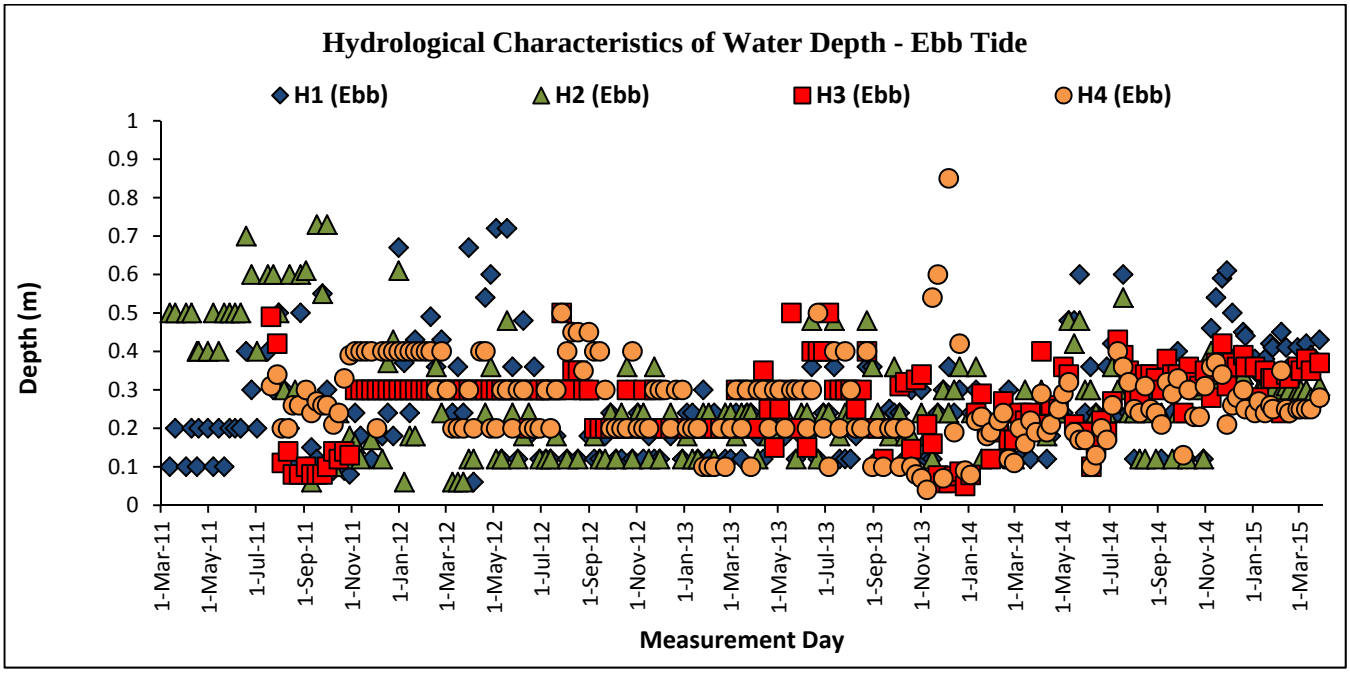
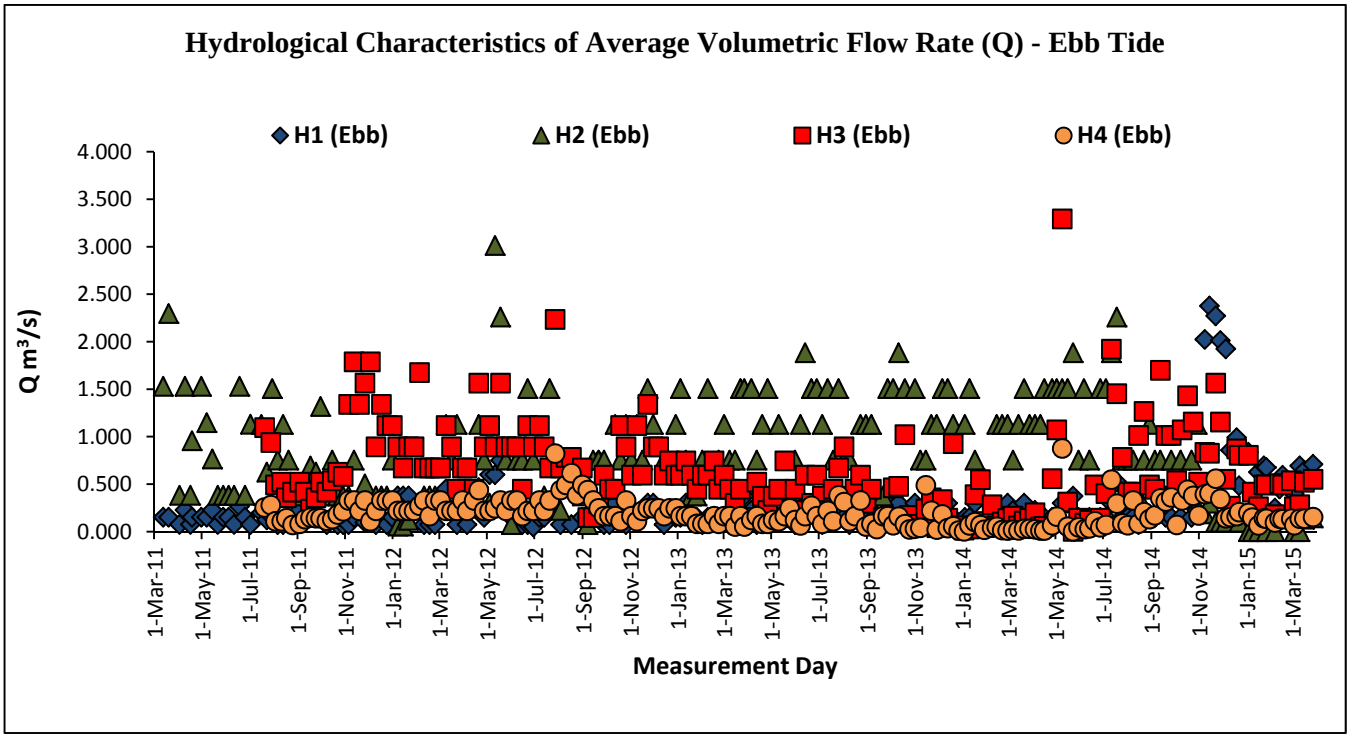
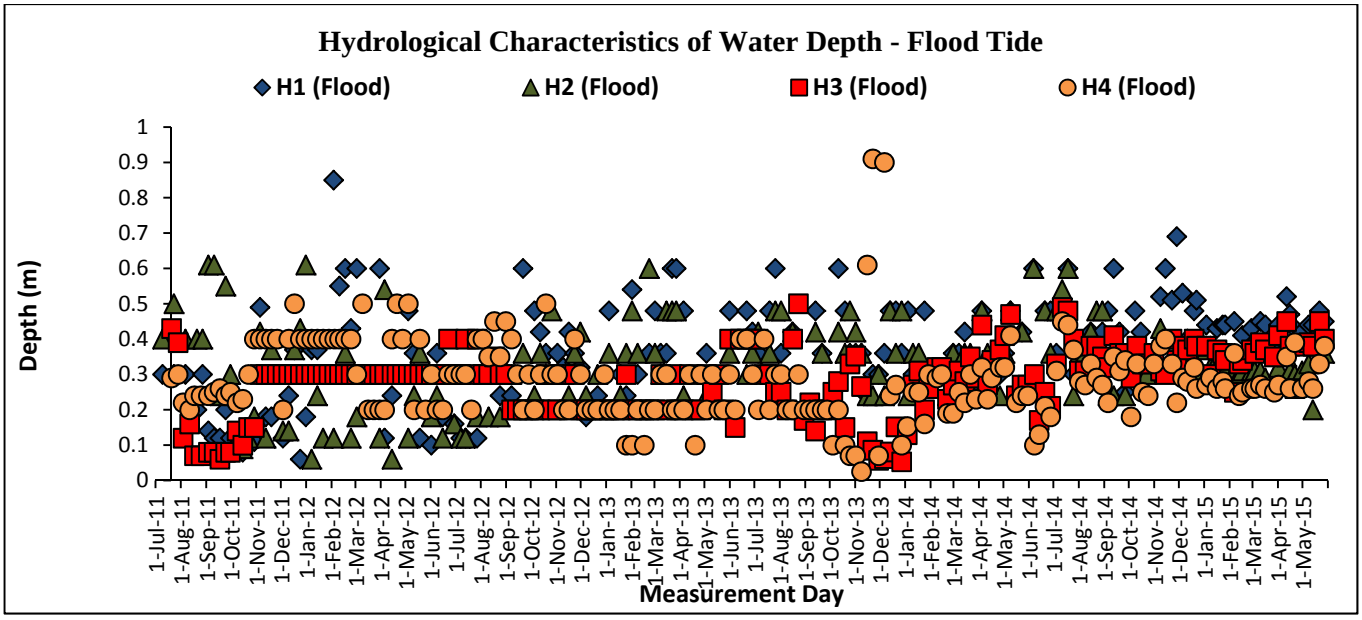
1-May-14
1-Jul-14
1-Sep-14
1-Nov-14
1-Jan-15
1-Mar-15
Sampling Day

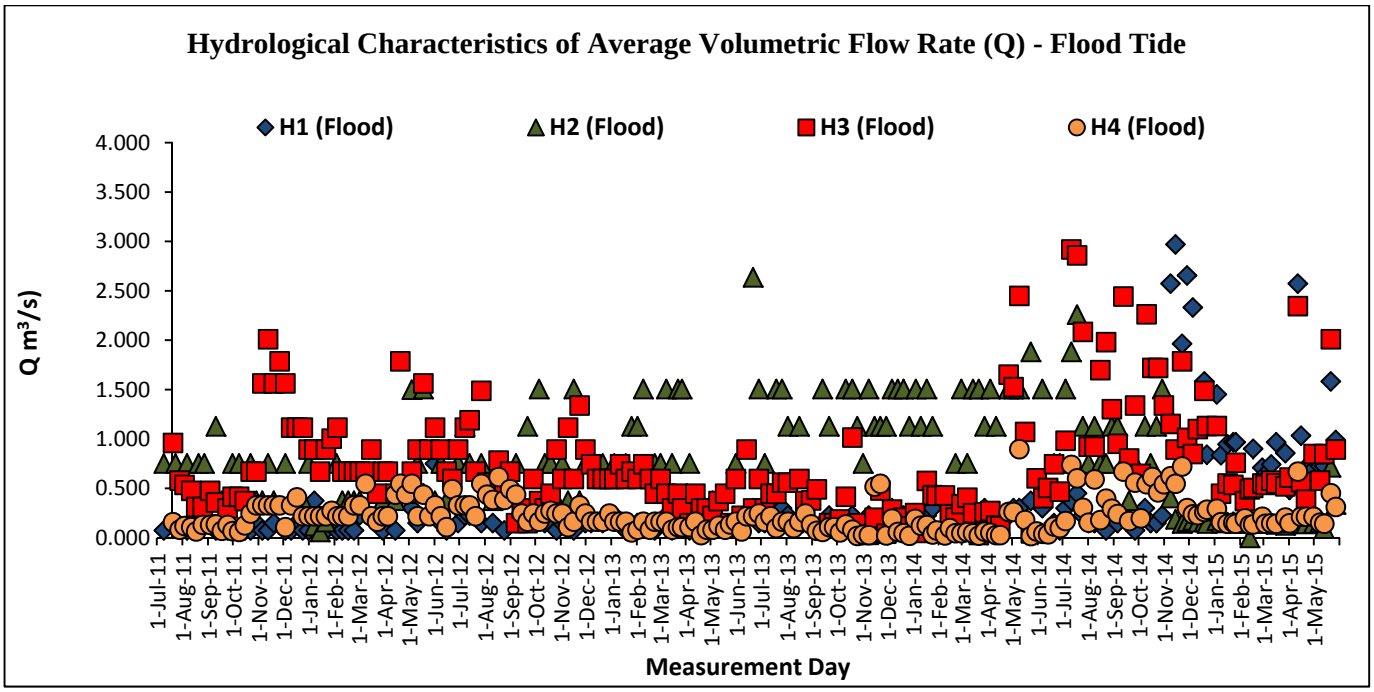

Graph Plot SS, mg/L
W1 (impcat Station) ebb
W2 (Impact Station)
W3 (Control Station)
W4 (Impact Station)
W1 (impcat Station) flood
DO, mg/L
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1-Mar-11
1-May-11
1-Jul-11
1-Sep-11
1-Nov-11
1-Jan-12
1-Mar-12
1-May-12
1-Jul-12
1-Sep-12
1-Nov-12
1-Jan-13
1-Mar-13
1-May-13
1-Jul-13
1-Sep-13
1-Nov-13
1-Jan-14
1-Mar-14
1-May-14
1-Jul-14
1-Sep-14
1-Nov-14
1-Jan-15
1-Mar-15
Sampling Day

Hydrological Characteristics (Construction Period)

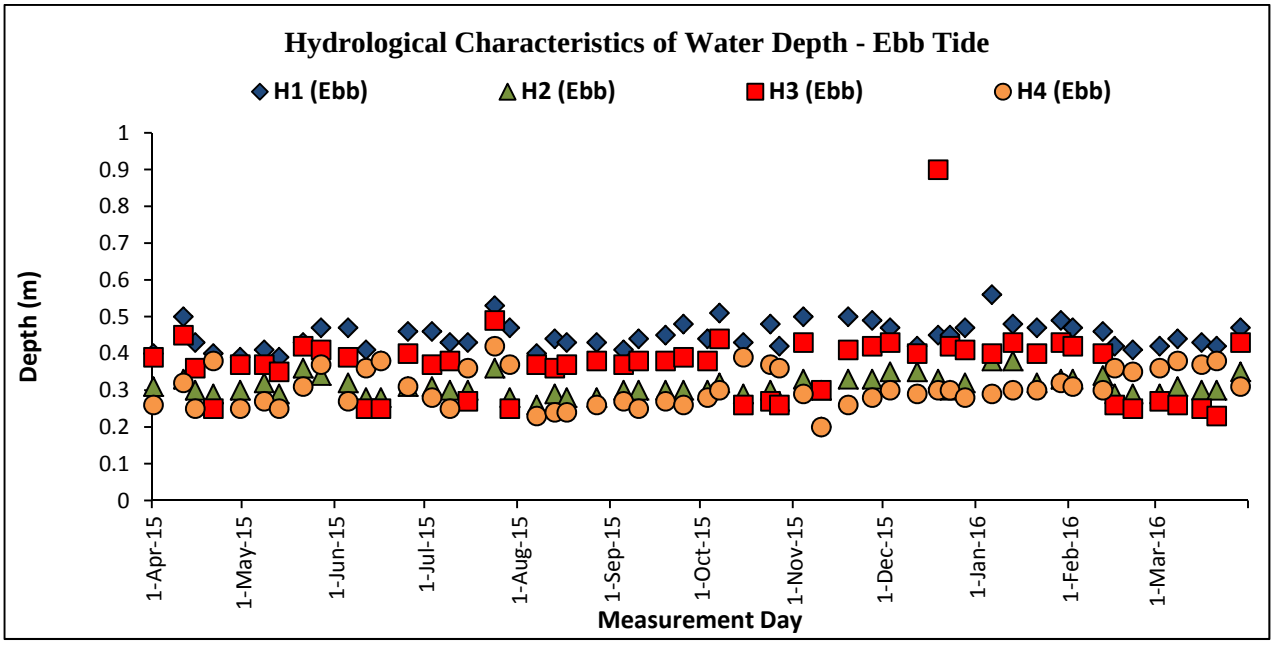


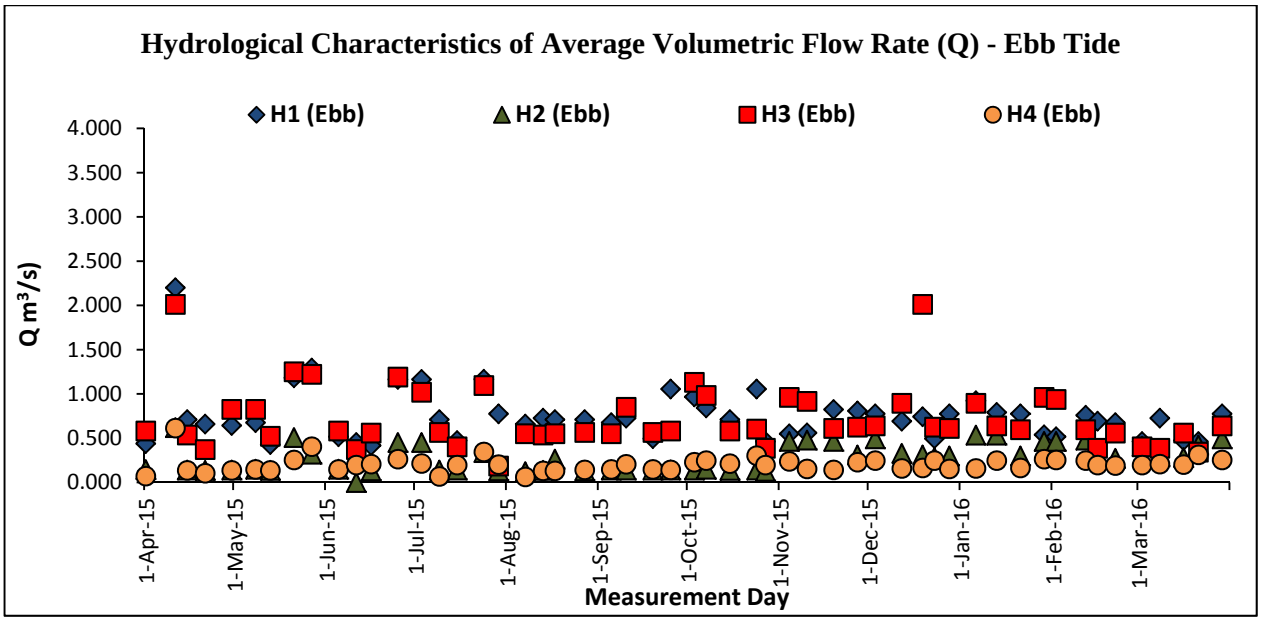


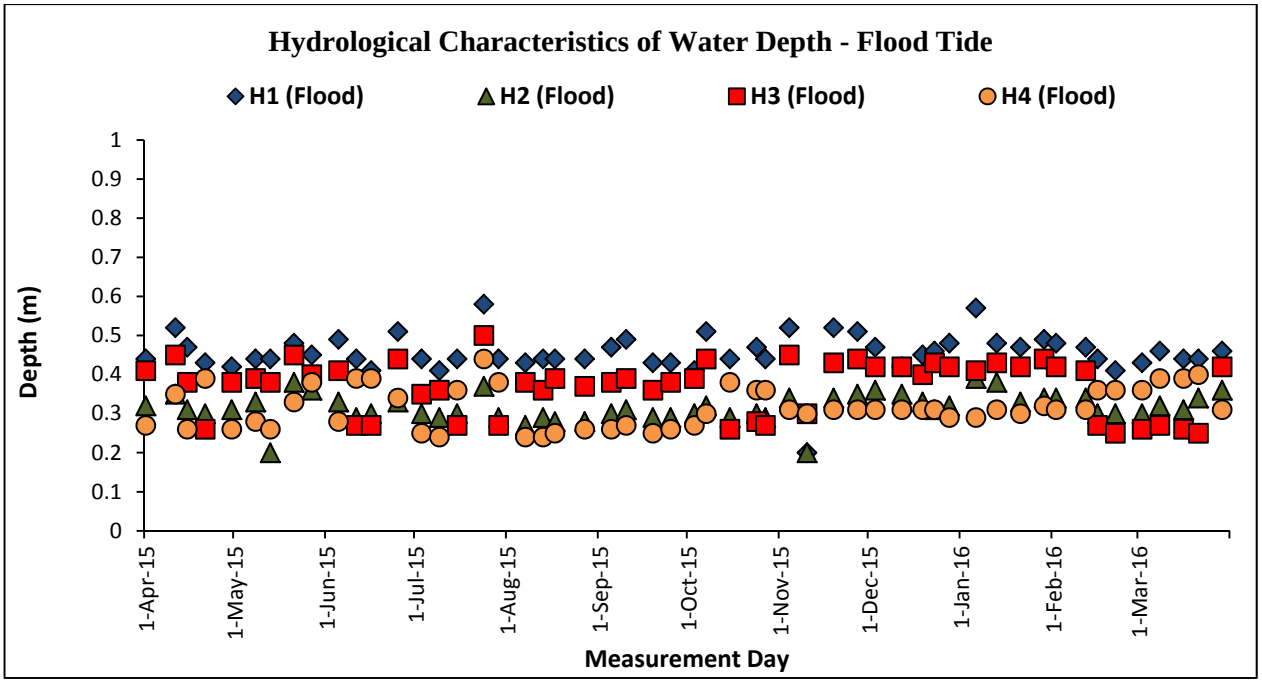

Hydrological Characteristics of Water Depth - Flood Tide
H1 (Flood)
H2 (Flood)
H3 (Flood)
H4 (Flood)
Depth (m)
Measurement Day

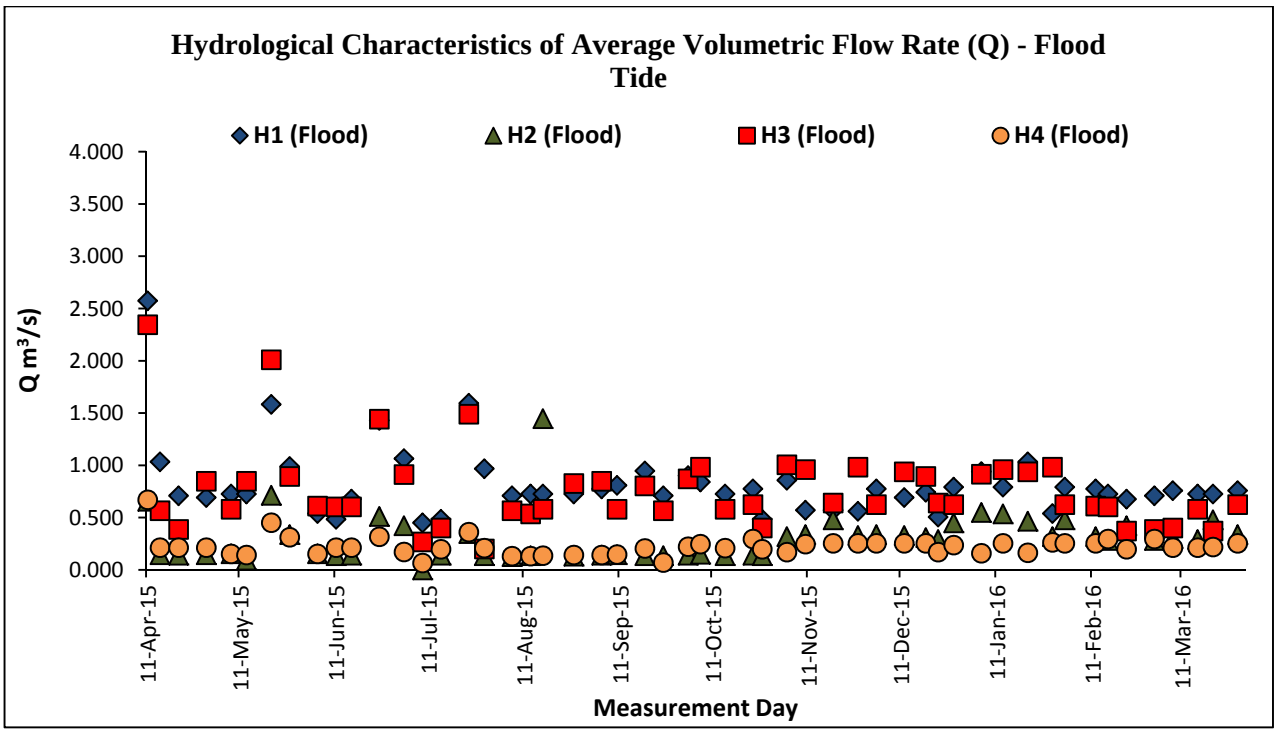

Hydrological Characteristics of Average Volumetric Flow Rate (Q) - Flood Tide
H1 (Flood)
H2 (Flood)
H3 (Flood)
H4 (Flood)
Q m³/s)
Measurement Day

Hydrological Characteristics (Operation Period)






Hydrological Characteristics of Water Depth - Flood Tide
H1 (Flood)
H2 (Flood)
H3 (Flood)
H4 (Flood)
Depth (m)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1-Apr-15
1-May-15
1-Jun-15
1-Jul-15
1-Aug-15
1-Sep-15
1-Oct-15
1-Nov-15
1-Dec-15
1-Jan-16
1-Feb-16
1-Mar-16
Measurement Day


Hydrological Characteristics of Average Volumetric Flow Rate (Q) - Flood Tide
H1 (Flood)
H2 (Flood)
H3 (Flood)
H4 (Flood)
Q m³/s)
4.000
3.500
3.000
2.500
2.000
1.500
1.000
0.500
0.000
11-Apr-15
11-May-15
11-Jun-15
11-Jul-15
11-Aug-15
11-Sep-15
11-Oct-15
11-Nov-15
11-Dec-15
11-Jan-16
11-Feb-16
11-Mar-16
Measurement Day

ANNEX G

WASTE FLOW TABLE

Name of Department: DSD

Monthly Summary Waste Flow Table for 2011 to 2013 (Year)

Month	Actual Quantities of Inert C&D Materials Generated Monthly						Actual Quantities of C&D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (see Note 3)	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)
Apr 2011	Nil	0	0	0	0	0	0	0	0	0	0
May 2011	Nil	0	0	0	0	0	0	0	0	0	0
June 2011	Nil	0	0	0	0	0	0	0	0	0	0
July 2011	Nil	0	0	0	0	0	0	0	0	0	0
Aug 2011	0.7855	0	0	0.7855	0	0	0	0	0	0	0
Sept 2011	Nil	0	0	0	0	0	0	0	0	0	0
Oct 2011	Nil	0	0	0	0	0	0	0	0	0	0.02
Nov 2011	Nil	0	0	0	0	0	0	0	0	0	0.045
Dec 2011	0.08	0	0	0	0.08	0	0	0	0	0	0
Jan 2012	Nil	0	0	0	0	0	0	0	0	0	0.01
Feb 2012	0.01	0	0	0	0.01	0	0	0	0	0	0.03
Mar 2012	0.405	0	0	0	0.405	0	0	0	0	0	0
Apr 2012	0.005	0	0	0	0.005	0	0	0	0	0	0
May 2012	0.165	0	0	0	0.165	0	0	0	0	0	0
June 2012	0.145	0	0	0	0.145	0	0	0	0	0	0.035
July 2012	0.005	0	0	0	0.005	0	0	0	0	0	0.005
Aug 2012	0.775	0	0	0	0.775	0	0	0	0	0	0
Sept 2012	0.21	0	0	0	0.21	0	0	0	0	0	0
Oct 2012	0.49	0	0	0	0.49	0	0	0	0	0	0
Nov 2012	0	0	0	0	0	0	0	0	0	0	0.03
Dec 2012	0	0	0	0	0	0	0	0	0	0	0.01
Jan 2013	0.035	0	0	0	0.035	0	0	0	0	0	0.025
Feb. 2013	0.035	0	0	0	0.035	0	0	0	0	0	0.005
Mar. 2013	0.002	0	0	0	0.002	0	0	0	0	0	0.005
Apr. 2013	0.31	0	0	0	0.31	0	0	0	0	0	0.005
May. 2013	0.04	0	0	0	0.04	0	0	0	0	0	0.035
June 2013	0.37	0	0	0	0.37	0	0	0	0	0	0.017

July 2013	0.015	0	0	0	0.015	0	0	0	0	0	0.01
Aug 2013	0	0	0	0	0	0	0	0	0	0	0
Sep 2013	0.036	0	0	0	0.036	0	0	0	0	0	0
Oct 2013	0.301	0	0	0	0.301	0	0	0	0	0	0
Nov 2013	0.215	0	0	0	0.215	0	0	0	0	0	0.00525
Dec 2013	0.333	0	0	0	0.333	0	0	0	0	0	0.0045
Total	**4.768**	**0**	**0**	**0.7855**	**3.983**	**0**	**0**	**0**	**0**	**0**	**0.2945**

Forecast of Total Quantities of C&D Materials to be Generated from the Contract*										
Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposed as Public Fill	Imported Fill	Metals	Paper/ cardboard packaging	Plastics (see Note 3)	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)
23	1	10	0	10	2	5	2	1	1	3

Notes:

(1) The performance targets are given in ETWB Technical Circular PS Clause 6(14).
(2) The waste flow table shall also include C&D materials that are specified in the Contract to be imported for use at the Site.
(3) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material
(4) The Contractor shall also submit the latest forecast of the total amount of C&D materials expected to be generated from the Works, together with a breakdown of the nature where the total amount of C&D materials expected to be generated from the Works is equal to or exceeding 50,000 m3. (ETWB Technical Circular PS Clause 5(4)(b) refers). [Delete Note (4) and the table above on the forecast, where inapplicable].

Kwan Lee - Kuly Joint Venture
Enviornmental Management Plan for Contract No. DC/2012/02
Drainage Improvement Works in Shuen Wan and Shek Wu Wai

Name of Department DSD

Monthly Summary Waste Flow Table

Month	Actual Quantities of Inert C & D Materials Generated Monthly						Actual Quantities of Inert C & D Wastes Generated Monthly				
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposal as Public Fill	Imported Fill	Metals	Paper/cardbpard packaging	Plastics (see note 3)	Chemical Waste	Others, e.g. general refise
	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000m^3)
Jan-14	0.435	-	-	-	-	0.435	-	-	-	-	0.015
Feb-14	0.215	-	-	-	-	0.215	-	-	-	-	0.000
Mar-14	0.036	-	-	-	-	0.036	-	-	-	-	0.000
Apr-14	0.333	-	-	-	-	0.333	-	-	-	-	0.000
May-14	0.333	-	-	-	-	0.333	-	-	-	-	0.000
Jun-14	1.776	-	-	-	-	1.776	-	-	-	-	0.000
Jul-14	0.461	-	-	-	-	0.461	-	-	-	-	0.000
Aug-14	2.187	-	-	-	-	2.187	-	-	-	-	0.000
Sep-14	0.000	-	-	-	-	0.000	-	-	-	-	0.000
Oct-14	0.680	-	-	-	-	0.680	-	-	-	-	0.000
Nov-14	0.000	-	-	-	-	0.000	-	-	-	-	0.090
Dec-14	0.000	-	-	-	-	0.000	-	-	-	-	0.015
Jan-15	0.000	-	-	-	-	0.000	-	-	-	-	0.120
Feb-15	0.000	-	-	-	-	0.000	-	-	-	-	0.000
Mar-15	0.000	-	-	-	-	0.000	-	-	-	-	0.000
Total	6.456	-	-	-	-	6.456	-	-	-	-	0.240

Forecast of Total Quantities of C & D Materials to be Generated from the Contract											
	Total Quantity Generated	Hard Rock and Large Broken Concrete	Reused in the Contract	Reused in other Projects	Disposal as Public Fill	Imported Fill	Metals	Paper/cardbpard packaging	Plastics (see note 3)	Chemical Waste	Others, e.g. general refise
	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000m^3)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000kg)	(in'000m^3)
	23	1	10	0	10	2	5	2	1	1	3

Note: (1) The performance targets are given in PS Clause 26.23(14)

(2) The waste flow table shall also include C & D materials that are specificed in the Contract to be imported for used at the Site

(3) Plastics refer to plastics bottles/containers, plastic sheets/foam from packaging materials

(4) The summary table shall be submitted to the Engineer's Representative monthly together with the Waste Flow Table for review and monitoring in accordance with the PS Clause 25.20A(4)

ANNEX H

FINAL ECOLOGICAL MONITORING REPORT

Agreement No. DP/01/2010
Drainage Improvement Works in Shatin and Tai Po: Construction and Operation Phase Ecological Monitoring under Contract 1 and 2
(Final Report)

Prepared for:

Drainage Services Department

Prepared by:
Ramboll Environ Hong Kong Limited

Date:
June 2016

Reference Number:
R5027_V1.0.docx

Agreement No. DP/01/2010
Drainage Improvement Works in Shatin and Tai Po:
Construction and Operation Phase Ecological Monitoring under
Contract 1 and 2
(Final Report)

Prepared by:

Daisy Au Yeung
Assistant Environmental Consultant

Approved by:

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Project Manager

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1. Introduction

1.1 Project description

The Drainage Improvement Works in Shuen Wan was undertaken to minimize the potential flooding impacts in Sha Tin and Tai Po area. Although the Ecological Impact Assessment in the EIA Report identified that ecological impacts resulting from the proposed drainage improvement works at Shuen Wan were anticipated to be very minor in scale, ecological mitigation and ecological monitoring were recommended in the EM&A Manual (http://env-shuenwan.com/pdf/review_note_em&a_rev.3.pdf) as stipulated under Environment Permit No. EP-303/2008.

1.2 Scope of ecological impact monitoring was described in the Particular Specifications and EM&A Manual of the projects. In brief, the monitoring tasks include regular check on the retained and transplanted trees and shrubs, monitoring on fauna groups and aquatic fauna within the works area and any ecologically sensitive area within 100m of the works boundary.

1.3 As there is an unavoidable loss of marsh habitat (about 0.3 ha) due to the associated construction activities, an existing low ecological value recreational fishpond on government land has been transformed to an Ecological Compensation Area (ECA) for compensating the loss of marsh and secondary habitat. In addition, the ECA also aims to create suitable foraging habitat for wildlife.

1.4 As stipulated in the EM&A Manual, ecological monitoring of the ECA during the 1-year wetland establishment period (covering both dry and wet seasons) of the ECA is required.

1.5 China-Hong Kong Ecology Consultants Co. was commissioned by Ramboll Environ Hong Kong Limited (formerly ENVIRON Hong Kong Limited) to perform the ecological impact monitoring survey for the projects under Contract 1 and Contract 2 since March 2011.

1.6 This is the final report aiming to review and summarize the monitoring results over the entire monitoring period from March 2011 to January 2016.

2. Summary of Major Points

- Field surveys were conducted from March 2011 to January 2016;
- Construction phase & operational phase monitoring of Contract 1 were completed in January 2015 and October 2015 respectively;
- Construction phase & operational phase monitoring of Contract 2 were completed in March 2015 and January 2016 respectively;
- Species richness of aquatic fauna was observed with some changes during construction and post-construction periods;
- Lower number of species of odonata and butterfly were recorded within 100m buffer area during post-construction phase;
- The rest of surveyed taxa groups have not changed significantly and presented fluctuation along different seasons;
- Ecological survey and vegetation monitoring have been carried out in ECA covering both wet and dry season. Relatively low diversity of fauna and flora were recorded due to the ECA was

at an early succession stage. Overall condition of the vegetation recorded inside the ECA was in fair condition;

- Trees within ECA including retained, transplanted, planted tree were monitored. They were mostly in fair condition throughout monitoring period;
- Three specimens of protected species *Pavetta hongkongensis* were in fair condition since the date of transplantation on 20th December 2011;
- Data review and analysis indicated that adverse ecological impact on flora and fauna within and in adjacent project/monitoring site was not significant. Monitoring data on flora and various faunal groups were generally shown natural fluctuation and no dramatic change was noted in terms of species richness and abundance; and
- The ECA has colonized with a diversity of fauna groups including fish, mollusks, crustaceans, benthic organism and as well as wetland dependant birds such as egrets and herons.

3. Monitoring Methodology

Ecological monitoring methods were generally followed those described in the baseline ecological surveys (DC/2009/22). However, sampling area maybe reduced because of habitat change, for instance, deforestation and channel modification due to drainage works, where sampling was not applicable. Survey data and evaluation are detailed in the following sections.

3.1 Vegetation survey

Vegetation survey was performed along the designated transects (Figure 1) for ecological monitoring as described in the project specifications to monitor the vegetation health which could be adversely influenced by any bad site practice. Qualitative data of plants within the works boundary and wetland vegetation in the 100m buffer area of Contract 1 and 2 and ECA was recorded (Appendix I and II). Riparian vegetation including aquatic and emergent, within ECA, at 4 stream ecological monitoring points (hereinafter referred to as "SEMP") under Contract 1 & 2 along the affected stream channel and riparian habitat was recorded in terms of species, relative abundance and average heights. Any signs of damages and adverse health problems directly caused the works were recorded and reported. Nomenclature and protection status of the species followed those documented in the AFCD website (www.hkbiodiversity.net) and Hong Kong Herbarium (2004).

Two species protected under Forestry Regulations (Cap. 96) were found including *Michelia alba* and *Pavetta hongkongensis*. They were transplanted from works area under Contract 1 or 2 due to direct conflict with the associated constructions. Weekly health monitoring of transplanted *P. hongkongensis* was conducted (since first transplantation on 20th Dec 2011).

Avifauna

Bird survey was conducted by following the proposed transects which cover the major ecologically sensitive areas of the Project areas of Contract 1 and 2 and 100m buffer area, as well as ECA. All bird species were recorded with special attention paid on the species of conservation importance and wetland-dependent species.

3.2 Herpetofauna

Hepetofauna survey was conducted via direct observation and active searching within the project area of Contract 1 and 2 and 100m buffer area, as well as ECA. All reptiles and amphibians encountered or heard were recorded. Nomenclature and conservation status of herpetofauna species follows AFCD website (www.hkbiodiversity.net).

3.3 Butterflies and Odonata

Odonates and butterfly survey was carried out within the project areas of Contracts 1&2 and 100m buffer area, as well as ECA. All butterflies and odonata were identified and relative abundance was recorded. Nomenclauture and status of conservation of butterflies follows Lo & Hui (2005) while that of odonata follows AFCD biodiversity websites (www.hkbiodiversity.net) and Wilson (2003).

3.4 Mammals

As the monitoring site was situated near traffics, plant nursery and residential buildings, mammals were unlikely inhabited at the site except rodents, domestic dogs and cats. Detailed mammal monitoring was not conducted. However, any sighting, tracks and signs of mammals encountered during survey of other faunal groups was recorded. Bat was surveyed by search for potential colony habitat, such as palm trees, which are often used by fruit bats as nesting sites.

3.5 Aquatic fauna

Monitoring of aquatic fauna was carried out mainly by bank-side observation, sometimes with the aid of binoculars, at two stream ecological monitoring points under Contract 1 & 2 (i.e. SEMP 1, 3 & 4) and at four monitoring points (i.e. S1, S2, S3, S4) of ECA. These points are selected for covering representative sections of Wai Ha River and sections of intertidal and subtidal zone within ECA (**Appendix I** and **II**). Hand net and fish traps were also deployed at these points to collect supplementary data. Aquatic fauna seen/collected was identified in situ to the lowest possible taxon and relative abundance was presented.

4. Review of Monitoring data

4.1 Vegetation survey

The habitats identified in areas under Contract 1 and 2 are river course, wooded area, mangrove, marsh and developed area (including villages). The coverage of riparian vegetation decreased due to the construction activities but recovered afterwards. Various flora species up to 209 were recorded within the buffer area, up to 120 species within the work areas under Contract 2, and as many as 61 species within the work areas under Contract 1. The recorded floras were generally in good health and the height of the dominated riparian grass and herb species were in a range from ~0.1m to over 3m as observed in the survey areas. Average numbers of flora species are shown in the **Figure 2**. There are no apparent species number changes during construction and operation phases.

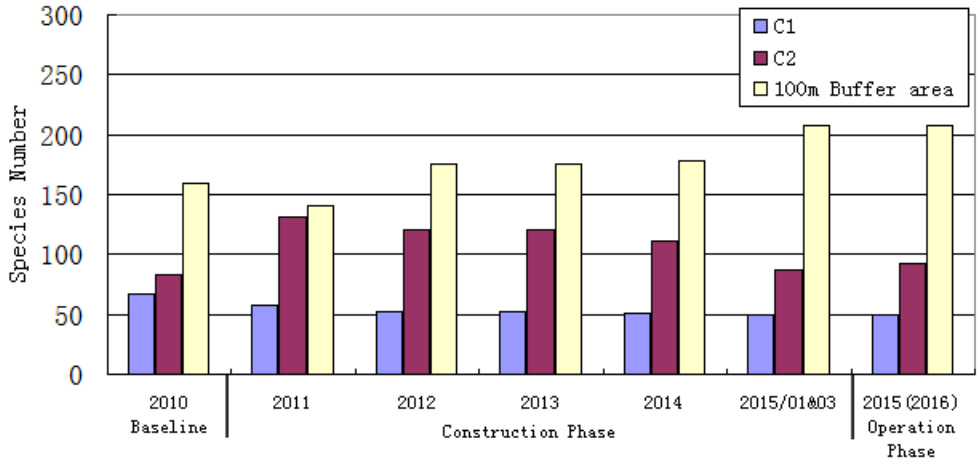

Figure 2 Number of plant species recorded during monitoring period

	
Photo 1. The Construction phase of Wai Ha River under Contract 1.	Photo 2. The Construction phase of Wai Ha River under Contract 2.
	
Photo 3. The Operation phase of Wai Ha River under Contract 1.	Photo 4. The Operation phase of Wai Ha River under Contract 2.

4.2 Ecological Compensatory Area

In total, 23 species of trees, shrubs, climbers and herbs including Terminalia catappa, Cocculus orbiculatus, Mangifera indica, Dimocarpus longan, Michelia x alba and Macaranga tanarius were retained or naturally colonized in the ECA during initial establishment period. Some green algae, such as c.f. Ulothrix sp. and Enteromorpha sp. were re-colonized in the water

body or attached to the substratum in the ECA. Those algae could attract algae feeding organisms and it also provides mirco-habitat for some marine or brackish water species especially juveniles. The general growth/health of the retained or newly re-colonized vegetations was in fair condition.

Starting in August 2011, a total of 16 tree in including *Bombax ceiba, Melaleuca quinquenervia* and *Celtis sinensis* and three specimens of protected species *Pavetta hongkongensis* were transplanted from works area under Contracts 1 and 2 to ECA. They were in fair condition after transplantation. Two of them were found dead including *Melaleuca quinquenervia* (T165) and *Celtis sinensis* (T250).

In addition, 370 trees, including *Celtis sinensis, Hibiscus tiliaceus, Macaranga tanarius, Ficus superb var japonica* and *Viburnum odoratissimum*, were randomly planted at different zones (except zone F) inside ECA since September 2011 for amenity purpose, shown as **Figure 2.** A total of 66 trees were removed in June 2012 and has been replace by new trees in July 2012. Most of the planted trees were in fair condition in Zone A, B, C, D and E. Small proportion were observed in poor condition or even dead.

Mangrove seedlings were planted in Zone F, but most of them were in poor to fair condition.

Ecological surveys have been carried out for ECA covering both dry season (6th February 2012) and wet season (30th August 2012). The result indicated that the ECA was at an early succession stage, thus a relatively low diversity of fauna and flora was recorded. In addition, overall health condition of transplanted tress and existing vegetations were fair.

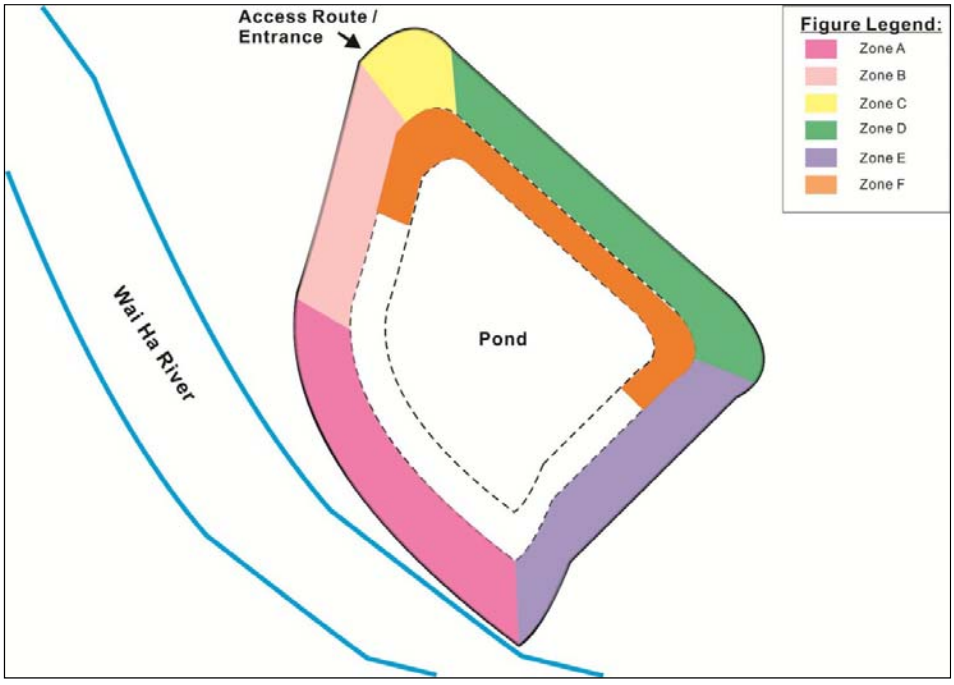

Figure 2. Landscape floor plan of ECA during establishment phase.

4.3 Transplanted *Pavetta Hongkongensis*

Three specimens of protected species Pavetta hongkongensis were transplanted from work area under Contract 2 to ECA at Zone D on 20th December 2011. Monthly monitoring was carried out and their overall conditions were fair during the monitoring period (Photo 5 & 6).

Photo 5. Specimens 1 & 2 (Transplanted *Pavetta Hongkongensis*)

Photo 6. Specimen 3 (Transplanted *Pavetta Hongkongensis*)

4.4 Avifauna

Avifauna surveys were undertaken from 2011 to 2015 of contract 1 and from 2011 to January 2016 of contract 2, showed as **Figure** 3. Normal fluctuation was seen in number of bird species during monitoring period. Bird's species number within the project area of contract 1 & contract 2 increased after completion of the construction. As the project scale was not large, bird within 100m buffer area was not highly affected by the project during construction period, which could be observed in the **Figure 3**.

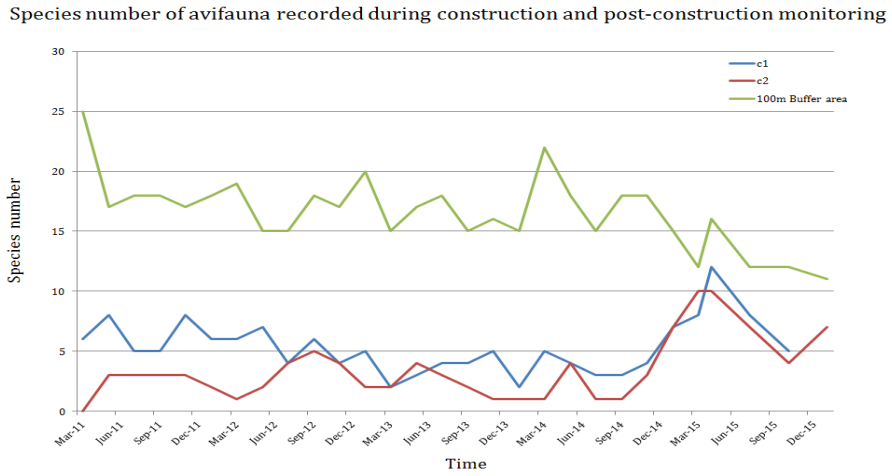

Figure 3 Number of avifauna species recorded during monitoring period

4.5 Herpetofauna

Figure showed the number of herpetofauna species recorded in the survey span. The result indicated that the maximum species number of herpetofauna was 5 within 100m buffer area. Specie was very limited inside the project area of contract 1 & contract 2 in both construction and post-construction periods. **Figure 4** also showed that seasonal fluctuation in number of species, which herpetofauna was only present during wet season. Except seasonal change was observed, there was no significant change in terms of species richness recorded in project areas of contract 1 and 2, as well as 100m buffer zone.

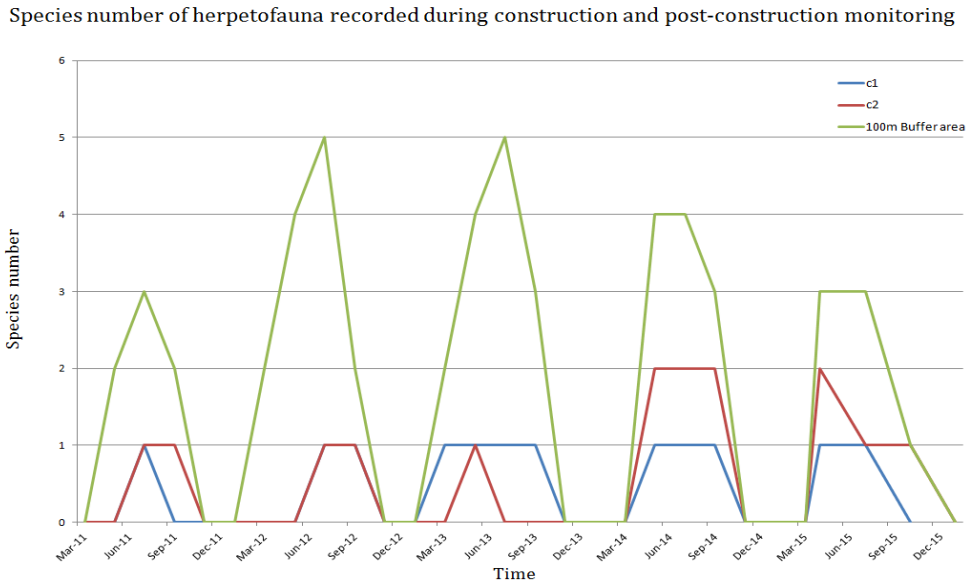

Figure 4 Number of herpetofauna species recorded during monitoring period

4.6 Butterflies

Number of butterfly species recorded from construction to post-construction period was shown in **Figure** 5. Species richness of butterfly presented seasonal fluctuation within all surveyed areas. The highest diversity of butterfly was usually recorded in mid-summer, i.e. August. There was no significant change in species richness of butterfly recorded in project areas of contract 1 and 2 from construction to post-construction period except normal fluctuation was seen in different seasons, except species decreasing was noted during post construction period in 100 buffer area.

Figure 5 Number of butterfly species recorded during monitoring period

4.7 Odonata

Number of odonata species recorded from construction to post-construction period was shown in **Figure 6.** Previous monthly surveys indicated that number of odonate species was fluctuating along with different season. The maximum number of odonata species was recorded during wet season, especially in August. During the survey period from 2010 to 2016, there were no obvious changes in the species number of odonata within contract 1&2 areas, except species decreasing was noted during post construction period in 100 buffer area.

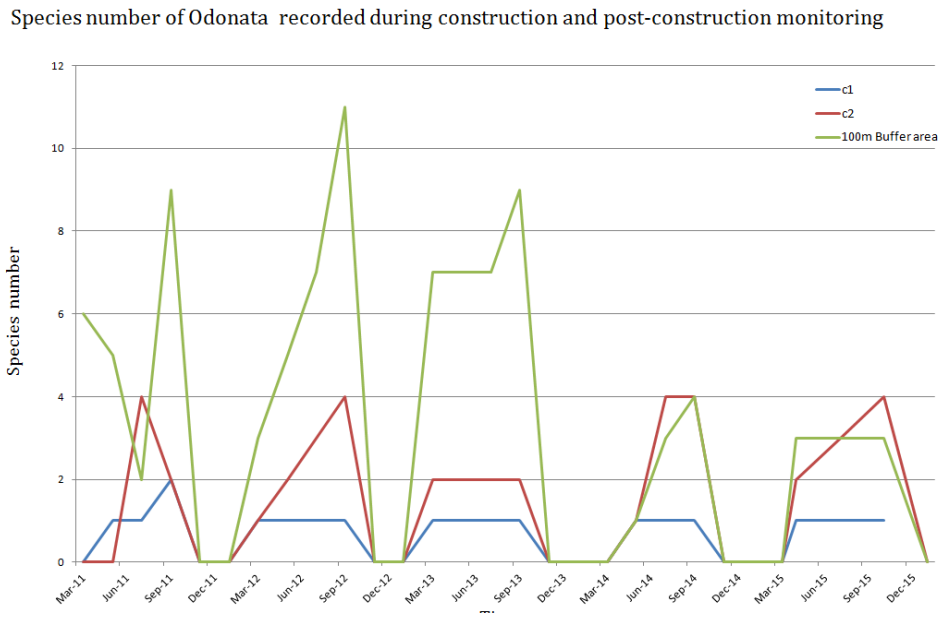

Figure 6 Number of odonata species recorded during monitoring period

4.8 Mammal

Mammals were not likely to present within the project areas with human disturbance raised from adjacent villages. Therefore, only two mammal species were recorded throughout the monitoring period including one bat species and one goat species. Short-nosed Fruit Bats (Cynopterus sphinx) were observed nesting in a few palm trees at the playground near Ting Kok Nursery Community Garden within Contract 1 boundary. Three black goats (Capra sp.) were observed in works area under Contract 2 and they were likely to be reared by local villagers in Tung Tsz.

4.9 Aquatic fauna

Number of aquatic fauna species recorded from construction to post-construction period was shown in Figure 7. They were recorded in Wai Ha River within the 100 m buffer of works boundary under Contracts 1 and Contract 2. Based on the results, diversity of aquatic fauna kept in stable most of time during construction period. Species recorded from sampling points of contract 1 was lower than before since September of 2013. In contrast, higher number of species was recorded in sampling points of contract 2 since post-construction period in April of 2015.

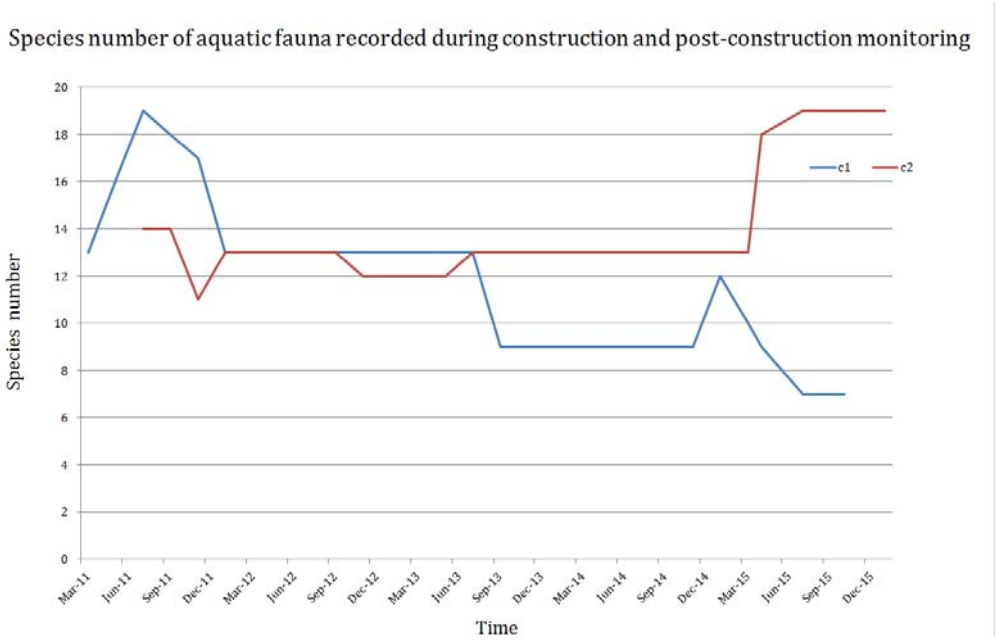

Figure 7 Number of aquatic fauna species recorded during monitoring period

5. Summary

Data presented and analyzed in this final report were derived from ecological surveys conducted from 2011 to 2016 including surveys conducted from construction period to post-construction period.

The riparian vegetation re-established quickly after the completion of the drainage works as demonstrated by the photographs in this report.

Relatively low diversity of fauna and flora were recorded during ecological survey conducted in 2012 as the ECA was at an early successional stage. Overall condition of the vegetation recorded inside the ECA was in fair condition.

Three specimens of transplanted Pavetta hongkongensis were in fair condition during the contract period.

Number of aquatic fauna species kept in stable during construct period. After construction, higher species number in sampling points of contract 2 and lower species number in sampling points of contract 1 were recorded.

Except insect species (Odonata and butterfly) recorded within 100m buffer zone were observed decreased during post-construction. There were no significant changes on species richness of other taxa groups including avifauna and herpetofauna. Fluctuation in species abundance for various taxa groups shown in graphic presentation of this report is considered natural.

The ECA has colonized with a diversity of fauna groups including fish, mollusks, crustaceans, benthic organism and as well as wetland dependant birds such as egrets and herons. Habitat quality of ECA is considered good in terms of decolonization of flora and fauna during establishment period.

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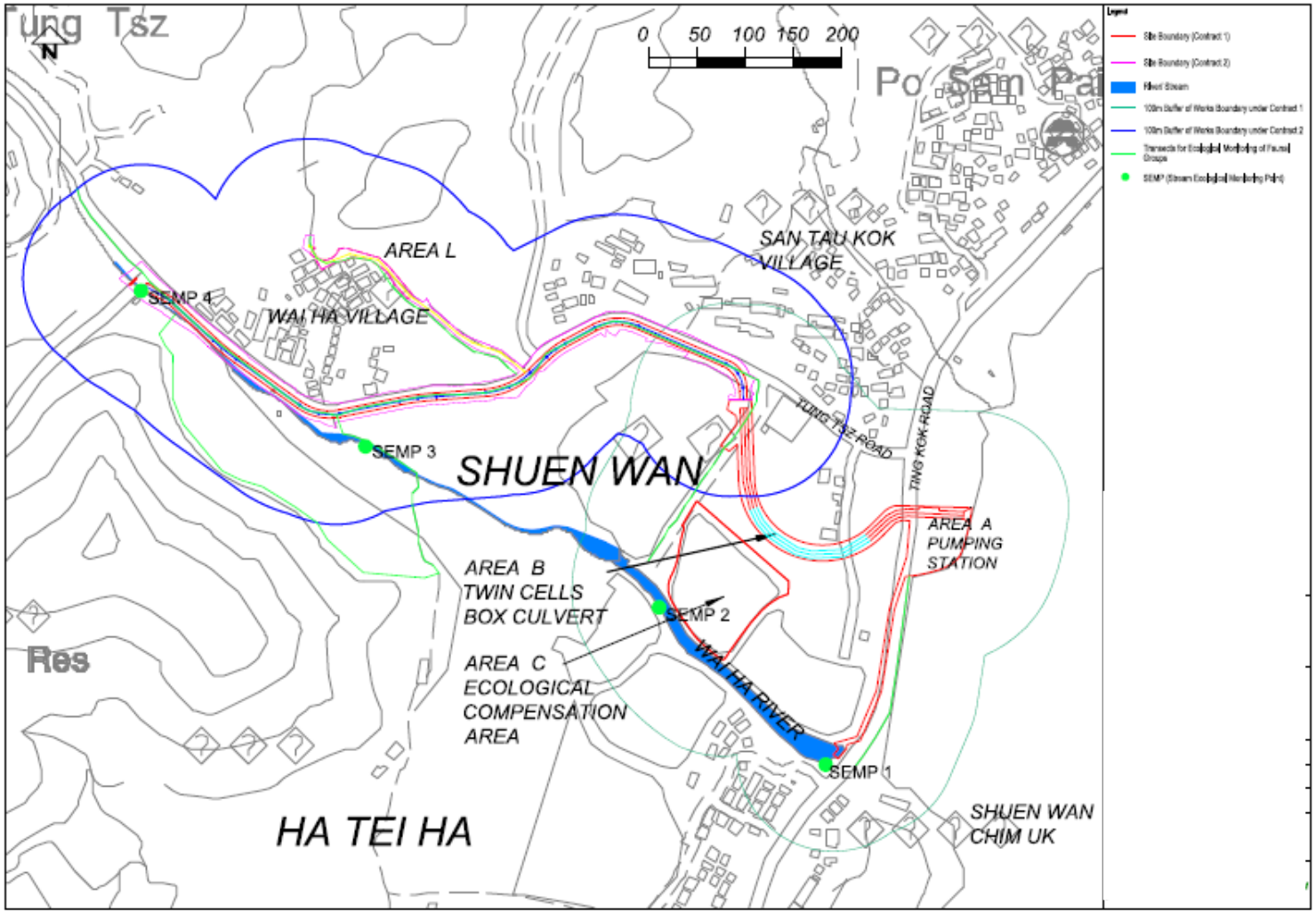
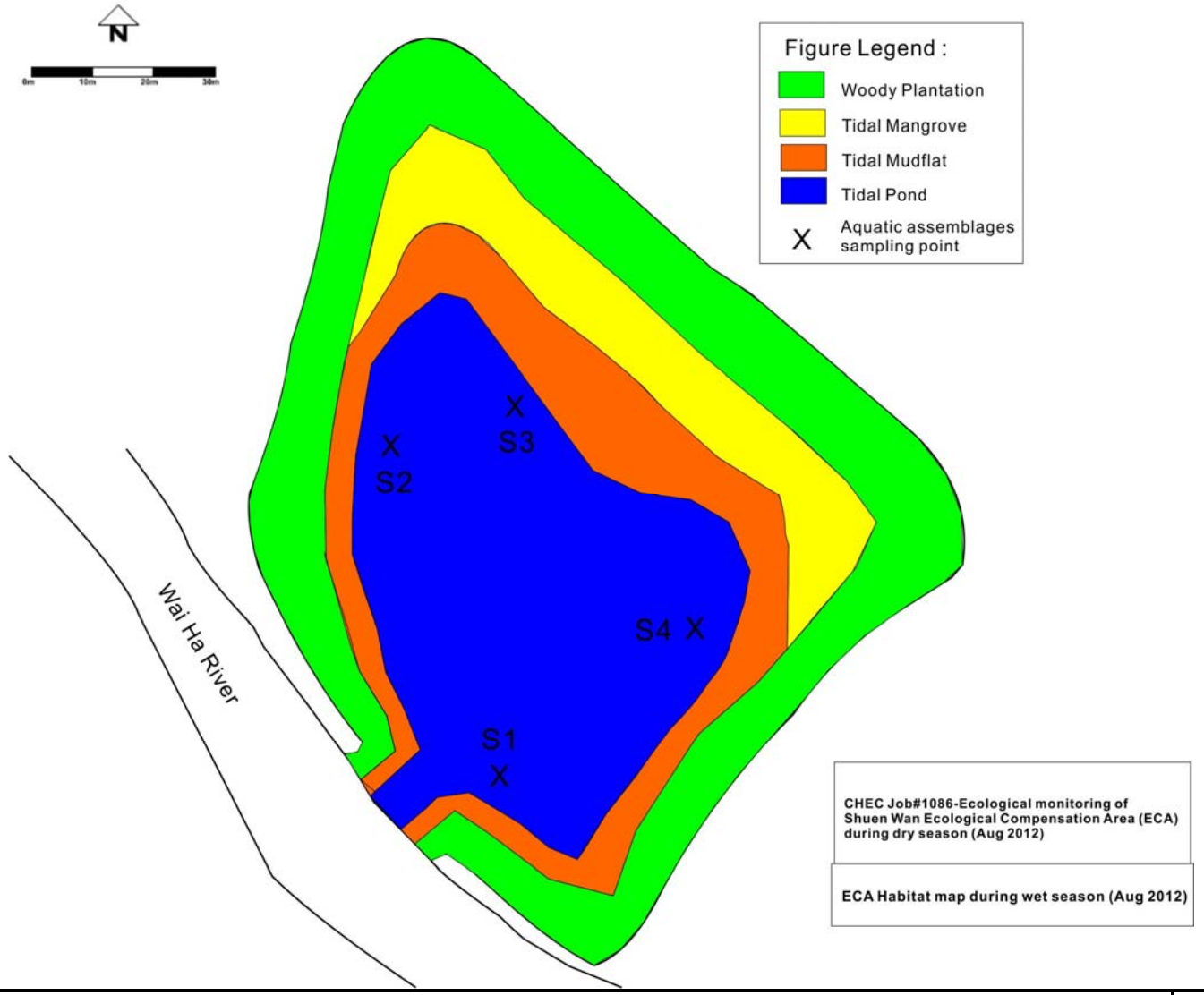
Appendices



Appendix I	RAMBOLL ENVIRON
Title: The ecological monitoring transect and the boundary of assessment area	Drawn by: T
	Checked by: DAY
Project: Agreement No. DP/01/2010 Drainage Improvement Works in Shatin and Tai Po: Construction and Operation Phase Ecological Monitoring in area under Contract 1 & 2 (Final Report)	Rev.: 1.0
	Date: June 2016



Appendix II	RAMBOLL ENVIRON
Title: The ecological monitoring transect and the boundary of assessment area (ECA)	Drawn by: IT
	Checked by: DAY
Project: Agreement No. DP/01/2010 Drainage Improvement Works in Shatin and Tai Po Construction and Operation Phase Ecological Monitoring in area under Contract 1 & 2 (Final Report)	Rev.: 1.0
	Date: June 2016