ATAL – Degrémont – China State Joint Venture

Contractor's Submission Form (CSF)

Contract No.	**DC/2008/03**		
Project Title:	**Design, Build and Operate Pillar Point Sewage Treatment Works**		
CSF No.:	**DC200803/CSF/GD/800339**	**Issue: B**	**Date: 10th Aug 2016**
To:	**Drainage Services Department (ST1)**	**Your Ref: Nil**	
Attention:	**Supervising Officer's – Michael K.F. Yeung**		
Cc:	**dc200803.aecom@gmail.com ; ATAL-Mandy Tsoi ; ADJV – Teck Suan Loy**		
From:	**ATAL-Degremont-China State Joint Venture**		
Title:	**Monthly EM&A Report No.11 (June 2016)**		
Specification:	**-**		
Purpose:	***Information / ~~Comments~~ / ~~Approval~~**		

Description of Contents:

We submit herewith 7 copy of the Monthly EM&A Report for June 2016.

Attachment:	***Yes / ~~No~~ Number of Copies: 7**
Remarks:	

Issued By: _____ **Printed Name:** Norman Cheng

Designation: Operation Manager **Date:** 10th Aug 2016

Received By: _____ **Date:** _____

(Signature & Received Chop)

*Delete if not applicable

(Rev.7)

AECOM
8/F Grand Central Plaza, Tower 2
138 Shatin Rural Committee Road
Shatin, Hong Kong
香港新界沙田鄉事會路138號
新城市中央廣場第2座8樓
www.aecom.com

+852 3922 9000 tel
+852 3922 9797 fax

Your Ref:
Our Ref: 60017423/C/oylw16080201

By Hand & By Fax (2833 9162)

Drainage Services Department
Sewage Services Branch
Harbour Area Treatment Scheme Division
5/F., Western Magistracy,
2A Pok Fu Lam Road,
Hong Kong.

Attn: Ms. Carol Ho (T: 2159 3405)

2 August 2016

Dear Madam,

Contract No. DC/2008/03
Design, Build and Operate
Pillar Point Sewage Treatment Works

Monthly EM&A Report for June 2016 (11th Monthly Operation Phase Monitoring Report for June 2016)

Reference is made to Environmental Team (ET)'s draft of the Monthly EM&A Report for June 2016 provided by email dated 13, 15, 29 July and 2 August 2016. We have no further comment.

We hereby verify the said Monthly EM&A Report as having complied with the requirement as set out in the Final EM&A Manual.

Should you have any queries, please feel free to contact the undersigned at 3922 9393.

Yours faithfully,

For and on behalf of
AECOM Asia Co. Ltd.

Y T Tang
Independent Environmental Checker

c.c. AECOM – Mr. C Y Hung (Fax No. 2441 1755)
SMEC – Ms. Vivian Chan (Fax No. 3995 8101)
ATAL–Degremont–China State JV – Mr. Raymond Chan (Fax No. 2811 3321)

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

68th Monthly EM&A Report (11th Monthly Operation Phase Monitoring Report for June 2016)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

July 2016

AUSTRALIA | ASIA | MIDDLE EAST | AFRICA | PACIFIC

ATAL – Degrémont – China State Joint Venture

SMEC ASIA

68th Monthly EM&A Report (11th Monthly Operation Phase Monitoring Report for June 2016)

Contract No. DC/2008/03

Design, Build and Operate
Pillar Point Sewage Treatment Works

July 2016

Certified By **Vivian CHAN**
ET Leader

Project/Deliverable No.	7076134 | D19/01
Project Name	Upgrading of Pillar Point Sewage Treatment Works – Design, Build and Operate
Report Name	68th Monthly EM&A Report (11th Monthly Operation Phase Monitoring Report for June 2016)
Report Date	July 2016
Report for	ATAL Engineering - Degrémont SA - China State Construction Engineering Joint Venture

PREPARATION, REVIEW AND AUTHORISATION

Revision #	Date	Prepared by	Reviewed by	Approved by
1.0 (Draft)	July 2016	Man CHEUNG	Vivian CHAN	Alexi BHANJA

ISSUE REGISTER

Distribution List	Date Issued	Number of Copies
ATAL Engineering - Degrémont SA - China State Construction Engineering Joint Venture	July 2016	1 soft copy
SMEC Project File:		1 electronic

SMEC COMPANY DETAILS

SMEC Asia Limited
27/F Ford Glory Plaza, 37-39Wing Hong Street, Cheung Sha Wan, Kowloon, Hong Kong
T +852 3995 8100|**F** +852 3995 8101
smecasia@smec.com |www.smec.com

CONTENTS

APPENDICES

TABLES

FIGURES

EXECUTIVE SUMMARY

E.1. In accordance with the Environmental Monitoring and Audit Manual (EM&A Manual) and the Environmental Permit (EP-321/2008/B) for the Upgrading of Pillar Point Sewage Treatment Works (PPSTW) (the Project), odour and water quality monitoring is required during the first year after Project commissioning and Water Quality Monitoring is required for each emergency discharge event. The purpose of operation phase monitoring is to confirm the predictions of odour and water quality made in the EIA report.

E.2. As confirmed by the Contractor, all major construction activities of the upgraded PPSTW has been completed in August 2015. The Operation Phase of the Upgraded PPSTW commenced on 15 August 2015. This Monthly Operation Phase Monitoring Report (Post-commissioning) summarizes monitoring events carried out during post-commissioning period from 1 to 30 June 2016. There were a total of three monitoring events carried out during the reporting period. The exact dates of monitoring carried out in this month are tabulated below:

Table E-1 Dates of Monitoring Events

Monitoring Events	11th Reporting Month Monitoring Period: 1 – 30 June 2016
Odour Monitoring	20/6/2016
H_2S Monitoring	1/6/2016 - 30/6/2016 (continuous monitoring)
Landscape and Visual Monitoring	14/6/2016

E.3. The monitoring results obtained were certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC) in accordance with the EM&A Manual.

Breach of Action and Limit Levels

E.4. No exceedance of Action and Limit Level of odour monitoring was recorded at the monitoring location in the reporting month.

E.5. No exceedance of Action and Limit Level of odour emission monitoring was recorded at the monitoring location in the reporting month.

E.6. No significant impact was detected between the pre-commission and post-commission periods of PPSTW from the benthic survey monitoring results.

E.7. The ecotoxicological assessment results for effluent sample collected during wet season indicated that the effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life.

E.8. No non-compliance of the landscape and visual monitoring has been recorded in the reporting month.

Environmental Complaint

E.9. In this reporting period, no environmental complaint in relation to the EM&A Programme was recorded.

Reporting Change

E.10. This is the 11th Monthly Operation Phase Monitoring report and no reporting changes were made in the Reporting Period.

Major Activities on Site

E.11. The major activities being carried out on site during the reporting period is list as follows:

- Normal operation of the upgraded PPSTW.

Future Key Issues

E.12. The Project has entered the Operation Phase since August 2015 and the upgraded PPSTW will continue its normal operation in the following monitoring period. Mitigation measures as proposed in the approved Environmental Impact Assessment report will be provided and maintained at the Project.

E.13. Potential environmental impacts arising from the Project operation are mainly associated with odour and effluent discharging from the Project.

1 INTRODUCTION

1.1 Background

1.1.1 Before the upgrading, the Pillar Point Sewage Treatment Works (PPSTW) was a preliminary treatment works with 5.79m^3/s capacity located at the north of Tuen Mun River Trade Terminal and bounded by Lung Mun Road to the north, as shown in ***Figure 1-1***. The PPSTW used to provide only preliminary treatment – screening followed by grit removal – prior to effluent discharge into the sea (within the North Western Water Control Zone) via twin submarine outfalls.

1.1.2 The *Review of the Tuen Mun and Tsing Yi Sewerage Master Plan*, commissioned in February 1999, recommended upgrading the capacity of PPSTW to 6.08m^3/s and upgrading the treatment level to incorporate Chemically Enhanced Primary Treatment (CEPT) with Ultraviolet (UV) disinfection. The aim of the upgrading works (the Project) is to provide sufficient capacity to meet future demand and pollutant loading for ultimate development scenario for Tuen Mun area, and to improve effluent quality.

1.1.3 An Environmental Impact Assessment (EIA) (EIA-145/2008) was carried out for the Project and was approved without conditions by the Environmental Protection Department (EPD) on 10 June 2008. An Environmental Permit (EP) (EP 321/2008) issued on 17 November 2008. Two Applications for variation of the EP was submitted and approved, and varied EPs, EP 321/2008/A and EP-321/2008/B were issued on 23 April 2013 and 30 May 2014 respectively. The Environmental Monitoring & Audit Manual (EM&A Manual) and EP provide guidelines for the Operational Phase Monitoring Reports and for preparation of the Operational Phase Monitoring Reports.

1.2 Major Activities on Site

1.2.1 The major activities being carried out on site during the reporting period is list as follows:

- Normal operation of the upgraded PPSTW.

1.3 Purpose of the Report

1.3.1 This is the eleventh Monthly Operational Phase Monitoring Reports which summarizes the findings of EM&A works during the reporting period from 1 to 30 June 2016.

Figure 1-1 Site Location

2 ODOUR MONITORING

2.1 Monitoring Methodology and Parameters

2.1.1 In accordance with Section 2.7.1.1 to 2.7.1.9 of the final EM&A Manual, odour patrols are required to be conducted for a period of one year during the operation of the upgraded PPSTW, one patrol for daytime and one patrol for evening every month at the same locations as for the baseline monitoring.

2.1.2 The 1-year monthly odour patrol might be extended as stipulated in second and third bullet point in Table 2.4 of Final EM&A Manual.

2.1.3 The odour monitoring should not be undertaken on rainy days and hourly meteorological conditions (temperature, wind speed & direction, humidity) as shown in ***Appendix G*** were recorded in the monitoring period.

2.1.4 The odour patrol shall be conducted by two independent trained personnel/ competent persons patrolling and sniffing along the PPSTW boundary and the air sensitive receivers (ASRs) in the vicinity of the PPSTW as identified in Section 2.4.1.4 of the final EM&A Manual. The odour patrol shall be carried from less odorous locations to stronger odorous locations.

2.1.5 Subject to the prevailing weather forecast condition, odour patrol shall be conducted by independent trained personnel/competent persons at the downwind locations. During the patrol, the sequence should start from less odourous locations to stronger odourous locations.

2.1.6 The trained personnel/competent persons shall record the findings including odour intensity, odour nature and possible sources and local wind speed and direction at each monitoring location. The perceived odour intensity is divided into five levels (0 to 4):

0 Not detected. No odour perceived or an odour so weak that it cannot be easily characterised or described.

1 Slight identifiable odour, and slight chance to have odour nuisance.

2 Moderate identifiable odour, and moderate chance to have odour nuisance.

3 Strong identifiable, likely to have odour nuisance.

4 Extreme severe odour, and unacceptable odour level.

2.2 Monitoring Stations

2.2.1 The identified monitoring locations for odour patrol are tabulated in ***Table 2-1*** and illustrated in ***Figure 2-1***.

Table 2-1 Monitoring Locations for Odour Patrol

Station ID	Description
A1	River Trade Terminal Office
A2	Chu Kong Warehouse 1

Station ID	Description
A3	Chu Kong Warehouse 2
A4	Wai Sang Sawmill Ltd. [1]
A5	Pillar Point Fire Station
A6	Sunhing Hung Kai Tuen Mun Godown
A7	EMSD Vehicle Servicing Station
S1	Northern Site Boundary
S2	Eastern Site Boundary
S3	Southern Site Boundary
S4	Western Site Boundary

2.3 Monitoring Personnel

2.3.1 The two independent trained personnel/competent persons (the "panellists") have satisfied the requirements listed in Section 2.3.1.9 and 2.7.1.4 of the approved EM&A Manual during odour patrol, namely:

- Have their individual odour threshold of n-butanol in nitrogen gas in the range of 20 to 80ppb/v required by the European Standard Method (EN 13725).
- Be at least 16 years of age and willing and able to follow instructions.
- Be free from any respiratory illnesses.
- Be engaged for a sufficient period to build up and monitor/detect at several monitoring location.
- Not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 min before and during odour intensity analysis.
- Take great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics.
- Not communicate with each other about the results of their choices.
- Do not normally work at or live in the area in the vicinity of PPSTW.

2.3.2 The two qualified panellists are Ms KONG Wing Man, Samantha and Mr CHEUNG Man Kit. The Nose Sensory Test Reports of the two panellists are provided in ***Appendix A***.

2.4 Action and Limit Levels

2.4.1 The Action and Limit Levels as proposed in Table 2.5 of the final EM&A Manual are summarized in ***Table 2-2***.

1. Wai Sang Sawmill Ltd. had been demolished, the patrol and the monitoring location was kept as the same location as Pre-commissioning monitoring conducted in Year 2013.

Table 2-2 Action and Limit Levels for Odour Patrol

Parameter	Action Level	Limit Level
Odour Nuisance (from odour intensity analysis or odour patrol)	Odour intensity of higher than 1 is measured from odour intensity analysis	Odour intensity of 2 or above is measured from odour intensity analysis

Note: To avoid ambiguity, a more conservative approach will be adopted: Action Level will be trigger when odour intensity equals to 1 and Limit Level will be triggered when odour intensity is 2 or above due to the operation of the PPSTW.

2.5 Event and Action Plan

2.5.1 The Event and Action Plan for Odour Quality Monitoring is provided in ***Appendix F***.

2.6 Monitoring Results and Observations

2.6.1 The odour patrol was carried out on 20 June 2016 during daytime and evening by two "panellists" (Panellist A and Panellist B) at all monitoring stations, as required by the EM&A Manual.

2.6.2 The Hong Kong Observatory's Tuen Mun Weather Station reported that the weather on the day of the patrol was fine. The weather condition during the period is provided in ***Appendix G***.

2.6.3 The results for odour patrol at each monitoring location are provided in ***Appendix B***.

2.6.4 No exceedance of the action or limit level was identified during the reporting period.

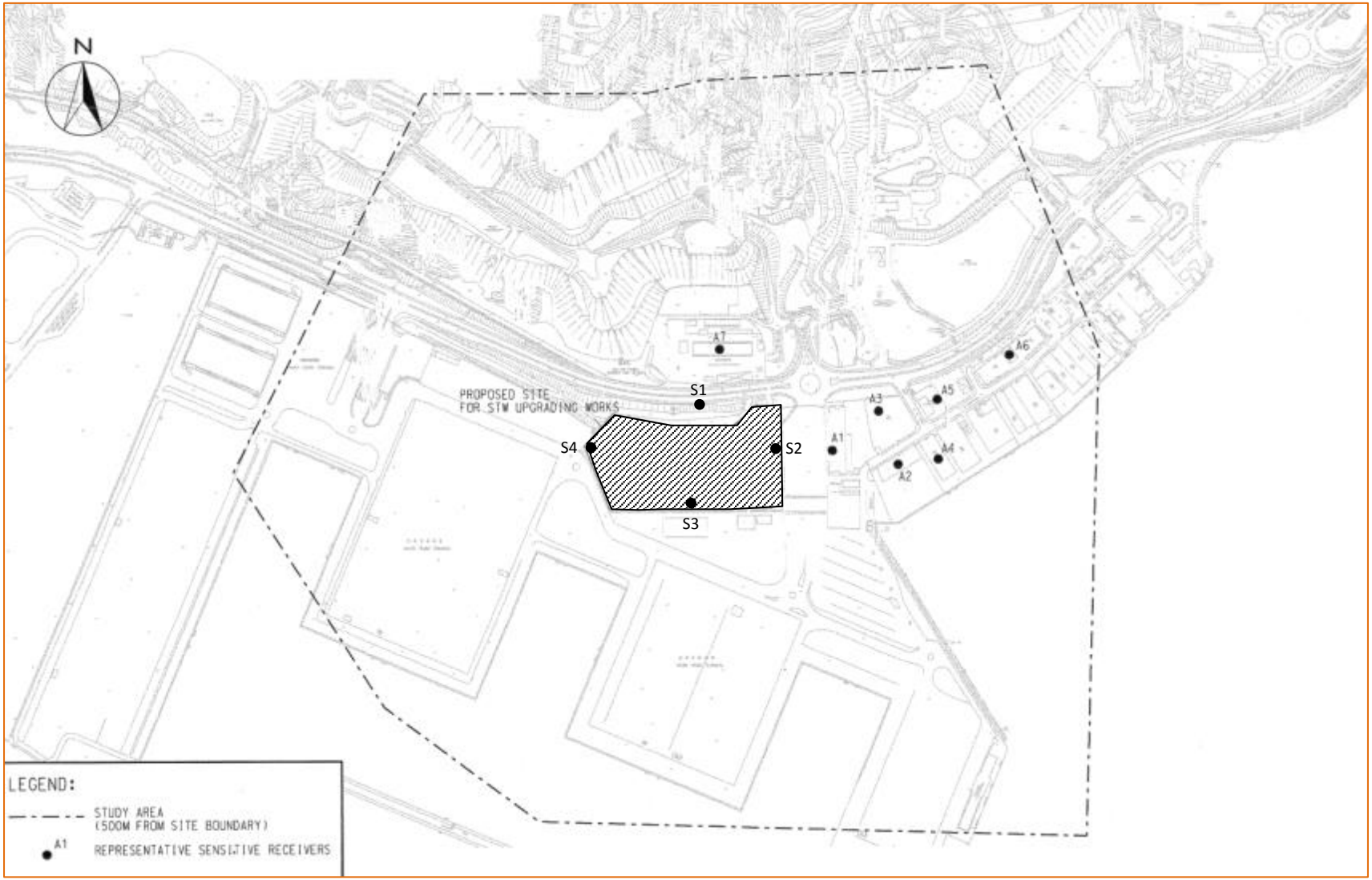
2.6.5 During the odour patrol, no noticeable odour due to operation of the PPSTW was observed at the sensitive receivers.

2.6.6 As predicted in Section 3.8.2.1 of the Final EIA report, there shall be no exceedances of the odour criteria at ASRs located outside of the project boundary. Since no odour monitoring results exceeded the odour criteria, the monitoring verified that the EIA predictions were correct.

2.7 Odour Complaint Registration System

2.7.1 An odour complaint registration system has been set up for the project. No odour complaint was received and registered in the odour complaint registration system in the reporting month.

Figure 2-1 Monitoring Locations for Odour Patrol



3 ODOUR EMISSION MONITORING

3.1 Monitoring Methodology and Parameters

3.1.1 In accordance with Section 3.8 of the Register of Change under Environmental Permit (EP) dated March 2013, two rounds of air sampling and olfactometric analysis are required to be conducted under full-load operation of the upgraded Pillar Point Sewage Treatment Works (PPSTW) to monitor the performance and effectiveness of the deodorization units. The first round of air sampling and olfactometric analysis will be conducted upon commissioning of the upgraded PPSTW and the second round will be carried out 1 year thereafter. The upgraded PPSTW commissioned on 15 August 2015 and the first round of air sampling and olfactometric analysis was carried out on 21 September 2015.

Air Sampling & Olfactomectric Analysis

Air Sampling Requirements and Methodology

3.1.2 As stipulated in 1.3.2 of Annex 3F of the Final EM&A Manual, the source temperature shall be measured at the time of air sampling. Other meteorological conditions including wind speed, wind direction and relative humidity should also be measured at the time of the monitoring. Two samples at each inlet/ outlet should be collected. Air sampling shall not be conducted in rainy days as it would affect the odour strength of the sources.

3.1.3 The air sampling procedure followed the European Standard Method EN13725:2003 and the procedures are listed as follow:

i. The sampling bags were prepared by filling the sampling bags with odour-free air at the odour laboratory to test any leaking problem.
ii. Sampling bags were emptied before sampling.
iii. For area sources, air samples were collected by hood sampling method. The odour sampling system includes a battery-operated air pump, a sampling vessel, and nalophane odour bags. Empty sample bag was placed in a rigid plastic container and the container was then evacuated at a controlled rate and the bag was filled. Sufficient volume of gas sample was collected at each sampling location and wind tunnel was employed during the sampling work.
iv. For non-area sources or “hood” method cannot be applied due to site constraint, the air samples were collected using a positive displacement pump and nalophane odour bags. The Positive displacement pump would be connected to the odour source and the sample bag was filled at a fixed flowrate.
v. The odour bags are Odour-free, which no odours added to the samples. The sampling bags were made of a material which does absorb or react with odorous samples. The odour bags were sufficiently impervious, reasonably robust, leak-free, equipped with leak-free fittings, compatible with olfactometer and other sampling equipment and the bags have sufficient capacity to complete a full test series.
vi. The temperature of the sampling bags was kept above dew point and exposure of samples to sunlight was avoided. Exposure of samples to direct sunlight was avoided to minimise photochemical reactions.

vii. The odour samples were delivered to a qualified laboratory for olfactometric analysis analysed within twenty-four hours.

Olfactometric Analysis Requirements and Methodology

3.1.4 The collected air samples were transported to Hong Kong Productivity Council (HKPC), which is a qualified laboratory for olfactometric analysis, within 24 hours.

i. The odour concentrations of the samples were determined by a forced-choice dynamic olfactometer with a panel of human assessors.

ii. The odour concentration is measured by determining the dilution factor required to reach the detection threshold, which is 1ou/m^3.

iii. The odour laboratory was ventilated to maintain an odour-free environment and to provide air to the panel members.

iv. The panellists were screened beforehand by using a 50-ppm solution/mixture of certified n-butanol standard gas in at least 3 sections on separated days with a pause of at least one day between sections, which the most sensitive and least sensitive individuals were eliminated and each odour testing session should comprise of 6 to 8 qualified panellists in 2 rounds of analysis.

v. The panel members were not allowed to eat or smoke one hour prior to the session, or use perfumes, after-shave lotions or any other fragrant essences before the session. They should be in the odour room 15 minutes before measurements. If they had health problems that affect their noses, they were not allowed to attend the testing session. No panel member were involved in the odour testing for more than 4 hours, within this period at least 2 ten minutes breaks for olfactory rest should be taken. The odour panel were housed in a room that constructs of odour-free materials and equipped with ventilation system.

vi. Regular calibration of the olfactometer was performed yearly to check the accuracy and repeatability of its dilution settings and to establish its calibration history. The olfactometer was calibrated regularly using propane as a tracer, which is an option recommended in BS 13725:2003 calibration method. The accuracy and repeatability of the olfactometer are calculated from two propane concentrations, one measured at the sniffing port of the olfactometer and once being the certified propane concentration.

H_2S Measurement

H_2S Measurement Methodology

i. H_2S level sensors were installed at the respective inlet and outlet of the deodorization units to continuously monitor the H_2S emission level at the stacks and H_2S removal efficiency of the deodorization units.

3.2 Monitoring Stations

3.2.1 The air samples collection locations are tabulated in ***Table 3-1*** and illustrated in ***Figure 3-1***.

Table 3-1 Monitoring Locations for Air Sampling

Deodourization Unit Portion	Station ID	Description
A	A1	Inlet for Portion A of the Deodorization Unit
	A2	Outlet from Activated Carbon Filter A1
	A3	Outlet from Activated Carbon Filter A2
B	B1	Inlet for Portion B of the Deodorization Unit
	B2	Outlet from Activated Carbon Filter B1
	B3	Outlet from Activated Carbon Filter B2

3.3 Monitoring Equipment

3.3.1 The equipment used for H_2S Gas Detector was listed in ***Table 3-2*** and calibration certificates for this equipment were provided in ***Appendix C***.

Table 3-2 Odour Emission Monitoring Equipment

Equipment	System Model	Detector Model	Unit	Channel Number	Serial Number
H_2S Gas Detector	"Crowcon" Gasmonitor Plus Control Panel	"Crowcon" Xgard Type 1 H_2S Gas Detector	A	1	410710/08-1
				4	410710/07-13
				5	410710/07-9
			B	1	410710/08-2
				4	410710/07-10
				5	410710/07-12

3.4 Action and Limit Levels

3.4.1 The design requirements for stacks (A2, A3 and B2, B3) of deodourizing units A and B stipulated in the Register of Change under Environmental Permit (EP) were summarized in ***Table 3-3***.

Table 3-3 Design Requirements for Outlet Stacks of Deodourizing Units

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
A2	• H=6.81m • V=19.58m/s • D=0.62m	1,786 ou/s (total emission from all vent pipes)
A3	• H=6.81m • V=19.58m/s • D=0.62m	

Stack of Deodorizing unit	Design requirements of deodorizing unit	Odour emission rates
B2	• H=6.81m • V=20.00m/s • D=0.62m	1,809 ou/s (total emission from all vent pipes)
B3	• H=6.81m • V=20.00m/s • D=0.62m	

3.4.2 The Action and Limit Levels as proposed in Table F.1 of Annex 3F of the Register of Change under Environmental Permit (EP) are summarized in ***Table 3-4***.

Table 3-4 Action and Limit Levels for Odour Emission Monitoring

Parameter	Action Level	Limit Level
Odour Emission (from air sampling, olfactometric analysis and H_2S measurement)	Odour emission rate from the outlet of the deodorizaiton unit exceeds 80% of the permitted value in ***Table 3-3***.	Odour emission rate from outlet of the deodorization unit exceeds the permitted value in ***Table 3-3***.

3.5 Event and Action Plan

3.5.1 The Event and Action Plan for Air Quality Monitoring (Operation Phase) is provided on ***Appendix F***.

3.6 Monitoring Results

Air Samples and Olfactometric Analysis

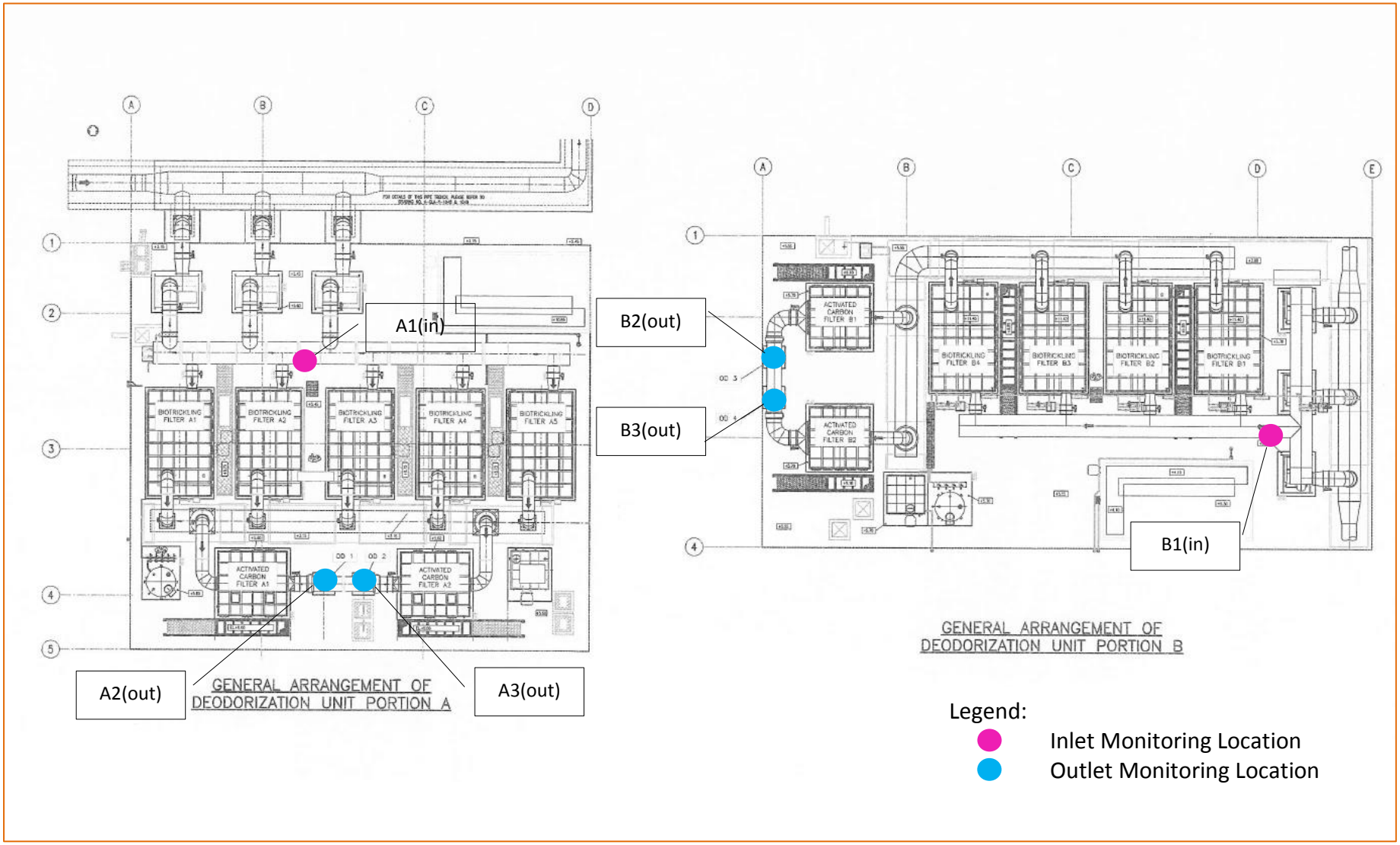
3.6.1 No air sampling for olfactometric analysis was carried out during the reporting month. The next monitoring is scheduled in August 2016, at 1 year after commissioning of the upgraded PPSTW, and the exact date of sampling will be agreed with the Independent Environmental Checker (IEC) in due course.

H_2S Monitoring

3.6.2 Continuous H_2S monitoring was conducted from 1 to 30 June 2016 and the results were provided in ***Appendix D***.

3.6.3 As shown in the continuous H_2S monitoring results, the average percentage of H_2S removal efficiency of the deodorization units were 100%, which is well above the designed control efficiency of at least 90% of the deodorizing units as stipulated in Condition 2.6 of the Environmental Permit No.EP-321/2008/B (EP). To conclude, the effectiveness of the odour control system complied with the design criteria and satisfies the EP requirements.

Figure 3-1 Air sampling locations



4 PPWQM Effluent quality Monitoring

4.1 Monitoring Methodology and Parameters

4.1.1 In accordance with Para 3.4.1.1 of the approved EM&A Manual, a one year impact monitoring of Post Project Water Quality Monitoring (PPWQM) programme shall be implemented after Project commissioning. Effluent quality monitoring is required as part of the PPWQM programme and shall be carried out during the operation phase of the upgraded PPSTW.

4.1.2 Para 1.2.1 of Appendix E of the approved EM&A Manual stated that two cycles of effluent sampling each of a full 24-hour period during both wet and dry seasons over the field work period of one year shall be carried out to characterize the quality of the treated effluent.

4.1.3 Operation Phase of the upgraded PPSTW was scheduled to commence on 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season operation phase effluent quality monitoring was completed on 23 August 2015 and 24 August 2015. Two round of dry season operation phase effluent quality monitoring were completed on 9 November 2015 to 10 November 2015 and 3 February to 4 February 2016 respectively. The second wet season effluent quality monitoring was completed on 19 May 2016 and 20 May 2016.

4.1.4 Effluent monitoring parameters and frequency for effluent quality monitoring as agreed by the Director of Environmental Protection (DEP) are summarised in ***Table 4-1***.

Table 4-1 Effluent Quality Monitoring Parameters and Frequency

Parameter (unit)	Type	Frequency
E.coli (CFU/1000mL)	Laboratory Analysis	Two cycles of a full 24-hour period during both wet and dry seasons.[2]
Biochemical Oxygen Demand (mg/L)		
Suspended Solids (SS) (mg/L)		
Ammonia as N (mg/L)		
Total Nitrogen as N (mg/L)		
Total Nitrogen as N – Filtered (mg/L)		
Total Phosphorous as P (mg/L)		
Total Phosphorous as P – Filtered (mg/L)		
Total Organic Carbon (mg/L)		
Aluminum (Al) (µg/L)		
Boron (B) (µg/L)		
Iron (Fe) (µg/L)		
Mercury (Hg) (µg/L)		

2. The proposal included the appropriate time intervals over the 24 hour period and analysed for a range of variables were endorsed by IEC on 16 November 2012 and approved by EPD on 5 March 2013.

Parameter (unit)	Type	Frequency
Arsenic (As) (µg/L)		
Barium (Ba) (µg/L)		
Cadmium (Cd) (µg/L)		
Chromium (Cr) (µg/L)		
Copper (Cu) (µg/L)		
Lead (Pb) (µg/L)		
Manganese (Mn) (µg/L)		
Nickel (Ni) (µg/L)		
Silver (Ag) (µg/L)		
Vanadium (V) (µg/L)		
Zinc (Zn) (µg/L)		

4.1.5 All laboratory analyses were carried out by ALS Technichem (HK) Pty Limited and Enviro Labs Limited. Both two laboratories are HOKLAS accredited laboratory.

4.1.6 A composite sample of treated effluent was collected by an auto sampler (Hach Sigma AWRS Sampler) on a half-hourly basis over a 24-hour period. The sample was then stored in insulated containers with ice packs to maintain a dark and below 4^{o}C condition without freezing. All collected samples were delivered to the testing laboratory within 24 hours of sampling.

4.2 Monitoring Stations

4.2.1 Effluent quality monitoring was carried out at the effluent outlet of the PPSTW as shown in ***Figure 4-1***.

4.3 Sampling Equipment

4.3.1 An auto effluent sampler, Hach Sigma AWRS Sampler, as shown in ***Photo 4-1*** was installed at the site for collection of effluent sample for laboratory analysis. Details of the sampler are provided in ***Table 4-2***.

Photo 4-1 Hach Sigma AWRS Sampler

Table 4-2 Effluent Quality Monitoring Equipment

Equipment	Brand and Model	Serial Number
Hach Sigma AWRS Sampler	Hach Sigma AWRS Sampler Model 3542SDRH	131000484113

Effluent Sampling Procedures

i. The power supply was checked to ensure the sampler works properly.
ii. The polyethylene sampling bottles were installed properly in the sampler and were cleaned for up to 3 times with source liquid prior to sample collection.
iii. The auto sampler automatically collected treated effluent in sampling bottle from the discharge outlet of the PPSTW on an half-hourly basis over 24-hours period.
iv. Technician gathered 24 hourly treated effluent samples and mixed all samples up in a bucket.
v. A composite effluent sample was collected from the bucket and stored in appropriate containers with suitable preservative as provided by the laboratory.
vi. The samples were sent to HOKLAS accredited laboratory immediately for analysis.

4.4 Effluent Discharge Assumptions and Limit

4.4.1 As presented in Table 4.13 of the approved EIA report and repeated in ***Table 4-3*** below, effluent loadings from the upgraded PPSTW were assumed and used to assess the potential impact to the receiving marine water.

Table 4-3 Assumed Effluent Loadings from the Upgraded PPSTW in the EIA Report

	TSS (mg/L)	BOD_5 (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000

4.4.2 As presented in ***Table 4-4*** below, effluent loadings from the upgraded PPSTW were assumed and used to assess the potential impact to the receiving marine water.

Table 4-4 Effluent Loadings from the Upgraded PPSTW in Water Discharge license

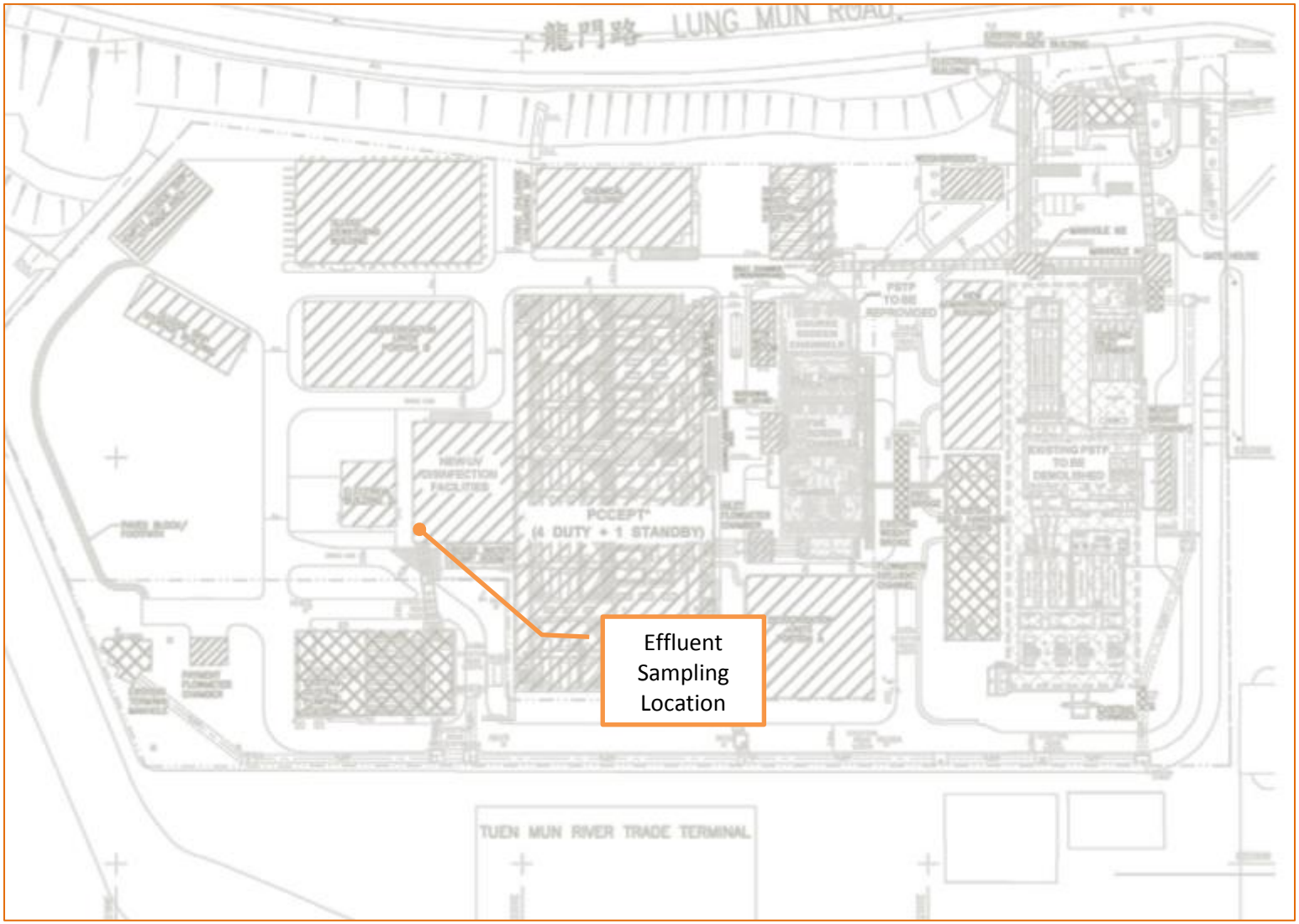
	TSS (mg/L)	BOD_5 (mg/L)	E. coli (counts/100mL)
Effluent Loadings at 95 Percentile	120	180	300,000
Upper Limit	240	360	#20,000

#: The upper limit is monthly geometric mean.

4.5 Monitoring Results

4.5.1 Two cycles of effluent sampling each of a full 24-hour period during both wet and dry seasons over the field work period of one year were completed as per the Para 1.2.1 of Appendix E of the approved EM&A Manual stipulated.

Figure 4-1 Monitoring Locations for Effluent Quality Monitoring



5 PPWQM WATER QUALITY MONITORING

5.1 Monitoring Methodology and Parameters

5.1.1 In accordance with Section 3.4.1.1 of the final EM&A Manual, PPWQM programme shall be implemented during first year of the Operation Phase of the upgraded PPSTW.

5.1.2 Section 1.3.1 of Appendix E of the final EM&A Manual stated that water quality monitoring should be performed four times over the field work period of one year to give adequate coverage of different tidal states during both wet and dry seasons. The operation phase of Upgraded PPSTW commenced on 15 August 2015, hence the one year field work shall run from 15 August 2015 to 14 August 2016. The first wet season and dry season operation phase water quality monitoring were completed on 26 August 2015 and on 5 November 2015 respectively. The second dry season water quality monitoring was completed on 18 February 2016, and the second wet season operation phase water monitoring works was completed on 24 May 2016.

5.1.3 Water monitoring parameters, frequency and water depths for water quality monitoring as agreed with the Director of Environmental Protection (DEP) [Ref. #3] are summarised in ***Table 5-1***.

Table 5-1 Water Quality Monitoring Parameters, Frequency and Water Depth

Parameter (unit)	Type	Frequency	Water Depth
Temperature (°C)	In situ Measurement	Mid-flood tide and Mid-ebb tide	• If water depth >6m, 1m below water surface, mid-depth and 1m above seabed • If water depth <6m, and >3m, 1m below surface and 1m above seabed • If water depth <3m, mid-depth only
Turbidity (NTU)			
pH			
DO (mg/L and %)			
Salinity (ppt)			
E.coli (CFU/100mL)	Laboratory Analysis		
BOD (mg/L)			
SS (mg/L)			
Nitrate (mg/L)			
Nitrite (mg/L)			
Total Nitrogen as N (mg/L)			
Total Nitrogen as N – Filtered (mg/L)			
Total Phosphorous as P (mg/L)			
Total Phosphorous as P – Filtered (mg/L)			
Ammonia (mg/L)			

5.1.4 All laboratory analyses were carried out by ALS Technichem (HK) Pty Limited, which is a HOKLAS accredited laboratory.

3. Via Drainage Services Department's letter memo dated 7 Dec 2012 (ref.: DSD SS 8/4329DS/CE200251/17) and Environmental Department's letter dated 5 March 2013 (ref.: (9) in Ax (11) to EP2/N4/F/34 Pt. 9)

5.1.5 Samples were stored in appropriate containers provided in advance by the testing laboratory. The containers were immediately sealed and labelled. Sample ID and sampling date were marked on each sample. The samples were then stored in insulated containers with ice packs to maintain a dark and below 4°C condition without freezing. All collected samples were delivered to the testing laboratory within 24 hours of sampling.

5.2 Monitoring Stations

5.2.1 As agreed with DEP, water quality monitoring was carried out at 11 monitoring stations as shown in ***Table 5-2***. Locations are shown in ***Figure 5-1*****.**

Table 5-2 Monitoring Locations for Water Quality Monitoring

Station ID	Description of Location	Co-ordinates	
		Easting	Northing
B1	Butterfly Beach	813517.1	825825.6
B2	Castle Peak Beach	815779.2	826530.7
B3	Kadoorie Beach	816098.4	826328.0
B4	Cafeteria Old Beach	816310.1	826240.2
B5	Cafeteria New Beach	816751.8	825888.4
B6	Golden Beach	816813.5	825493.2
WSD1	Flushing Water Intake near Butterfly Beach	813103.0	825511.1
WSD2	Flushing Water Intake near LRT Terminus	815241.3	825860.0
U2	Secondary Contact Recreation Subzone at Lung Kwu Tan	809704.9	827855.5
NM6	Control Station	820121.5	807822.1
NM1	Control Station	823025.4	820503.9

5.3 Monitoring Equipment

5.3.1 The equipment used for water quality monitoring was listed in ***Table 5-3*** and calibration certificates for this equipment were provided in ***Appendix C***.

Table 5-3 Water Quality Monitoring Equipment

Equipment	Model	Serial Number
Multiparameter sonde	YSI Sonde 6920 v2	00019CB2

5.4 Action and Limit Levels

5.4.1 The Action and Limit Levels for the water quality monitoring was established by using the baseline water monitoring data which carried out before commissioning of the upgraded PPSTW for each monitoring locations. The Action and Limit Levels are showed in ***Table 5-4***.

5.5 Monitoring Results and Observations

5.5.1 Four times water quality monitoring over the field work period of one year is completed as per the Section 1.3.1 of Appendix E of the final EM&A Manual stipulated.

Table 5-4 Action and Limit Levels for Water Quality

Parameters	Detection Limit	Dry Season (October to March)		Wet Season (April to September)	
		Action Level *	Limit Level **	Action Level *	Limit Level **
DO in mg/L	0.01	6.39 (Surface & Middle) 6.25 (Bottom)	6.22 (Surface & Middle) 6.15 (Bottom)	5.14 (Surface & Middle) 4.51 (Bottom)	4.84 (Surface & Middle) 4.49 (Bottom)
DO in %age	0.1	90.0 (Surface & Middle) 88.6 (Bottom)	87.7 (Surface & Middle) 87.2 (Bottom)	74.7 (Surface & Middle) 65.9 (Bottom)	70.6 (Surface & Middle) 65.6 (Bottom)
Turbidity in NTU	0.1	6.8	9.4	6.8	8.4
Salinity in ppt	0.01	31.98	32.15	29.66	30.06
E.coli count	1	90	102	333	1002
BOD in mg/L	2	2	3	2	>2
SS in mg/L	2	11	14	9	13
Nitrate in mg/L	0.01	0.52	0.85	0.7	0.72
Nitrite in mg/L	0.01	0.18	0.29	0.11	0.14
Total Nitrogen in mg/L	0.1	1.2	1.6	1.3	1.4
Total Phosphorous in mg/L	0.1	0.1	>0.1	0.1	>0.1
Ammonia in mg/L	0.01	0.18	0.21	0.21	0.24

Note:

* Action Levels were derived based on 95 percentile of baseline data. If baseline monitoring results were found to be below the detection limit, the detection was used as the Action Level or for calculation of the 95th percentile. During impact monitoring, 120% of upstream control station value at the same tide on the same day shall also be used as the Action Level for assessment of the monitoring results.

** Limit Levels were derived based on 99 percentile of baseline data. If baseline monitoring results were found to be below the detection limit, the detection was used as the Limit level or for calculation of the 99th percentile. During impact monitoring, 130% of upstream control station value at the same tide on the same day shall also be used as the Limit Level for assessment of the monitoring results.

Figure 5-1 Monitoring Locations for Water Quality Monitoring

6 PPWQM BENTHIC SURVEY

6.1 Monitoring Methodology and Parameters

6.1.1 In accordance with Para 3.4.1.1 of the approved EM&A Manual, Post Project Water Quality Monitoring programme was implemented during the first year of Operation Phase. Benthic Survey shall be carried out as part of PPWQM programme during the first year of operation phase of the upgraded PPSTW.

6.1.2 Para 1.5.1 of Appendix E of the approved EM&A Manual stated that benthic survey should be performed four times over the field work period of one year, in parallel with the sediment sampling, covering both wet and dry season.

6.1.3 The operation of Upgraded PPSTW is scheduled to commence on 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season operation phase benthic survey was carried out on 15 August 2015 and the first dry season operation phase benthic survey was carried out on 14 November 2015 together with sediment quality sampling. The second dry season benthic survey was carried out on 21 February 2016, and the second wet season operation phase benthic survey was carried out on 15 May 2016.

6.1.4 The collected benthos samples were analysed for the below parameters through Field Sampling and Laboratory Work:

- Species composition to the lowest taxonomic level.
- Benthic community structure.

Field Sampling

6.1.5 At each monitoring station, five replicates of sediment samples were collected using a 0.1m^2 van Veen grab. Collected samples were accepted when at least two-third of grab volume was filled. A photographic record of the sediment texture and colour was taken. The samples were washed with gentle seawater through a plastic box with sieve of 0.5mm mesh size. Large animals that were visible from the residues were hand-picked into a small plastic vial. All remains were transferred into a plastic container for temporary storage.

Laboratory Work

6.1.6 The samples were delivered to laboratory within two hours of completion of field works. The samples were preserved with 70% ethanol solution followed by staining with 1% Rose Bengal solution. The samples were stored for one day to ensure sufficient preservation and staining. The fauna collected were sorted out from the sediment residues. For quality assurance, the sediment residues of one-third sorted samples were randomly rechecked. No missed fauna was found in the recheck.

6.1.7 The collected specimens were identified to the lowest taxonomic resolution. Examination of the morphological features of the specimens was undertaken with the aid of both stereoscopic and compound microscopes.

6.1.8 The taxonomic classification was conducted according with the following references: Polychaetes: Day (1967)[Ref.#4], Gallardo (1967)[Ref.#5], Fauchald (1977)[Ref.#6], Yang and Sun (1988)[Ref.#7], Wu et al. (1997)[Ref.#8], Sun and Yang (2004)[Ref.#9]; Arthropods: Dai and Yang (1991)[Ref.#10], Dong (1991)[Ref.#11]; and Molluscs: Qi (2004)[Ref.#12]. The number of individuals of each species was recorded by counting the anterior portions of the fauna only. Total biomass of each species was determined as preserved wet weight, after blotting the animals on filter paper for 3 minutes before weighing to the nearest 0.0001g.

Data Analysis

6.1.9 Data collected from five replicate samples at every monitoring station were pooled together for data analysis. Shannon-Weaver Diversity Index (*H'*) and Pielou's Species Evenness (J) were calculated using the formulae below,

$$H' = -\Sigma (Ni / N) \ln (Ni / N) \quad \textit{(Shannon and Weaver, 1963)}$$

$$J = H' / \ln S \quad \textit{(Pielou, 1966)}$$

where S is the total number of species in the sample, N is the total number of individuals, and Ni is the number of individuals of the i^{th} species

6.2 Monitoring Stations

6.2.1 In accordance with Para 1.5.1 of Appendix E of the approved EM&A Manual, benthic survey was undertaken in parallel with sediment sampling using the same monitoring stations. Nine of the stations represented the sensitive receivers which could potentially be affected by the untreated or partially treated effluent from the PPSTW (B1 to B6: gazetted beaches; WSD1 to WSD2: flushing water intake points and U2: secondary contact recreation subzone).

6.2.2 Stations NM1 and NM6 were control stations locating outside the influence zone of the emergency discharge as predicted by the water quality modelling and would unlikely be affected by the PPSTW.

6.2.3 During the benthic survey, slight adjustments to the location of seven of the monitoring stations were necessary due to shallow water near the shore that made the original locations inaccessible by the sampling vessel. The revised co-ordinates are provided in ***Appendix E*** for reference.

4. Day, J.H., 1967. A monograph on the polychaeta of South Africa. Trustees of the British Museum, London.
5. Gallardo, V., 1967. Polychaeta from the Bay of Nha Trang, South Viet Nam. In: Scientific Results of Marine Investigations of the South China Sea and the Gulf of Thailand 1959-1961, Naga Report 4(3). Scripps Institution of Oceanography, University of California Press. La Jolla, California, 35-279.
6. Fauchald, K., 1977. The polychaete worms. Definitions and keys to the orders, families and genera. Natural History Museum of Los Angeles County, Science Series 28. Los Angeles, U.S.A.
7. Yang, D.J, Sun, R.P., 1988. Polychaetous annelids commonly seen from the Chinese waters (Chinese version). China Agriculture Press, China.
8. Wu, B.L., Wu, Q.Q., Qiu, J.W., Lu, H., 1997. Fauna Sinica, Phylum Annelida, Class Polychaeta, Order Phyllodocimorpha. Science Press. Beijing.
9. Sun, R.P., Yang, D.J., 2004. Fauna Sinica. Phylum Annelida. Class Polychaeta II, Order Nereidida. Science Press. Beijing.
10. Dai, A.Y., Yang, S.L., 1991. Crabs of the China Seas. China Ocean Press. Beijing.
11. Dong, Y.M., 1991. Fauna of ZheJiang Crustacea. Zhejiang Science and Technology Publishing House. ZheJiang.
12. Qi, Z.Y., 2004. Seashells of China. China Ocean Press. Beijing, China.

6.3 Monitoring Equipment

6.3.1 A 0.1m^2 van Veen grab, as shown in ***Photo 6-1***, was used to collect sediment samples for laboratory analysis.

Photo 6-1 Van Veen Grab Sampler

6.4 Wet Season Baseline Ecological Status of the Benthic Communities

6.4.1 The results will be comparing to the wet season mean benthic baseline survey results which were conducted in wet season before commissioning of the upgraded PPSTW at each monitoring locations. The mean of the benthic survey conduct during baseline were showed in ***Table 6-1 .***

Table 6-1 Benthic Survey Wet Season Baseline Results Summary

Station ID	Mean				
	Number of Species (spp. 0.5m^2)	Density (ind. m^{-2})	Biomass (g m^{-2})	Shannon weaver Diversity index H'	Pielou's Species Evenness J
B1	16	110	46.8	2.06	0.74
B2	13	43	6.2	2.13	0.84
B3	5	11	2.18	1.59	0.98
B4	6	17	0.55	1.34	0.95
B5	14	60	3.02	2.22	0.89
B6	19	216	36.14	1.88	0.7
WSD1	31	126	20.61	3.21	0.94
WSD2	11	70	4.59	1.89	0.86
U2	18	75	20.01	2.52	0.88
NM1	30	269	27.52	2.61	0.77
NM6	23	189	43.64	2.15	0.68

6.5 Monitoring Results

Sediment Condition

6.5.1 The sediment texture and colour and hydrogen sulphite (H_2S) odour at the monitoring stations are shown in ***Table 6-2***.

Table 6-2 Sediment Texture and Colour at Monitoring Stations

Station ID	Sediment Texture	Sediment Colour	Level of H_2S Odour	Remarks
B1	Soft mud	Grey with brown surface	-	-
B2	Soft mud	Grey with brown surface	-	Rubbish inside sediments
B3	Soft mud	Grey with brown surface	-	-
B4	Soft mud	Grey with brown surface	-	-
B5	Soft mud	Grey with brown surface	-	-
B6	~90% Soft mud + ~10% Coarse sand	Grey with brown surface	-	-
WSD1	~ 50% Soft mud + ~50% Coarse sand	Brown surface	-	Lots of broken shells inside sediments
WSD2	~ 70% Soft mud + ~30% Coarse sand	Grey with brown surface	-	-
U2	~ 50% Soft mud + ~50% Fine sand	Dark grey	-	-
NM1	~ 90% Soft mud + ~10% Coarse sand	Dark grey	-	-
NM6	~ 70% Soft mud + ~30% Coarse sand	Grey	-	Rubbish inside sediment

6.5.2 As revealed in ***Table 6-2*** , the sediments collected in B1 to B6 stations were mainly soft mud (90-100%). The sediment colour was grey with thin, brown surface. Rubbish was found in B2 sediments that reflected the dumping activities of vessel from nearby typhoon shelter.

6.5.3 The sediments of stations WSD1 were intermediate mixture of soft mud (~50%) and coarse sand (~50%) with lots of broken shells. The sediment colour was brown. The sediments of station WSD2 were mainly soft mud (~70%) with coarse sand (~30%) as remaining portion. The sediment colour was grey with thin, brown surface.

6.5.4 The sediments of station U2 were intermediate mixture of soft mud (~50%) and fine sand (~50%). The sediment colour was dark grey.

6.5.5 The sediments of station NM1 were mainly soft mud (~90%). The sediment colour was dark grey. The sediments of station NM6 were mainly soft mud (~70%) with coarse sand as the remaining portion. The sediment colour was grey. Rubbish was found inside the sediment.

Benthic Baseline

6.5.6 The total abundance and total biomass of every phylum are summarized in ***Table 6-3***. A total of 2,069 specimens were collected. 128 out of the total 138 taxa were identified to genus or species levels. The most diverse phylum was Annelida (56 polychaete taxa), followed by Mollusca (21 bivalve taxa + 11 gastropod taxa + 1 Scaphopod taxon),

Arthropoda (9 amphipod taxa + 8 crab taxa + 6 shrimp taxa + 1 isopod taxa + 1 mantis shrimp species + 1 hermit crab taxon + 1 leptostracan taxon + 1 cumacean taxon), Echinodermata (5 brittle star taxa + 1 sea urchin species + 1 sea cucumber species) and Cnidaria (3 sea anemone taxa + 2 sea pen + 1 coral taxon). Other less diverse phyla (1-3 taxa) were Hermichordata (acorn worm), Sipuncula, Echiura, Chordata (fishes) and Nemertea.

6.5.7 In general, 50% of total abundance was Annelida (polychaetes, 1036 ind.). Other abundant phyla were Mollusca (569 ind., 28%), Arthropoda (229 ind., 11%) and Echinodermata (92 ind., 4%). Other phyla were relatively few in abundance while each contributed less than 3% of total abundance. The total biomass was 55.4073 g accounted mainly by Mollusca (27.2657 g, 49%). Other biomass-contributing phyla were Echinodermata (9.6651 g, 17%), Cnidaria (7.3163 g, 13%) and Arthropoda (4.8314 g, 9%).

6.5.8 All recorded species were common with no conservation interest. The complete list of species identified in the collected specimens is provided in ***Appendix I***.

Table 6-3 Abundance and Biomass for Each Phylum

Phylum	Abundance (individuals)	%age of Abundance	Biomass (g)	%age of Biomass
Annelida	1036	50	1.8569	3
Mollusca	569	28	27.2657	49
Arthropoda	229	11	4.8314	9
Echinodermata	92	4	9.6651	17
Sipuncula	56	3	0.1216	0
Nemertea	47	2	0.2945	1
Cnidaria	33	2	7.3163	13
Hemichordata	4	0	1.9946	4
Chordata	2	0	2.0563	4
Echiura	1	0	0.0049	0
Total	**2069**	**-**	**55.4073**	**-**

Note: 0%: total individual / biomass of the phylum is <1% of that of all specimens

6.5.9 The relative abundance of each phylum for each sampling locations are shown in ***Table 6-4***.

6.5.10 Gazetted beaches: Stations B1-B6 were low to moderate in abundance (68-128 ind.) while the common phyla were Annelida (26-91 ind, relative abundance 33-72%), Arthropoda (4-19 ind., 5-23%) and Mollusca (8-40 ind., 10-50%).

6.5.11 Flushing water intake points: Stations WSD1 and WSD2 were moderate in abundance (214-234 ind.). The common phyla were Annelida (126-173 ind., 59-74%), Mollusca (27-51 ind., 12-24%) and Arthropoda (19-24 ind., 9-11%).

6.5.12 Secondary contact recreation subzone: Station U2 was very high in abundance (528 ind.). It was mainly accounted by Mollusca (301 ind., 58%) and Annelida (158 ind., 30%).

6.5.13 Control stations: Station NM1 was moderate in abundance (160 ind.). The abundant phyla were Annelida (70 ind., 44%) followed by Arthropoda (30 ind., 19%) and Mollusca (28 ind.,

18%). Station NM6 was very high in abundance (411 ind.) which was mainly accounted by Annelida (214 ind., 53%). The less abundant phyla were Echinodermata (70 ind., 18%), Arthropoda (59 ind., 15%) and Mollusca (50 ind., 13%).

Table 6-4 Relative Abundance (Percentage) of Each Phylum at Monitoring Stations

Phylum	Station ID																					
	B1		B2		B3		B4		B5		B6		WSD1		WSD2		U2		NM1		NM6	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Annelida	44	53	55	68	45	56	26	33	34	50	91	72	126	59	173	74	158	30	70	44	214	53
Arthropoda	19	23	12	15	4	5	5	7	13	20	13	11	19	9	24	11	31	6	30	19	59	15
Chordata	1	2	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cnidaria	1	2	-	-	-	-	-	-	2	3	4	4	1	1	7	3	12	3	3	2	3	1
Echinodermata	2	3	-	-	-	-	1	2	1	2	-	-	3	2	-	-	5	1	10	7	70	18
Echiura	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemichordata	1	2	-	-	-	-	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mollusca	8	10	9	12	29	36	40	50	11	17	15	12	51	24	27	12	301	58	28	18	50	13
Nemertea	2	3	3	4	-	-	2	3	5	8	3	3	-	-	1	1	15	3	12	8	4	1
Sipuncula	6	8	2	3	3	4	1	2	2	3	2	2	14	7	2	1	6	2	7	5	11	3
Total	**84**	**100**	**81**	**100**	**81**	**100**	**80**	**100**	**68**	**100**	**128**	**100**	**214**	**100**	**234**	**100**	**528**	**100**	**160**	**100**	**411**	**100**

Note: 0%: relative abundance of the phylum is less than 1% at the monitoring station

6.6 Results

Ecological Status of the Benthic Communities

6.6.1 The number of species, density, biomass, Shannon-weaver Diversity Index (H') and Pielou's Species Evenness (J) values for each sample are provided in ***Table 6-5***, ***Figure 6-1*** to ***Table 6-5***.

6.6.2 The condition and responses (if any) of macrobenthic communities of all stations were evaluated below.

6.6.3 The complete list of species identified in the collected specimens is provided in ***Appendix I***.

Table 6-5 Number of Species, Abundance, Biomass, Shannon-Weaver Diversity Index (H') and Pielou's Species Evenness (J) at Every Monitoring Station

Station ID	Mean				
	Number of Species (spp. 0.5m^2)	Density (ind.m^{-2})	Biomass (gm^{-2})	Shannon-weaver Diversity index H'	Pielou's Species Evenness J
B1	34	168	22.33	3.15	0.89
B2	30	162	3.92	3.03	0.89
B3	27	162	0.88	2.92	0.89
B4	27	160	3.12	3.02	0.92
B5	30	136	0.25	3.09	0.91
B6	40	256	2.56	3.27	0.89
WSD1	36	428	5.83	2.88	0.80
WSD 2	43	468	1.66	3.23	0.86
U2	51	1056	41.48	2.80	0.71
NM1	45	320	14.93	3.47	0.91
NM6	61	822	13.85	3.34	0.81

Figure 6-1 Graphical Plots of Comparison of Species Number at Each Monitoring Station

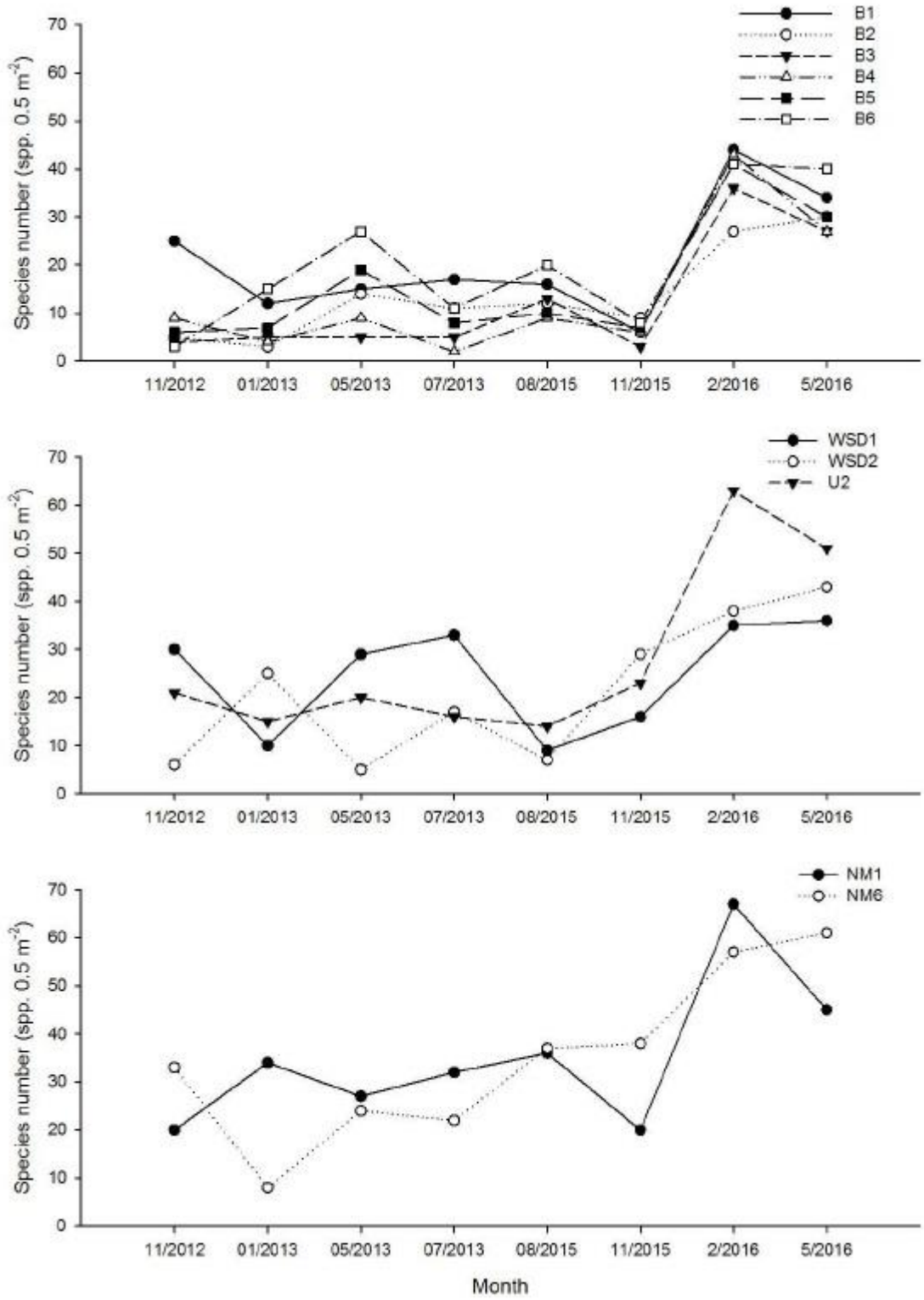


Figure 6-2 Graphical Plots of Comparison of Density at Each Monitoring Station

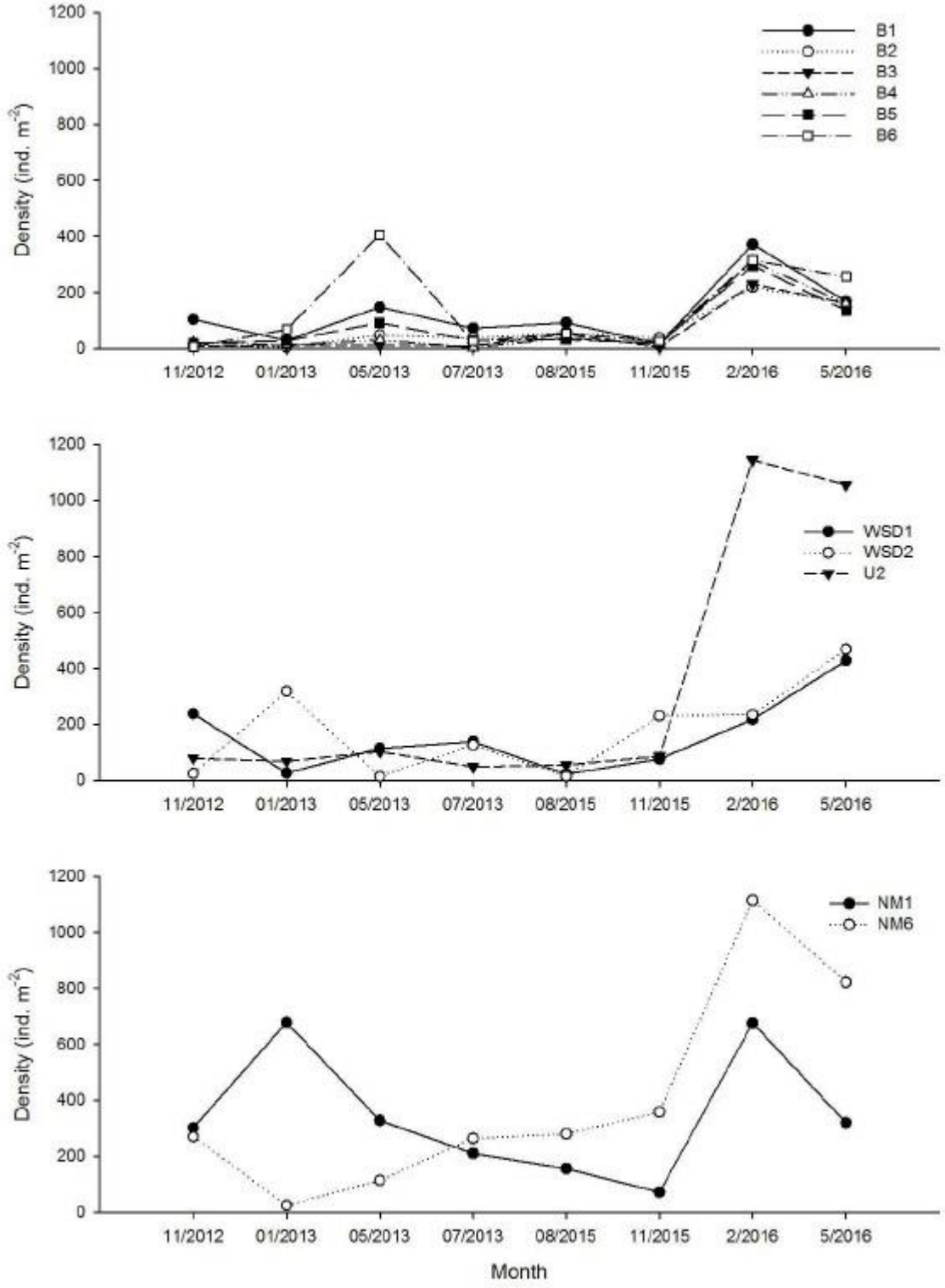


Figure 6-3 Graphical Plots of Comparison of Biomass at Each Monitoring Station

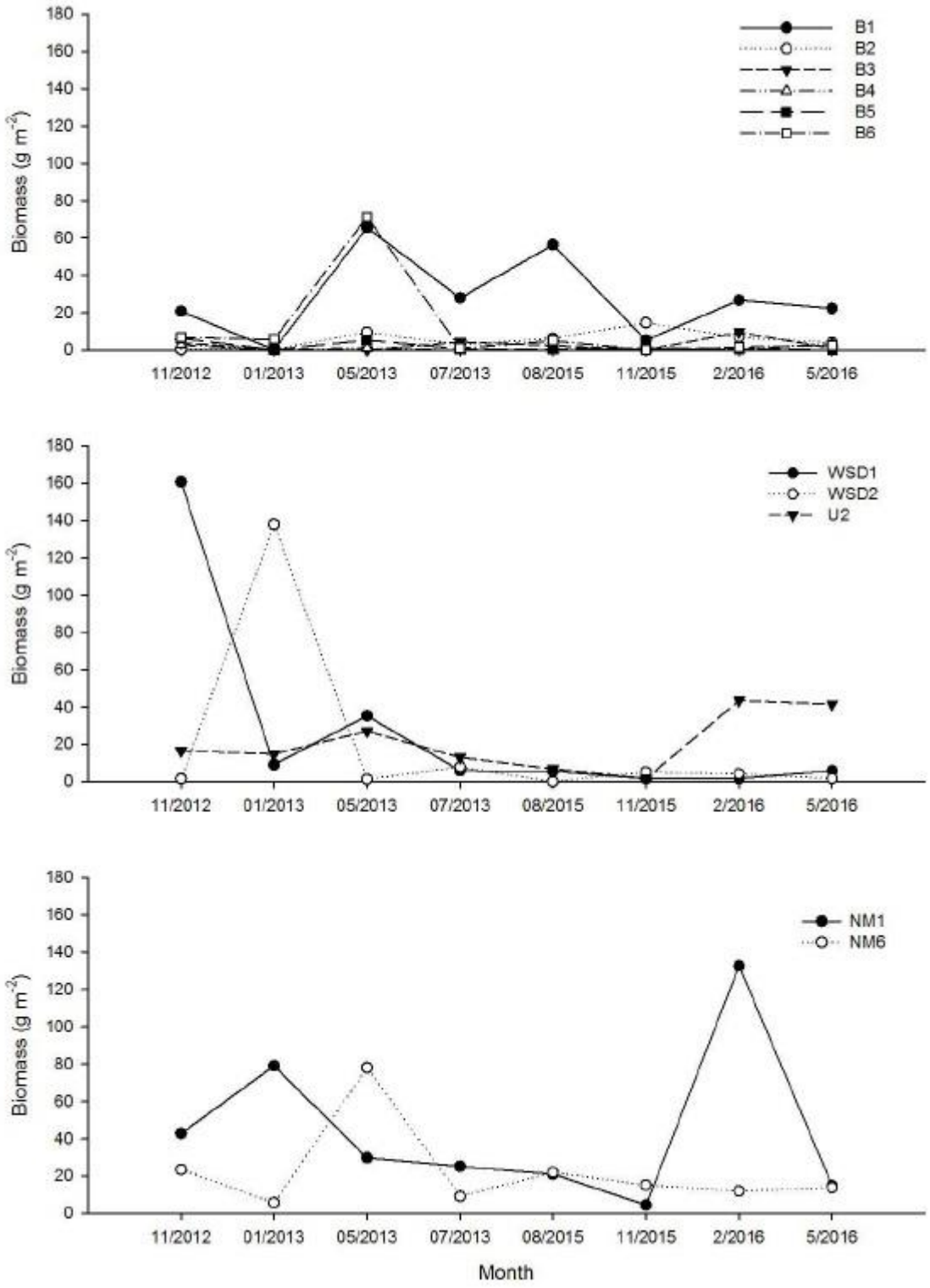


Figure 6-4 Graphical Plots of Comparison of Shannon-Weaver Diversity Index (H') at Each Monitoring Station

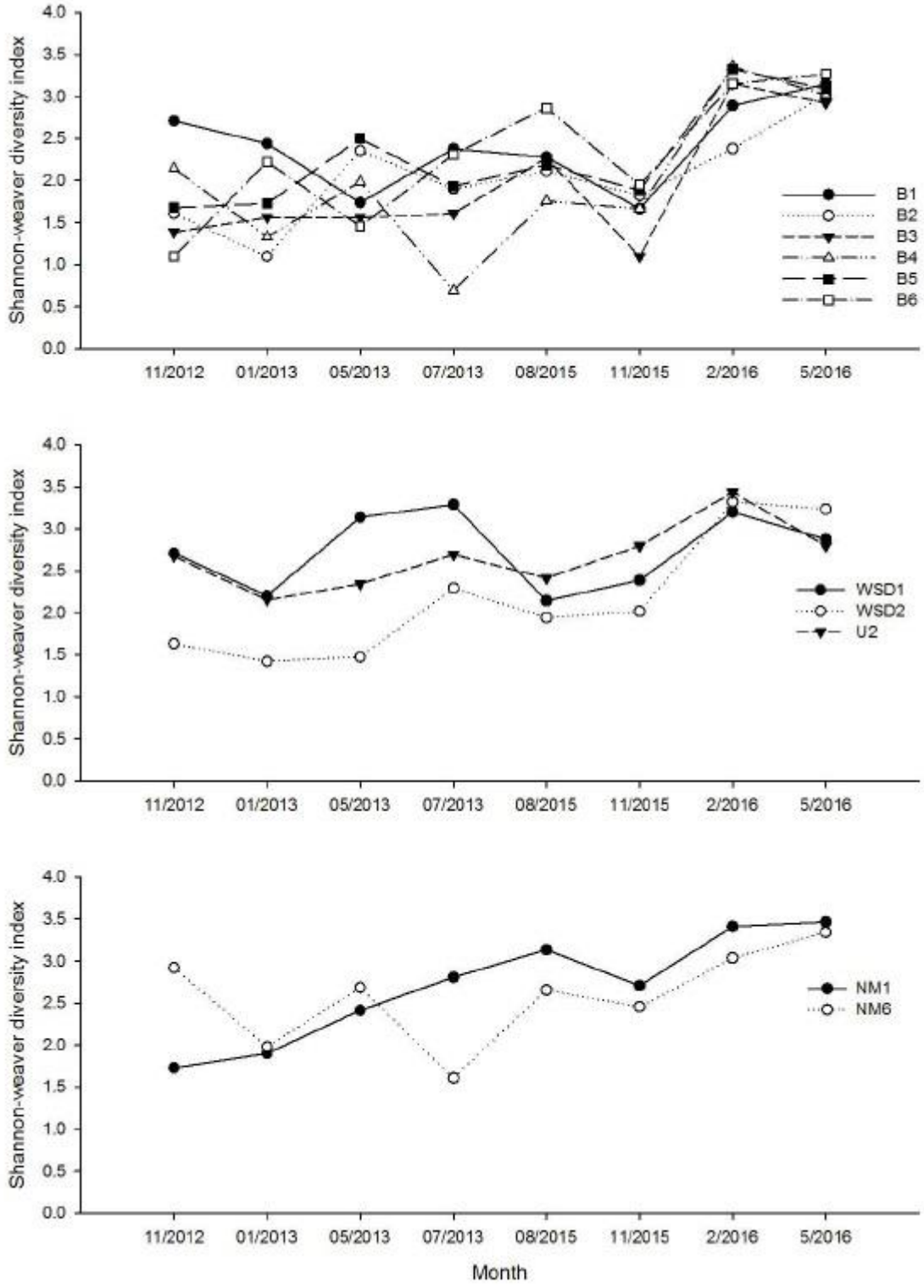
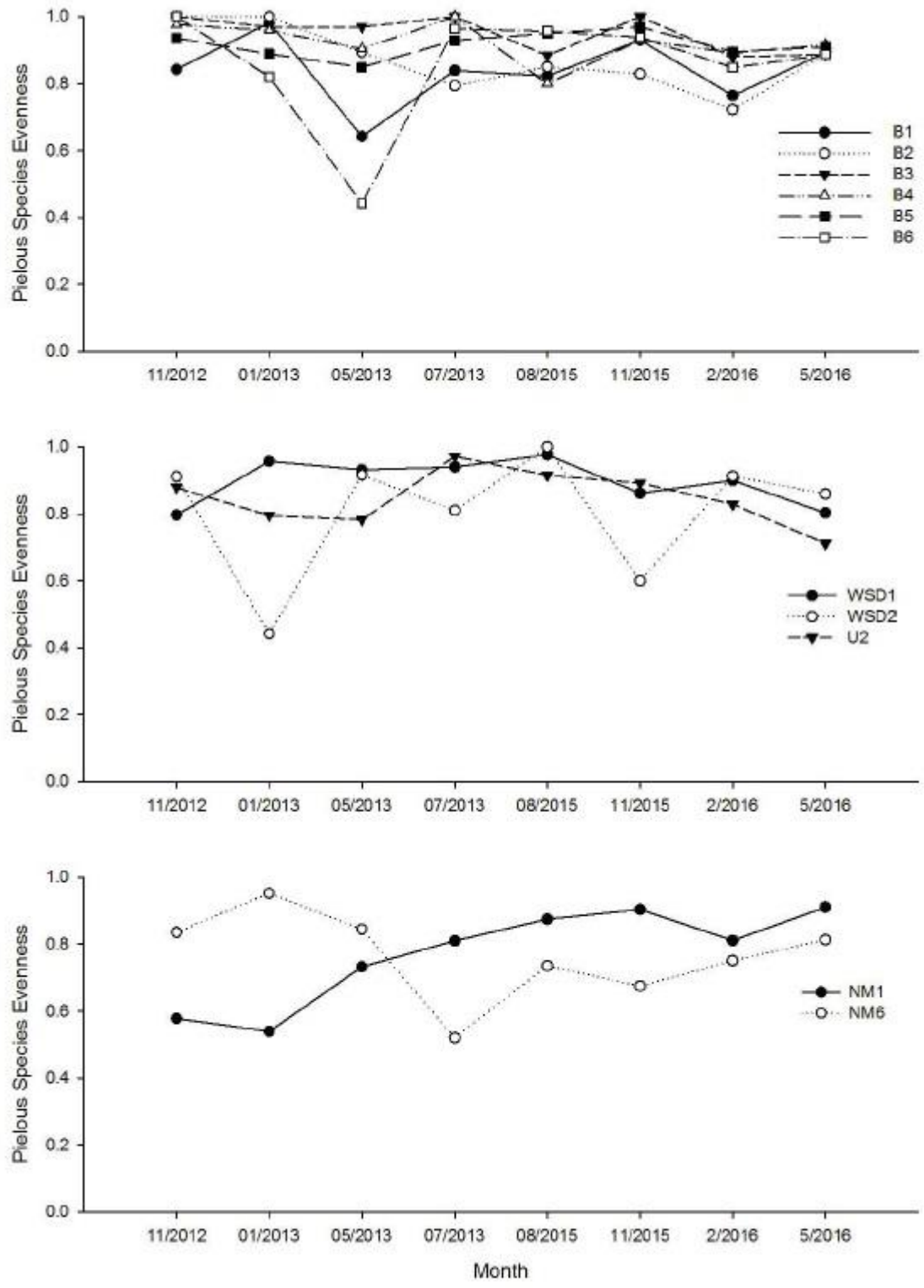


Figure 6-5 Graphical Plots of Comparison of Pielou's Species Evenness (J) at Each Monitoring Station



6.7 Result Analysis

6.7.1 In order to investigate any responses of benthic communities after the upgrading works of PPSTW, samplings were conducted between pre-commission period and post-commission period. For the pre-commission period, two samplings were conducted in dry season (Nov. 2012 & Jan. 2013) and wet season (May & Jul. 2013). For the post-commission period, two samplings were conducted in dry season (Nov. 2015 & Feb. 2016) and wet season (Aug. 2015 & May 2016).

6.7.2 Post-commission benthic survey monitoring results for May 2016 were compared to the pre-commission benthic survey baseline monitoring results in ***Table 6-1*** and ***Table 6-5***; and ***Figure 6-1*** to ***Figure 6-5***.

Gazetted beaches

6.7.3 For station B1, the mean species number and density ranged 16-19 spp. 0.5m^{-2} and 66-110 ind. m^{-2} between dry and wet seasons of the pre-commission period. Slight declines of mean *H*' (from 2.6 to 2.1) and *J* (from 0.9-0.7) were observed from the dry to wet season. It was due to the increased dominance of bivalve species *Paphia undulata* and sea cucumber *Protankyra bidentata*. Moreover it accounted for the higher mean biomass in wet season (from 10.5 to 46.8 g m^{-2}).

6.7.4 In the post-commission period, both the mean species numbers (25 spp. 0.5 m^{-2}) and densities (130-194 ind. m^{-2}) of B1 increased in both seasons. Such increases were mainly due to higher records in Feb. and May 2016. Since the mean *J* (0.8-0.9) remained similar that resulted in slight increases of mean *H*' (2.3-2.7). The mean biomasses of dry and wet seasons were 16.0 g m^{-2} and 39.4 g m^{-2} respectively, similar to that of pre-commission period. Higher mean biomass of wet season was due to the abundant sea cucumber *Protankyra bidentata* found in Aug. 2015. Besides, high dominance of copepods was recorded in Feb. 2016. But both abundant species were no longer abundant in the last sampling month (May 2016).

6.7.5 For stations B2 to B5, all were low in mean species number (4-14 spp. 0.5 m^{-2}), density (8-60 ind. m^{-2}) and *H*' (1.3-2.2) in the pre-commission period while no obvious change was observed between dry and wet seasons. The commonly occurring polychaete *Mediomastus* sp. was an opportunistic species feeding on organic matters in sediments (Cheung et al., 2008) [Ref.#13]. It indicated a mild but long term condition of organic enrichment. As mentioned above, all taxa were very even relatively while high *J* was resulted.

6.7.6 In the post-commission period, there were clear increases of mean species number (18-25 spp. 0.5 m^{-2}), density (84-164 ind. m^{-2}) and *H*' (2.1-2.6) in both seasons. Such increases were due to higher records in Feb. and May 2016. The taxa distribution was even while the mean *J* (0.8-0.9) remained high. The mean biomasses ranged 0.4-10.7 g m^{-2} and remained low in both seasons. In general, there was no abundant species in stations B2-B5. Besides, amphipod *Ampelisca* sp. (62 ind. m^{-2}) and bivalve *Ruditapes philippinarum* (54 ind. m^{-2}) were

13. Cheung. S.G., Lam, N.W.Y., Wu, R.S.S., Shin, P.K.S., 2008. Spatio-temporal changes of marine microbenthic community in sub-tropical waters upon recovery from eutrophication. II. Life-history traits and feeding guilds of polychaete community. Marine Pollution Bulletin 56, 297-307.

once abundant at B2 in Feb. 2016 but both were no longer abundant in this sampling month (May 2016).

6.7.7 For station B6, there were increases of mean species number (from 9 to 19 spp. 0.5 m^{-2}), density (from 37 to 216 ind. m^{-2}) and biomass (from 6.2 to 36.1 g m^{-2}) from dry to wet season in the pre-commission period. Higher density and biomass were due to high dominance of pea crab *Xenophthalmus pinnotheroides* (290 ind. m^{-2}) in May 2013. Moreover high dominance of this pea crab species resulted in higher mean *H*' slightly (from 1.7 to 1.9) but lower mean *J* (from 0.9 to 0.7) in wet season.

6.7.8 In the post-commission period, there were general increases of mean species numbers (25-30 spp. 0.5 m^{-2}), densities (155-171 ind. m^{-2}) and *H*' (2.6-3.1) in both seasons. Such increases were due to higher records in Feb. and May 2016. There was one exception that the mean density of wet season was higher in pre-commission period, due to the high dominance of pea crab *Xenophthalmus pinnotheroides* in May 2013. But it was no longer dominant during the post-commission period. The mean biomass were very low (from 0.8 to 3.7 g m^{-2}) in both seasons due to no dominance of large body-sized species. Although polychaete *Sternaspis scutata* was dominant in Feb. 2016, it was small in size and would not contribute in increasing biomass.

Flushing water intake points

6.7.9 For station WSD1, the mean species number increased from dry to wet season (from 20 to 31 spp. 0.5 m^{-2}) while the mean density (126-132 ind. m^{-2}) and *J* (0.9) remained similar in the pre-commission period. Increased mean species number leaded to higher mean *H*' (from 2.5 to 3.2) in wet season. Since every taxon was quite even in abundance, no abundant species could be determined except that in November 2012 (pea crab *Xenophthalmus pinnotheroides*: 56 ind. m^{-2}; polychaete *Eunice indica*: 44 ind. m^{-2}). The cease of these two dominant species accounted for the decreased mean biomasses (from 84.9 to 20.6 g m^{-2}) in the following sampling months (Jan., May & Jul. 2013).

6.7.10 In the post-commission period, the mean species numbers were at low to moderate level (23-26 spp. 0.5 m^{-2}) in two seasons. There were slight increases of mean density (147-225 ind. m^{-2}) relative to the pre-commission period. Every taxon was low and similar in density, resulting in high mean *J* (0.9). Overall the mean *H*' (2.5-2.8) remained at moderate level. There were generally lower mean biomasses (1.6-5.7 g m^{-2}) due to cease of previously dominant pea crab *Xenophthalmus pinnotheroides* as mentioned. The polychaete *Eunice indica* was once abundant (22 ind. m^{-2}) in Nov. 2015 similar to the Nov. 2012 survey of pre-commission period. Again it was no longer dominant in the next sampling months (Feb. & May 2016).

6.7.11 For station WSD2, the mean species numbers were similar in two seasons (11-16 spp. 0.5 m^{-2}) in the pre-commission period. But the mean density (171-70 ind. m^{-2}) and biomass (69.7-4.6 g m^{-2}) decreased clearly from dry to wet season, caused by the variable abundance of pea crab *Xenophthalmus pinnotheroides* (228 ind. m^{-2} in dry season; 28 ind. m^{-2} in wet season). In general, the mean *H*' (1.5-1.9) and *J* (0.7-0.9) were similar and remained at low to moderate level between two seasons.

6.7.12 In the post-commission period, the mean species numbers (25-34 spp. 0.5 m^{-2}), densities (232-241 ind. m^{-2}), *H*' (2.6-2.7) and *J* (0.8-0.9) were higher than that of pre-commission period. Such increases were due to higher records in Feb. and May 2016. No clear difference was noticed between two seasons. Polychaete *Eunice indica* (132 ind. m^{-2}) was the abundant species in Nov. 2015. Its size was much lower than the previously dominant

pea crab *Xenophthalmus pinnotheroides*. It accounted for lower mean biomasses (0.9-4.6 g m^{-2}) in the post-commission period. This polychaete species was no longer dominant in the next sampling months (Feb. & May 2016).

Secondary contact recreation subzone

6.7.13 For station U2, there was no clear change of the biological parameters in the pre-commission period. The mean species numbers (18 spp. 0.5 m^{-2}), densities (73-75 ind. m^{-2}) and biomasses (15.7-20.0 g m^{-2}) remained at low to moderate value in both seasons. Also the *H*' (2.4-2.5) and *J* (0.8-0.9) remained at moderate level. The overall commonly occuring species was pea crab *Xenophthalmus pinnotheroides* at low densities (22-40 ind. m^{-2}) which was no longer abundant in the post-commission period.

6.7.14 In the post-commission period, there were much higher mean species numbers (33-43 spp. 0.5 m^{-2}) and densities (555-615 ind. m^{-2}) in both seasons relative to that of pre-commission period. There were also slight increases of mean *H*' (2.6-3.1) and biomasses (22.5-24.2 g m^{-2}). Such increases were due to higher records in Feb. and May 2016. From Aug. 2015 to Feb. 2016, there was no abundant species while every taxon was even in distribution. In Aug. 2016, bivalve *Ruditapes philippinarum* was abundant (312 ind. m^{-2}). Overall the mean *J* remained high (0.8-0.9) in the both seasons of post-commission period. Besides the abundant bivalve species was very small in body size, it would not increase the mean biomass clearly.

Control stations

6.7.15 For station NM1, the mean species numbers were similar (27-30 spp. 0.5 m^{-2}) between the dry and wet seasons of the pre-commission period. But the mean density (from 490 to 269 ind. m^{-2}) and biomass (from 60.9 to 27.5 g m^{-2}) decreased from dry to wet season. Since the taxa were more even in abundances relatively, the mean *H*' (from 1.8 to 2.6) and *J* (from 0.6 to 0.8) increased in the wet season. The declined density was mainly accounted by variable abundance of dominant pea crab *Xenophthalmus pinnotheroides*.

6.7.16 In the post-commission period, there were much higher mean species numbers (41-44 spp. 0.5m^{-2}) in both seasons. The mean density (374 ind. m^{-2}) and biomass (68.5 g m^{-2}) of dry season were higher than that of wet season (density: 238 ind. m^{-2}; biomass 18.0 g m^{-2}) similar to the results of pre-commission period. The previously abundant pea crab *Xenophthalmus pinnotheroides* decreased much in abundance in Aug. 2015 (32 ind. m^{-2}) and even ceased in the next sampling months (Nov. 2015, Feb. & May. 2016). Hence the species distribution became more even, resulting in high *J* values (0.9) in both seasons. Overall the mean *H*' (3.1-3.3) was much higher than that of pre-commission period.

6.7.17 For station NM6, the species number, density and biomass varied much among the sampling months during the pre-commission period. Overall the mean species numbers (21-23 spp. 0.5m^{-2}), densities (147-189 ind. m^{-2}) and *H*' (2.1-2.4) were similar between two seasons. The mean biomass increased (from 14.6 to 43.6 g m^{-2}) but the J decreased (from 0.9 to 0.7) from dry to wet season. The changes were mainly due to the variable abundance of pea crab *Xenophthalmus pinnotheroides*. In general the species compositions varied that no consistent abundant species was determined.

6.7.18 In the post-commission period, there were much higher species numbers (48-49 spp. 0.5 m^{-2}) and densities (551-736 ind. m^{-2}) in both seasons. The dominance of brittle star *Amphioplus depressus* (88-134 ind. m^{-2}) in Aug. and Nov. 2015 leaded to moderate *J* (0.7-0.8) in both seasons. Overall there were slight increases of mean *H*' (2.7-3.0) in both

seasons. Since the previously dominant pea crab *Xenophthalmus pinnotheroides* was replaced by smaller body-sized brittle star *Amphioplus depressus*, lower mean biomasses (13.6 to 17.9 g m^{-2}) were resulted in both seasons relative to the pre-commission period.

6.8 Impact Evaluation of the Upgraded Pillar Point Sewage Treatment Works

6.8.1 During the pre-commission period, there were higher variations of species number, total abundance and species composition at stations B1, B6, WSD1, WSD2, NM1 and NM6. Based on similar sediment condition and relatively stable *H*' and *J*, the variations would not be caused by the changes of environmental condition. It was believed that the distribution of benthic communities were in patchy pattern at small spatial scale at these stations. The result differences were due to variation of grab sampling location.

6.8.2 Pea crab *Xenophthalmus pinnotheroides* was the dominant species in the survey area during pre-commission period. According to other previous benthic surveys, this crab species was reported commonly occurring in Hong Kong waters in variable densities (2-310 ind. / m^2). No correlation could be observed between its abundance and pollution. Since low densities (<10 ind / m^2) of this species were reported in both polluted waters (e.g. Causeway Bay and Yau Tong Bay) and unpolluted waters (e.g. Tung Lung Chau and Shek O Quarry). In general, it was found more abundant in North Western WCZ (e.g. Lung Kwu Sheung Tan, Tai Lam Kok and Tsing Chau Wan). It might indicate this species preferred waters of higher organic detritus but lower salinity due to influx of Pearl River. Relatively pea crab *Xenophthalmus pinnotheroides* was also reported a common species in the estuarial region of Changjiang River (Yangtze River) [Ref.#14]. In the post-commission period, this pea crab species decreased much in abundance and even ceased at several stations. It reflected that it was an opportunistic, short-lived and motile animal.

6.8.3 During the post-commission period, there were higher species number and density at all monitoring stations except WSD1. It was believed that large spatial-scaled, seasonal recruitment had occurred in the survey area (i.e. North-western WCZ) between Nov. 2015 and Feb. 2016. Since there were similar increases at the two control stations (NM1 and NM6) where would not be influenced by the discharged effluent of PPSTW, the positive effect of the upgraded PPSTW was not obvious in this monitoring programme. Besides some taxa were once abundant at 1-2 stations such as amphipod *Ampelisca* sp., brittle star *Amphioplus depressus*, bivalve *Ruditapes philippinarum* and polychaetes *Sternaspis scutata* and *Eunice indica*. These taxa were generally motile and short in life cycle that their dominance would not persist for a long period. Or its dominance would be replaced by other species through natural succession. Hence the changes of dominance species would not reflect the change of environmental condition.

6.9 Impact of the upgraded Pillar Point Sewage Treatment Works

6.9.1 Across the whole monitoring period, the biological parameters and species composition of benthic communities showed natural, seasonal fluctuations. No significant impact was detected between the pre-commission and post-commission periods of PPSTW.

14. Li B., Li X. , Wang H., Wang Y., Wang J., Zhang B., 2007. Characters of a macrobenthic community off the Changjiang River Estuary. Institute of Oceanology, Chinese Academy of Sciences.

7 PPWQM Sediment Quality Monitoring

7.1 Monitoring Methodology and Parameters

7.1.1 In accordance with Section 3.4.1.1 of the final EM&A Manual, PPWQM programme shall be implemented during first year of the Operation Phase of the upgraded PPSTW.

7.1.2 Para 1.4.1 of Appendix E of the approved EM&A Manual stated that sediment quality monitoring should be performed four times over the field work period of one year to give adequate coverage of different tidal states during both wet and dry seasons.

7.1.3 The operation of Upgraded PPSTW is scheduled to commence in 15 August 2015, hence the one year operation phase monitoring period shall run from 15 August 2015 to 14 August 2016. The first wet season and dry season operation phase sediment quality monitoring were completed on 15 August 2015 and 15 November 2015 respectively. The second dry season sediment quality monitoring was completed on 21 February 2016, and the second wet season operation phase sediment quality monitoring was carried out on 15 May 2016.

7.1.4 ***Table 7-1*** summarizes the monitoring parameters agreed with the DEP and reference measurement methods.

Table 7-1 Sediment Quality Monitoring Parameters and Measurement Methods

Parameter	Method Reference / Technique [15]
Percentage of Silt/ Clay	BS 1377
pH Value	APHA 4500H: B
Acid Volatile Sulphide (AVS)	Allen H.E. et al , 1991
Total Volatile Solids (TVS)	APHA 2540 G
Total Organic Carbon (TOC)	APHA 5310 B
Ammonia (NH_4-N)	APHA 4500NH3: B&C
Total Nitrogen	APHA 4500Norg: D APHA 4500NO3: I
Total Phosphorus	APHA 4500P: B&H
Aluminium, Arsenic, Barium, Boron, Cadmium, Copper, Chromium, Lead, Manganese, Nickel, Silver, Vanadium, Zinc	USEPA 6020A
Iron	USEPA 6010A
Mercury	APHA 3112B

7.1.5 All laboratory analysis was carried out by ALS Technichem (HK) Pty Limited, which is a HOKLAS accredited laboratory.

15 .The proposal included the sampling locations and analysis of sediment samples to be conducted were endorsed by IEC on 16 November 2012 and approved by EPD on 5 March 2013.

7.1.6 Samples were stored in appropriate containers provided in advance by the testing laboratory. The containers were immediately sealed and labelled. Sample ID and sampling date were marked on each sample. The samples were then stored in insulated containers with ice packs to maintain a dark and below 4°C condition without freezing. All collected samples were collected by the testing laboratory within 24 hours of sampling.

7.2 Monitoring Stations

7.2.1 As agreed with the DEP, the sediment quality monitoring were carried out at the same 11 monitoring stations as for water quality monitoring, as shown in ***Table 5-2*** and in ***Figure 5-1***.

7.2.2 During the sediment sampling, slight adjustments to the location of seven of the monitoring stations were necessary due to shallow water near the shore that made the original locations inaccessible by the sampling vessel. The revised co-ordinates of the seven monitoring stations (B1, B3 to B6, WSD1 and U2) are provided in ***Appendix E*** for reference. As far as reasonably practicable, the relocated sampling points were chosen at the closest possible locations from the original locations. The relocated stations were 73 to 341m from the original co-ordinates with similar water depth (difference <1.0m). Hence the sediment quality monitoring data can be aligned with the water quality data.

7.3 Monitoring Equipment

7.3.1 A 0.1m^2 van Veen grab, same as the equipment used for benthic survey in ***Section 6.3*** was used for sample collection.

7.4 Action and Limit Levels

7.4.1 The Action and Limit Levels for the sediment quality monitoring was established by using the baseline sediment monitoring data which were gathered before commissioning of the upgraded PPSTW for each monitoring locations. The Action and Limit Levels are shown in ***Table 7-2***.

7.5 Monitoring Results and Observations

7.5.1 Sediment quality monitoring should be performed four times over the field work period of one year as per Para 1.4.1 of Appendix E of the approved EM&A Manual stipulated.

Table 7-2 Action and Limit Levels for Sediment Quality

Station ID	B1		B2		B3		B4		B5		B6		WSD1		WSD2		U2		NM1		NM6	
Monitoring Parameters	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level	Action Level	Limit Level
pH	7.8	7.8	7.8	7.8	7.8	7.8	8.0	8.0	7.9	7.9	8.1	8.1	8.1	8.1	8.0	8.0	8.1	8.1	8.1	8.1	8.1	8.1
Volatile Solids (%)	6.5	6.7	7.4	7.6	35.3	36.7	5.2	5.2	6.0	6.2	4.3	4.4	4.1	4.2	5.3	5.5	3.6	3.6	2.4	2.4	1.5	1.5
Acid Volatile Sulphides (mg/kg)	46	47	227	233	94	95	40	41	38	39	36	37	37	10	10	23	23	10	10	14	14	10
Ammonia (mg/kg)	10	10	20	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Nitrite + Nitrate (mg/kg)	0.5	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.2	0.2	0.2	0.2	0.4	0.4	1.0	1.0	0.2	0.2
Total Nitrogen (mg/kg)	1,090	1,098	1,237	1,239	1,236	1,239	999	1,000	968	970	843	849	590	590	680	688	657	667	631	638	435	439
Total Phosphorus (mg/kg)	551	554	603	605	631	633	526	528	533	537	439	442	324	324	373	374	459	459	362	364	448	458
Aluminium(mg/kg)	39,800	40,280	45,175	45,595	47,140	47,588	39,655	40,011	38,985	39,317	30,135	30,347	24,135	24,667	32,945	33,789	23,355	23,391	19,582	19,996	17,750	17,950
Boron(mg/kg)	31	31	35	35	33	33	26	26	26	26	21	21	20	20	25	26	23	23	24	24	13	13
Iron(mg/kg)	34,005	34,241	39,295	39,619	38,395	38,639	35,655	35,851	34,280	34,456	26,610	26,762	21,530	21,906	30,385	31,037	52,980	53,796	19,200	19,520	22,220	22,364
Mercury(mg/kg)	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Arsenic(mg/kg)	12	12	13	13	14	14	13	13	13	13	10	10	7	7	10	10	13	13	8	8	10	10
Barium(mg/kg)	49	49	56	57	56	56	46	46	45	45	36	36	30	30	65	66	30	31	35	36	23	24
Cadmium(mg/kg)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Chromium(mg/kg)	42	42	52	52	52	52	44	44	42	42	31	31	26	27	32	33	31	31	25	26	22	22
Copper(mg/kg)	40	40	81	81	65	65	49	49	45	45	32	32	25	26	54	56	26	26	24	25	13	13
Lead(mg/kg)	40	40	54	54	51	51	42	42	41	41	33	33	26	26	29	30	41	41	63	65	22	22
Manganese(mg/kg)	664	672	543	546	580	583	531	533	537	539	529	535	385	386	480	481	695	701	562	565	356	362
Nickel(mg/kg)	25	25	30	30	30	30	25	25	25	25	18	18	15	15	18	19	19	19	14	14	13	13
Silver(mg/kg)	0.5	0.5	0.7	0.7	0.7	0.7	0.5	0.5	0.6	0.6	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.1	0.1
Vanadium(mg/kg)	49	49	60	60	58	58	51	52	50	51	40	40	28	28	31	31	38	39	33	34	33	34
Zinc(mg/kg)	133	134	187	188	172	173	140	141	139	140	105	105	87	89	99	101	111	112	105	108	51	52
Total Organic Carbon(%)	1.08	1.09	1.44	1.44	1.26	1.27	0.97	0.97	1.09	1.10	0.82	0.83	0.81	0.83	1.19	1.22	0.94	0.96	1.01	1.02	0.44	0.45
Gravel (%)	10	10	0	0	0	0	1	1	1	1	9	9	22	22	16	17	3	3	33	34	10	10
Sand (%)	31	31	2	2	4	4	18	18	15	15	33	33	48	49	39	40	69	70	51	51	65	66
Silt (%)	37	37	63	63	61	61	57	58	57	57	39	39	24	24	43	44	34	35	18	19	26	27
Clay (%)	33	33	44	44	44	44	36	36	37	38	26	26	29	30	34	35	19	20	18	18	19	19

Note:

* Action Levels were derived based on 95 percentile of baseline data and 120% of upstream control station value on the same day shall also be used as the Action Level for assessment of the monitoring results.

** Limit Levels were derived based on 99 percentile of baseline data and 130% of upstream control station value on the same day shall also be used as the Limit Level for assessment of the monitoring results.

8 LANDSCAPE AND VISUAL MONITORING

8.1.1 In accordance with Section 5.4 of the final EM&A Manual, landscape and visual mitigation measures shall be monitored monthly during the first year of the Operational Phase to ensure the effectiveness of the mitigation measures. All measures undertaken by both the Contractor and their Landscape Contractor during the first year of the operational phase shall be audited by the registered landscape architect (RLA).

8.1.2 ERM Hong Kong Limited (ERM) has been commissioned to carry out the landscape and visual mitigation measures monitoring including the 12 months establishment period in the Operation Phase.

8.2 Monitoring Results and Recommendations

8.2.1 The landscape and visual monitoring was carried out on 14 June 2016. The Hong Kong Observatory's Tuen Mun Weather Station reported that the weather on the day of the patrol was sunny. The weather condition during the period is provided in ***Appendix G***.

8.2.2 The site inspection findings and recommendations made by the RLA are contained in the monthly Operational Phase Landscape & Visual Monitoring Report prepared by ERM is provided in ***Appendix H***. The findings and recommendations also summarised in ***Table 8-1***.

8.2.3 No non-compliance of the landscape and visual mitigation measures has been recorded in ERM's landscape and visual mitigation measures monitoring report.

Table 8-1 Summary of Site Audit Findings and Recommendations

Area of Works	Establishment Works Stage	
	Observation	**Recommendation/Action**
Issues Observed in this Audit		
Within Pillar Point Sewage Treatment Works	Trees in ground floor garden were observed in poor condition below: Tree 390 was observed fungi on the tree trunk; Trees T001, T002, T221, T207, T208 and T209 were observed few leaf to be poor condition; Trees 128, 129, 131, 133-135, N84, R156 and R157 were observed collapsed/ poor form or and poor health condition;	It is recommended to carry out maintenance works for the trees. T001, T002, T221, T207, T208, T209 and 390. The Contractor had submitted the tree felling proposal for trees N84, 128, 129, 131, 133-135, R156 and R157. Trees will be replaced after it is approved.
Within Pillar Point Sewage Treatment Works	Construction materials were observed in tree protection zone during this site inspection.	It is recommended to remove the construction materials in tree protection zone.
Within Pillar Point Sewage Treatment Works	Groundcover and lawn were observed in poor condition during this site inspection	It is strongly recommended to provide sufficient watering and carry out necessary maintenance works for the groundcover and lawn after manhole construction.

9 ECOTOXICOLOGICAL ASSESSMENT

9.1 Assessment Methodology

9.1.1 In accordance with Section 3.4.1.1 of the final EM&A Manual, PPWQM programme shall be implemented during first year of the Operation Phase of the upgraded PPSTW. Ecotoxicological Assessment shall be carried out as part of PPWQM programme during the first year of operation phase of the upgraded PPSTW.

9.1.2 Para 1.6.1 of Appendix E of the approved EM&A Manual stated that Ecotoxicological Assessment shall be carried out to determine the toxicity of the treated effluent and the toxicity of the receiving marine water.

9.1.3 An Ecotoxicological Assessment Programme with detailed requirements for conducting Whole Effluent Toxicity Test (WETT) was submitted and approved by the Director of Environmental Protection.

9.1.4 As the hydrodynamic conditions change between wet and dry seasons, each WETT is proposed to be conducted once during wet season and once during dry season in the first year after project commencement. Furthermore, the three (3) WETTs may be conducted separately as test species may not be available at the same time. Effluent sample collection for the dry season WETT and wet season WETT were carried out on 3 to 4 February 2016 and 19 to 20 May 2016 respectively.

9.2 Whole Effluent Toxicity Test (WETT)

9.2.1 WETT was conducted to determine the whole effluent toxicity of UV disinfected CEPT effluent from Pillar Point Sewage Treatment Works for the following three (3) species:

- Dinoflagellate (*Prorocentrum dentatum*), with 7-days growth inhibition test
- Barnacle Larvae (*Balanus amphitrite*), with 4-days settlement test
- Fish (*Oryzias melastigma*), with 14-days survival and growth test

9.2.2 The toxicity tests for barnacle larvae, fish and algae are to determine the chronic toxicity of the effluents to the species via percentage of successful metamorphosis, growth measurements and cell density measurements respectively.

9.2.3 The WETT followed the protocol agreed and adopted in previous study that aimed to establish fisheries and marine ecological criteria appropriate to local marine biota and fisheries resources (Centre for Coastal Pollution and Conservation (CCP&C), 2001). The species proposed in this WETT are based on their availability according to the PPWQM timeline, of which are considered as the “representative local species” of great ecological and fisheries significance.

Effluent Sample Collection

9.2.4 Effluent sample collection for dry season WETT and wet season WETT were conducted on 3 to 4 February 2016 and 19 to 20 May 2016 respectively, in conjunction with the

effluent sampling. Sampling location and procedures shall follow the effluent monitoring programme as specified in the PPWQM Programme. The effluent sampling was planned to ensure adequate volume was collected in order to prepare sufficient amount of flow-weighted composite sample for WETT. The effluent samples was kept in sterilized containers and transported to the laboratory using a chilled vehicle. WETT commenced within 36 hours from sample collection.

Dilution Seawater Collection

9.2.5 Dilution seawater used for WETT was collected from Clear Water Bay, Sai Kung. The site is away from any effluent discharge and is free from toxicity and other contamination. It is also far from areas of agricultural runoff, storm sewers or other potential point source contaminations.

9.2.6 The collected seawater was filtered and stored in a fibre tank and circulated through a UV sterilization system for more than 24 hours. Autoclave sterilization was completed at 120°C at least fifteen (15) minutes before use.

9.2.7 The salinity was adjusted to 30% with artificial sea salt or distilled water if necessary.

Test Methodology and Procedures

9.2.8 The WETT methodology and procedures followed the *Standard Operating Procedures for Whole Effluent Toxicity Test (SOP for WETT)* developed by the Environmental Protection Department (EPD) for the proposed species issued in February 2009. The test consisted of five effluent concentrations and the WETT results will be used to derive the inhibition concentration (IC), No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) to determine whether toxicity of the effluent has exceeded the target toxicity level.

9.2.9 At least three (3) replicates of each control and effluent concentration were tested such that parametric and non-parametric statistical tests can be performed for each set of data.

Reference Toxicant Testing

9.2.10 Cadmium (Cd^{2+}) was used as the reference toxicant. Five (5) concentrations spanning over the effective concentration range were selected for testing. The concentration range covered at least one IC below and one IC above the intended IC. In addition, to facilitate regression analysis, at least two levels of inhibition between 10% and 90% were included.

9.2.11 Five (5) replicates for each reference toxicant concentration was made and dose-response curves will be constructed based on the findings to calculate LOEC, NOEC and IC.

9.2.12 An additional effluent sample was retained. Should the effluent toxicity level exceed the target, the sample will be further analyzed for contaminants as listed in ***Table 9.1***.

Table 9-1 List of Contaminants and Analytical Methods to be Applied

Determinant	Suggested Method	Suggested Detection Limit (ug/L)
Aluminium	USEPA 200.7	1
Antimony		1
Arsenic		1
Barium		1
Chromium III		1
Copper		1
Lead		1
Mercury		0.1
Nickel		1
Selenium		1
Silver		1
Tin		1
Vanadium		1
Zinc		1
Ammonia	APHA 4500NH: G	10
Sulphide	APHA 20e 4500-S^{2-}	10
TCDD	USEPA 1613	1 TEQ pg/L
Toluene	USEPA 1624	10
Diazinon	USEPA 1657	0.01
Malathion	USEPA 1657	0.01
Sulphide	APHA 17ed 4500-S^{2-}	0.01
Suspended Solids	APHA 17ed 2540D	2

9.2.13 The suggested detection limit is based on local/international authority approved standard.

Data Collection and Analysis

9.2.14 All raw data including water quality measurements, cell counts, fish sizes and mortality was recorded on data sheets. Formal statistical analysis of raw data will be performed in accordance with the flowchart in Figure 5.1 in the SOP for each respective species.

Target Toxicity Level

9.2.15 The target toxicity level is derived from the dilution potential of the receiving water body. The effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life if chronic toxicity at edge of mixing zone (EMZ) is < 1.0 chronic toxicity unit (TU_c). Based on these two conditions, the target chronic toxicity level shall be determined in a supplemental far-field modeling study to derive the average dilution factor (DF) at the edge of the mixing zone. The target chronic toxicity level can be determined as follows:

$$NOEC_{TARGET} = \frac{100}{DF_{EMZ} \times TU_c}$$

9.2.16 A water quality and plume dispersion modelling study is being carried out as part of the Post-Project Water Quality Monitoring Programme and chronic toxicity levels will be established based on the far-field dilution factor to be established by the model prior to the WETT. The target toxicity levels are summarized in ***Table 9.2***.

Table 9-2 Target Toxicity Levels of PPSTW Effluent

Effluent Characteristics	Dilution Factor		Target Level	
Chronic Toxicity	Wet Season	Dry Season	Wet Season	Dry Season
NOEC in 7-day algae growth inhibition test	451[Note 1]	504[Note 1]	≥22.2%	≥19.8%
NOEC in 4-day barnacle larvae settlement test				
NOEC in 14-day fish survival and growth test				

Note:
1. Dilution factor was generated from the plume dispersion modelling.

9.2.17 In the event that the results exceed the target toxicity levels, further investigation shall be carried out to identify specific pollutants that contributed to the toxicity, including:

- Sample analysis collected from testing chambers at the beginning and the end of WETT for contaminants as shown in Table 1.1;
- Review the data collected in the effluent quality testing and identify the pollutants that may contribute to the observed toxicity;
- Re-test the species that exceeded the target level toxicity; and
- Should the re-test results indicate persistent pollution, advise operators to implement measures to reduce contaminant concentrations in the effluent

Quality Assurance / Quality Control (QA/QC)

9.2.18 The QA/QC measures shall refer to the QA/QC section from the SOP for each respective species such that the acceptability criteria is met, as shown in ***Table 1.3***:

Table 9-3 Test Acceptability Criteria

Fish	Barnacle Larvae	Algae
• The average survival of fish in the control > 85%, AND • Significant change in body weight and/or body length is observable.	• Mean % settlement in the seawater control is greater than 50%	• The control cell density shall have increased by a factor >16 in 7 days, AND • The level of variability between control replicates (i.e. coefficient of variation) is <20%

9.2.19 Should the test results in the controls do not meet the acceptability criteria, the validity of WETT data should be evaluated and test to be re-performed if required.

9.3 Monitoring Results

7-Day Algae Growth Inhibition Test

9.3.1 Toxicity of the effluent sample was determined based on a 7 days algae growth inhibition test using *Prorocentrum dentatum* as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. *Prorocentrum dentatum* was exposed to effluent test samples of five different concentrations for a 7 days test period. The toxicity of the sample was determined based on cell density and specific growth rate.

9.3.2 A summary of test result for the 7-Day Algae Growth Inhibition Test is provided in ***Table 9-4***.

Table 9-4 Summary of 7-Days Algae Growth Inhibition Test Results

Test Concentration (%)	Day 7 Percentage Inhibition of Growth Rate (%)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	-0.8	0.00	No
	0.8		
	0.0		
6.25	-2.4	-0.73	No
	0.9		
	-0.7		
12.5	-1.7	-2.77	No
	-5.4		
	-1.2		
25	-1.5	-0.10	No
	1.3		
	-0.1		
50	45.1	46.03	Yes
	47.1		
	45.9		
100	69.4	71.93	Yes
	69.1		
	77.3		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration(LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	55.4% (58.1%, 52.4%)		

9.3.3 The NOEC for the dry season effluent sample was found to be 25% based on a 7-days algae growth inhibition test, which is higher than the targeted wet season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.4 The growth curve of *Prorocentrum dentatum* in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix J***.

4-Day Barnacle Larvae Settlement Test

9.3.5 Toxicity of the effluent sample was determined based on a 4-day barnacle larvae settlement test using *Balanus Amphitrite* cypris Larvae as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. *Balanus Amphitrite* cypris Larvae was exposed to effluent test samples of five different concentrations for a 4 days test period. The toxicity of the sample was determined based on the settlement ability of the barnacle larvae.

9.3.6 A summary of test result for the 4-Days Barnacle Larvae Settlement Test is provided in ***Table 9-5***.

Table 9-5 Summary of 4-Days Barnacle Larvae Settlement Test Results

Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	80	80.0	No
	75		
	85		
6.25	75	78.3	No
	80		
	80		
12.5	85	76.7	No
	75		
	70		
25	90	83.3	No
	80		
	80		
50	60	60.0	Yes
	55		
	65		
100	15	13.3	Yes
	15		
	10		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration(LOEC)	50%		

Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate	Mean	Significant Different (p<0.05) from Negative Control
EC50 (Upper, Lower Confidence Level)	67.3% (72.8%, 58.9%)		

9.3.7 The NOEC for the wet season effluent sample was found to be 25% based a 4-day barnacle larvae settlement test, which is higher than the targeted wet season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.8 The growth curve of *Barnacle (Balanus Amphitrite)* Cypris Larvae in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix J***.

14-Day Fish Survival and Growth Test

9.3.9 Toxicity of the effluent sample was determined based on a 14 days fish survival and growth test using Marine Medaka *(Oryzias melastigma)* as the testing specie. The test was carried out in accordance with WETT Standard Operation Procedure (2009) published by the EPD. Marine Medaka *(Oryzias melastigma)* was exposed to effluent test samples of five different concentrations for a 14 days test period. The toxicity of the sample was determined based on fish survival and growth rate.

9.3.10 A summary of test result for the 14-Day Fish Survival and Growth Test is provided in ***Table 9-6*** and ***Table 9-7***.

Table 9-6 Summary of 14-Day Fish Survival Test Results

Test Concentration (%)	Replicate	Survival (%)	Mortality (%)
0 (Negative Control)	1	100	0
	2	100	0
	3	100	0
6.25	1	100	0
	2	100	0
	3	100	0
12.5	1	100	0
	2	100	0
	3	100	0
25	1	100	0
	2	100	0
	3	100	0
50	1	100	0
	2	100	0
	3	100	0
100	1	100	0

Test Concentration (%)	Replicate	Survival (%)	Mortality (%)
	2	100	0
	3	100	0

Table 9-7 Summary of 14-Day Fish Growth Test Results

Test Concentration (%)	Average Growth Rate (%)		
	Replicate Results	Mean	Significant Different (p<0.05) from Negative Control
0 (Negative Control)	180.7	186.4	No
	179.4		
	199.1		
6.25	167.5	178.8	No
	191.8		
	177.0		
12.5	180.6	177.9	No
	164.6		
	188.4		
25	187.9	189.5	No
	191.6		
	188.8		
50	162.6	175.4	No
	199.1		
	164.3		
100	117.2	116.6	Yes
	117.0		
	115.6		
No Observable Effect Concentration (NOEC)	50%		
Lowest Observed Effect Concentration(LOEC)	100%		
EC50	>100%		
EC25 (Upper, Lower Confidence Level)	76.3% (86.2%, 54.4%)		

9.3.11 The NOEC for the wet season effluent sample was found to be 50% based on the 14 days fish survival and growth test, which is higher than the targeted wet season NOEC of 22.2%. This implies that the chronic toxicity unit of effluent from PPSTW is less than one and it is considered not inducing unacceptable toxicity to aquatic life.

9.3.12 The growth curve of Marine Medaka *(Oryzias melastigma)* in various concentrations of effluent samples and growth rate curve against various concentrations of control are provided in ***Appendix J.***

10 CONCLUSION

10.1.1 In accordance with the EM&A Manual for the Upgrading of PPSTW, operation phase monitoring report is required on a monthly basis after the Project commissioning. The purpose of the operation phase monitoring report is to confirm the predictions of odour and water quality made in the EIA report and also ensure the effectiveness of the landscape and visual mitigation measure.

10.1.2 This is the 11th Monthly Operation Phase Monitoring Report which summarizes all environmental monitoring events carried out during post-commissioning period from 1 to 30 June 2016. A total of three monitoring events were carried out during the reporting period.

10.1.3 The exact dates of monitoring carried out are shown in ***Table 10-1***, below:

Table 10-1 Monitoring Dates during the Reporting Month

Monitoring Events	11th Reporting Month Monitoring Period: 1 – 30 June 2016
Odour Monitoring	20/6/2016
H_2S Monitoring	1/6/2016 - 30/6/2016 (continuous monitoring)
Landscape and Visual Monitoring	14/6/2016

10.1.4 The monitoring results carried out in reporting period were certified by the Environmental Team (ET) Leader and verified by the Independent Environmental Checker (IEC) in accordance with the EM&A Manual.

10.1.5 All laboratory results satisfied the QA/QC requirements and all monitoring equipment was properly calibrated and has valid calibration certificates.

10.1.6 No exceedance of Action and Limit Level of odour monitoring was recorded at the monitoring location in the reporting month.

10.1.7 No exceedance of Action and Limit Level of odour emission monitoring was recorded at the monitoring location in the reporting month.

10.1.8 No significant impact was detected between the pre-commission and post-commission periods of PPSTW from the benthic survey monitoring results.

10.1.9 The ecotoxicological assessment results for effluent sample collected during wet season indicated that the effluent from PPSTW is considered not inducing unacceptable toxicity to aquatic life.

10.1.10 No non-compliance of the landscape and visual monitoring has been recorded in the reporting month.

10.1.11 No environmental complaint was reported during the reporting month.

10.1.12 The ET will keep track on the EM&A programme to ensure the compliance of environmental requirements and the proper implementation of all necessary mitigation measures.

APPENDIX A

Nose Sensory Test Report

SMEC ASIA LIMITED

REPORT ON
NOSE SENSORY TEST

(Project No. : 4101-10002276 #039)

Environmental Management Division
Hong Kong Productivity Council

Quality Index

Date	Reference No.	Prepared by	Endorsed by
16 May 2016	10002276#039v1	KW Poon	CHAU Kam Man, Grant

1. COMPANY NAME AND NAME OF PANELISTS

Company name : SMEC Asia Limited
Name of panelists : (1) Cheung Man Kit
(2) Kong Wing Man, Samantha

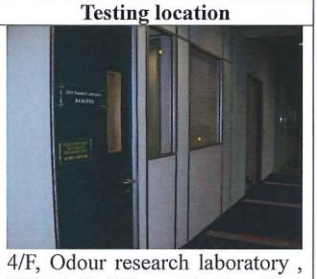
2. OBJECTIVE

The objective of this study was to have a nose sensory test for SMEC Asia limited staff, Cheung Man Kit and Kong Wing Man (Samantha), and report them if they are to be "certified panelists" according to the British Standard Method BS EN13725:2003.

3. TESTING DATES AND LOCATION

The dates of testing and testing location are summarized in Table 1:

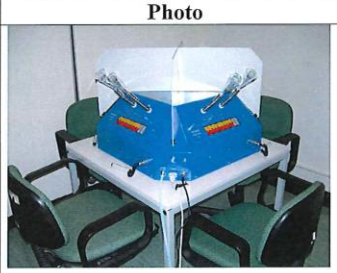
Table 1: Name of panelist, testing dates and testing location

Name of panelist	Testing Dates	Testing location
Cheung Man Kit (Re-certified)	26 April 2016	 4/F, Odour research laboratory , HKPC Building, 78 Tat Chee Avenue, Kowloon
Kong Wing Man, Samantha	(1) 18 April 2016 (2) 21 April 2016 (3) 26 April 2016	

4. METHODOLOGY OF MEASUREMENT

The methodology of the nose sensory test was listed in Table 2:

Table 2: Methodology of the nose sensory test

Description	Methodology	Photo
Nose sensory test	BS EN13725:2003:- (1) Odour concentration measurement (60 ppm n-butanol): Dynamic olfactometer (Model TO9, Ecoma) (2) Force choice method	 Olfactometer (Model TO9, Ecoma)

5. RESULTS OF THE TEST

Certified 60ppm/v standard n-butanol gas was applied as reference material and the n-butanol thresholds in the range of 20 to 80 ppb/v (accordance with BS EN13725:2003) was determined as follows (Table 3):-

Table 3: Nose sensory test results

Odour panelist	Repeatability (Requirement: Repeatability ≤ 2.3)	Accuracy (Requirement: 20 ≤ Accuracy ≤ 80)	Pass/ Fail
Cheung Man Kit	2.25	75.08	Pass
Kong Wing Man, Samantha	1.40	51.01	Pass

*The requirements followed BS EN13725:2003.

6. DISCUSSION

Referring to the nose sensory test results, the following findings could be summarized:

a. Both Cheung Man Kit and Kong Wing Man, Samantha of SMEC Asia Limited passed the repeatability and accuracy requirement of nose sensory test according to British standard method BS EN13725:2003.

b. Both Cheung Man Kit and Kong Wing Man, Samantha of SMEC Asia Limited are certified panelists with effective from 26 April 2016 to 25 April 2017.

7. LIMITATION OF MEASUREMENT

The results obtained in this test are only representative of the nose sensory system at the specific time. The result should not be extrapolated to other conditions without caution. Please refer to code of behavior of BS EN13725:2003 for the details.

Environmental Management Division
Hong Kong Productivity Council

16 May 2016

APPENDIX B

Odour Monitoring Results and Field Record Sheet

Summary of Odour Intensity (OI) at Each Monitoring Location

Date	Period	ID	Location	Time	Wind Direction	Wind Speed (m/s)	Odour Intensity		Odour Characteristics
							Panellist 1	Panellist 2	
20-June-16	Daytime (14:46-15:42)	A1	River Trade Terminal Office	14:58	NE	0.8	0	0	-
		A2	Chu Kong Warehouse 1	14:54	SW	1.0	0	0	-
		A3	Chu Kong Warehouse 2	14:53	SW	1.3	0	0	-
		A4	Wai Sang Sawmill Ltd.	14:55	SW	1.5	0	0	-
		A5	Pillar Point Fire Station	14:46	SW	1.2	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	15:04	N	0.3	0	0	-
		A7	EMSD Servicing Vehicle Station	15:19	NE	2.3	0	0	-
		S1	Northern Site Boundary	15:24	E	0.3	0	0	-
		S2	Eastern Site Boundary	15:29	E	0.7	0	0	-
		S3	Southern Site Boundary	15:39	W	0.9	0	0	-
		S4	Western Site Boundary	15:42	W	0.1	0	0	-
20-June-16	Evening (17:00-17:28)	A1	River Trade Terminal Office	17:00	NE	1.2	0	0	-
		A2	Chu Kong Warehouse 1	17:05	SW	0.8	0	0	-
		A3	Chu Kong Warehouse 2	17:04	SW	1.1	0	0	-
		A4	Wai Sang Sawmill Ltd.	17:06	SW	1.4	0	0	-
		A5	Pillar Point Fire Station	17:02	SW	0.9	0	0	-
		A6	Sunhing Hung Kai Tuen Mun Godown	17:09	N	0.6	0	0	-
		A7	EMSD Servicing Vehicle Station	17:16	NE	1.6	0	0	-
		S1	Northern Site Boundary	17:20	E	0.9	0	0	-
		S2	Eastern Site Boundary	17:22	E	0.4	0	0	-
		S3	Southern Site Boundary	17:25	W	0.2	0	0	-
		S4	Western Site Boundary	17:28	W	0.1	0	0	-

Upgrading of Pillar Point STW - Investigation, Design and Construction
Operation Period EM&A - Odour Patrol Record Sheet

Date	20/06/2016
HKO Monitoring Location	Tuen Mun
Weather	Fine
Temperature	34.1°C
Humidity	66%

Odour Intensity (OI)
- 0- Not detected and an odour so weak that it cannot be easily characterized and described.
- 1- Slight identifiable odour and slight chance to have odour nuisance.
- 2- Moderate identifiable and moderate chance to have odour nuisance.
- 3- Strong identifiable, likely to have odour nuisance.
- 4- Extreme severe odour and unacceptable odur level.

ID	Location	Daytime Period: -					Evening Period: -				
		Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics	Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics
A1	River Trade Terminal Office	14:58	NE	0.8	0	/	17:40	NE	1.2	0	/
A2	Chu Kong Warehouse 1	14:54	SW	1.0	0	/	17:05	SW	0.8	0	/
A3	Chu Kong Warehouse 2	14:53	SW	1.3	0	/	17:04	SW	1.1	0	/
A4	Wai Sang Sawmill Ltd.	14:55	SW	1.5	0	/	17:06	SW	1.4	0	/
A5	Pillar Point Fire Station	14:46	SW	1.2	0	/	17:02	SW	0.9	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	15:04	N	0.3	0	/	17:09	N	0.6	0	/
A7	EMSD Servicing Vehicle Station	15:19	NE	2.3	0	/	17:16	NE	1.6	0	/
S1	Northern Site Boundary	15:24	E	0.3	0	/	17:20	E	0.9	0	/
S2	Eastern Site Boundary	15:29	E	0.7	0	/	17:22	E	0.4	0	/
S3	Southern Site Boundary	15:34	W	0.9	0	/	17:25	W	0.2	0	/
S4	Western Site Boundary	15:42	W	0.1	0	/	17:28	W	0.1	0	/

I declare that the below requirements as listed in Clauses 2.3.1.9 and 2.7 of the final EM&A Manual are complied with:
- passing the nose sensory test;
- being free from any respiratory illnesses;
- no smoking, eating, drinking (except water) or using chewing gum or sweets 30 min before and during odour intensity analysis;
- taking great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics;
- no communication with each other about the results of our choices; and
- not normally working at or live in the areas in the vicinity of PPSTW.

	Name	Signature	Date
Recorded By:	Man Cheung		20/6/2016
Checked By:	VIVIAN CHAN		23/6/16

707134 | Odour Patrol Record Sheet | Revision No. 1
z:\jobs\7076134 - atal - et for ppstw operation period\06 engineering\odour patrol record sheet r2.docx

Page 1 of 1

Upgrading of Pillar Point STW - Investigation, Design and Construction
Operation Period EM&A - Odour Patrol Record Sheet

Date	20/6/2016
HKO Monitoring Location	Tuen Mun
Weather	Fine
Temperature	34.1°C
Humidity	66%

Odour Intensity (OI)
- 0- Not detected and an odour so weak that it cannot be easily characterized and described.
- 1- Slight identifiable odour and slight chance to have odour nuisance.
- 2- Moderate identifiable and moderate chance to have odour nuisance.
- 3- Strong identifiable, likely to have odour nuisance.
- 4- Extreme severe odour and unacceptable odur level.

ID	Location	Daytime Period: -					Evening Period: -				
		Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics	Time	Wind Direction	Wind Speed (m/s)	OI	Odour Characteristics
A1	River Trade Terminal Office	14:58	NE	0.8	0	/	17:00	NE	1.2	0	/
A2	Chu Kong Warehouse 1	14:54	SW	1.0	0	/	17:05	SW	0.8	0	/
A3	Chu Kong Warehouse 2	14:53	SW	1.3	0	/	17:04	SW	1.1	0	/
A4	Wai Sang Sawmill Ltd.	14:55	SW	1.5	0	/	17:06	SW	1.4	0	/
A5	Pillar Point Fire Station	14:46	SW	1.2	0	/	17:02	SW	0.9	0	/
A6	Sunhing Hung Kai Tuen Mun Godown	15:04	N	0.3	0	/	17:09	N	0.6	0	/
A7	EMSD Servicing Vehicle Station	15:19	NE	2.5	0	/	17:16	NE	1.6	0	/
S1	Northern Site Boundary	15:24	E	0.3	0	/	17:20	E	0.9	0	/
S2	Eastern Site Boundary	15:29	E	0.7	0	/	17:22	E	0.4	0	/
S3	Southern Site Boundary	15:39	W	0.9	0	/	17:25	W	0.2	0	/
S4	Western Site Boundary	15:42	W	0.1	0	/	17:28	W	0.1	0	/

I declare that the below requirements as listed in Clauses 2.3.1.9 and 2.7 of the final EM&A Manual are complied with:
- passing the nose sensory test;
- being free from any respiratory illnesses;
- no smoking, eating, drinking (except water) or using chewing gum or sweets 30 min before and during odour intensity analysis;
- taking great care not to cause any interference with their own perception or that of others by lack of personal hygiene or the use of perfumes, deodorants, body lotions or cosmetics;
- no communication with each other about the results of our choices; and
- not normally working at or live in the areas in the vicinity of PPSTW.

	Name	Signature	Date
Recorded By:	Samantha Kong		20/6/2016
Checked By:	VIVIAN CHAN		23/6/16

707134 | Odour Patrol Record Sheet | Revision No. 1
z:\jobs\7076134 - atal - et for ppstw operation period\06 engineering\odour patrol record sheet r2.docx

Page 1 of 1

APPENDIX C

Monitoring Equipment Calibration Certificates

FIREMARK

Calibration Certificate

Number: CCS/65694

Customer: ATAL-Degremont Joint Venture
Contact Person: Mr. Gary Chan
System Model: "Crowcon" Gasmonitor Plus Control Panel
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector
Plant Address: DOUA at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8124	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8134A	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8141A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8141B	10	10	10ppm	Passed
7	H2S	0 to 10ppm	AE8107B	10	10	10ppm	Passed
9	H2S	0 to 10ppm	AE8107D	10	10	10ppm	Passed
10	H2S	0 to 10ppm	AE8107E	10	10	10ppm	Passed

Remarks: Instrument PASSED – fit for service.

Next calibration: 12th Jan 2017

Authorized Signature

Technical Department
13th Jan 2016

FireMark Hong Kong Limited
Flat A, 11/F., Hop Hing Industrial Building, 704 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong.
Tel : (852) 2751 8871 Fax : (852) 2751 880

FIREMARK

Calibration Certificate

Number: CCS/65695

Customer: ATAL-Degremont Joint Venture
Contact Person: Mr. Gary Chan
System Model: "Crowcon" Gasmonitor Plus Control Panel
Detector Model: "Crowcon" Xgard Type 1 H2S Gas Detector
Plant Address: DOB at DSD Pillar Point Sewage Treatment Works

Channel Number	Sensor Type	Measuring Range	Serial Number	Alarm 1	Alarm 2	Calibration Gas	Result
1	H2S	0 to 100ppm	AE8224	100	100	100ppm	Passed
2	H2S	0 to 50ppm	AE8234A	50	50	50ppm	Passed
3	H2S	0 to 50ppm	AE8234B	50	50	50ppm	Passed
4	H2S	0 to 10ppm	AE8241A	10	10	10ppm	Passed
5	H2S	0 to 10ppm	AE8241B	10	10	10ppm	Passed
6	H2S	0 to 10ppm	AE8207A	10	10	10ppm	Passed

Remarks: Instrument PASSED – fit for service.

Next calibration: 12th Jan 2017

Authorized Signature

Technical Department
13th Jan 2016

FireMark Hong Kong Limited
Flat A, 11/F., Hop Hing Industrial Building, 704 Castle Peak Road, Lai Chi Kok, Kowloon, Hong Kong.
Tel : (852) 2751 8871 Fax : (852) 2751 880

Remarks:

1. The sensor of channel number 1 is used for monitoring the H_2S emission level at inlet.
2. The sensor of channel number 4 and 5 are used for monitoring the H_2S emission level at outlet

Appendix D

Odour Emission Monitoring Result

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
6/1/2016	00:00:00-00:59:59	27.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	19.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	30.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	25.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	35.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	44.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	32.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	37.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	30.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	30.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	19.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	25.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	43.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	54.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	53.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	51.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	42.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	77.7	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	36.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	50.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	68.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	60.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	59.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	38.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
6/2/2016	00:00:00-00:59:59	62.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	34.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	31.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	28.2	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	12.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	14.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	30.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	14.4	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	41.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	40.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	100.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	36.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	37.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	52.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	50.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	57.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	16:00:00-16:59:59	53.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	60.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	83.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	63.4	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	62.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	56.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	57.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	73.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
6/3/2016	00:00:00-00:59:59	37.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	21.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	16.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	17.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	20.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	17.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	16.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	21.1	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	30.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	24.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	18.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	17.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	31.4	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	53.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	43.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	71.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	52.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	58.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	54.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	59.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	77.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	56.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	52.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	46.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
6/4/2016	00:00:00-00:59:59	44.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	44.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	48.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	43.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	36.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	21.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	18.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	18.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	20.6	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	09:00:00-09:59:59	22.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	19.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	23.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	27.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	26.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	25.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	39.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	41.6	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	30.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	36.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	60.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	62.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	54.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	66.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	45.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
6/5/2016	00:00:00-00:59:59	59.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	51.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	34.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	30.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	39.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	35.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	26.5	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	39.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	62.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	32.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	27.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	37.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	41.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	60.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	72.4	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	68.6	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	74.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	66.7	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	82.7	0.0	0.0	14.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	90.5	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	100.0	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	84.5	0.0	0.0	17.7	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	59.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	55.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
6/6/2016	00:00:00-00:59:59	42.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	38.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	02:00:00-02:59:59	29.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	27.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	19.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	14.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	12.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	17.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	27.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	23.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	24.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	24.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	23.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	23.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	28.3	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	88.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	39.9	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	32.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	29.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	30.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	34.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	41.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	29.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	35.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
6/7/2016	00:00:00-00:59:59	34.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	28.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	23.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	23.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	25.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	23.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	19.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	23.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	39.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	25.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	31.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	45.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	27.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	66.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	66.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	59.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	60.8	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	95.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	69.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	19:00:00-19:59:59	59.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	68.6	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	45.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	49.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	59.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/8/2016	00:00:00-00:59:59	24.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	30.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	17.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	14.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	16.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	18.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	18.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	24.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	25.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	39.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	38.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	39.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	44.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	66.7	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	66.1	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	63.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	28.2	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	71.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	47.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	68.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	57.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	60.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	63.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	57.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/9/2016	00:00:00-00:59:59	67.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	64.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	39.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	48.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	51.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	48.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	44.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	32.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	100.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	55.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	43.6	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	42.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	12:00:00-12:59:59	44.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	62.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	62.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	51.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	49.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	58.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	45.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	56.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	43.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	58.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	53.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	45.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
6/10/2016	00:00:00-00:59:59	42.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	41.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	28.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	19.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	19.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	18.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	17.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	19.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	21.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	26.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	23.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	26.1	0.0	0.0	4.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	27.4	0.0	0.0	4.7	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	28.6	0.0	0.0	5.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	53.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	43.6	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	30.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	57.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	41.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	50.2	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	49.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	53.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	57.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	55.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/11/2016	00:00:00-00:59:59	43.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	47.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	100.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	41.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	43.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	05:00:00-05:59:59	42.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	38.5	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	35.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	19.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	16.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	43.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	34.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	36.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	48.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	43.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	37.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	52.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	52.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	42.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	44.8	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	47.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	35.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	39.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	41.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/12/2016	00:00:00-00:59:59	46.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	37.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	63.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	27.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	21.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	14.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	13.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	19.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	26.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	19.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	15.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	16.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	16.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	22.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	29.4	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	32.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	38.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	37.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	38.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	36.2	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	44.1	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	48.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	22:00:00-22:59:59	48.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	51.5	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
6/13/2016	00:00:00-00:59:59	41.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	35.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	36.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	32.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	24.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	18.5	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	18.0	0.0	0.0	2.2	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	15.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	13.2	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	21.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	32.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	30.3	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	30.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	37.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	59.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	99.4	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	100.0	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	100.0	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	100.0	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	100.0	0.0	0.0	25.2	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	100.0	0.0	0.0	20.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	100.0	0.0	0.0	33.6	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	100.0	0.0	0.0	23.6	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	100.0	0.0	0.0	16.5	0.0	0.0	100%	100%	100%	100%
6/14/2016	00:00:00-00:59:59	100.0	0.0	0.0	13.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	78.9	0.0	0.0	15.8	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	71.1	0.0	0.0	17.7	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	71.1	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	54.5	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	41.6	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	41.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	46.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	57.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	49.5	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	96.8	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	70.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	51.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	51.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	50.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	15:00:00-15:59:59	80.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	42.2	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	82.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	80.9	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	66.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	60.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	57.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	44.3	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	43.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
6/15/2016	00:00:00-00:59:59	32.1	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	30.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	22.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	24.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	26.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	19.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	20.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	17.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	33.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	37.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	30.7	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	47.0	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	23.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	37.2	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	68.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	78.4	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	68.6	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	82.7	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	64.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	73.0	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	64.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	54.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	50.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	37.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
6/16/2016	00:00:00-00:59:59	29.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	30.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	100.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	30.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	25.1	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	18.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	17.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	21.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	08:00:00-08:59:59	27.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	25.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	22.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	30.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	25.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	46.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	32.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	45.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	58.9	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	64.9	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	49.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	58.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	50.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	43.1	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	41.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	36.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/17/2016	00:00:00-00:59:59	41.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	36.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	18.0	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	19.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	22.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	19.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	22.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	22.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	32.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	31.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	23.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	31.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	20.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	39.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	50.2	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	36.8	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	71.1	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	53.9	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	82.7	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	87.4	0.0	0.0	16.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	70.5	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	64.9	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	53.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	53.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
6/18/2016	00:00:00-00:59:59	50.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	01:00:00-01:59:59	52.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	32.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	11.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	9.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	58.4	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	32.6	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	33.3	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	38.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	42.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	34.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	31.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	32.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	43.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	59.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	77.0	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	64.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	73.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	66.1	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	66.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	52.1	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	41.6	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	64.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	50.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
6/19/2016	00:00:00-00:59:59	100.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	64.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	39.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	36.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	25.7	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	31.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	24.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	30.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	45.2	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	25.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	24.8	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	31.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	57.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	90.5	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	51.3	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	67.4	0.0	0.0	13.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	86.1	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	56.4	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	18:00:00-18:59:59	64.5	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	74.2	0.0	0.0	14.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	70.5	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	59.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	79.6	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	48.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
6/20/2016	00:00:00-00:59:59	44.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	42.9	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	27.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	20.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	19.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	15.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	11.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	14.1	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	19.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	19.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	35.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	21.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	19.9	0.0	0.0	1.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	52.0	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	24.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	36.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	52.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	56.4	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	52.1	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	48.2	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	43.8	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	55.3	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	55.8	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	57.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
6/21/2016	00:00:00-00:59:59	54.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	41.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	30.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	34.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	31.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	34.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	39.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	35.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	38.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	25.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	22.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	11:00:00-11:59:59	26.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	33.9	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	45.7	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	45.3	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	52.1	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	44.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	52.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	53.4	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	58.4	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	66.1	0.0	0.0	11.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	100.0	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	49.6	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	39.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
6/22/2016	00:00:00-00:59:59	38.7	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	33.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	29.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	31.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	36.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	24.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	46.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	41.8	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	47.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	50.3	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	35.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	41.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	34.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	44.7	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	47.8	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	36.8	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	47.0	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	46.9	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	60.9	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	66.1	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	64.9	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	70.5	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	54.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	54.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
6/23/2016	00:00:00-00:59:59	51.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	45.2	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	27.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	47.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	04:00:00-04:59:59	53.8	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	44.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	52.1	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	47.6	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	44.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	36.6	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	24.9	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	60.9	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	50.2	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	71.1	0.0	0.0	12.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	52.0	0.0	0.0	13.0	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	68.1	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	53.9	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	52.8	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	57.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	69.2	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	66.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	69.2	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	56.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	59.5	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/24/2016	00:00:00-00:59:59	62.1	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	46.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	28.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	55.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	46.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	36.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	44.2	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	32.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	50.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	48.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	29.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	23.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	18.5	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	17.4	0.0	0.0	13.9	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	15.6	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	14.1	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	100.0	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	64.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	67.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	77.7	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	79.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	21:00:00-21:59:59	83.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	76.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	71.7	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
6/25/2016	00:00:00-00:59:59	88.6	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	61.5	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	54.6	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	58.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	49.5	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	68.1	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	49.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	45.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	47.8	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	46.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	40.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	32.1	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	25.9	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	73.0	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	83.9	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	100.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	100.0	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	95.2	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	100.0	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	100.0	0.0	0.0	17.7	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	85.5	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	85.5	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	79.5	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	78.9	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
6/26/2016	00:00:00-00:59:59	75.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	77.0	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	51.5	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	78.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	69.2	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	40.6	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	71.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	48.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	65.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	37.2	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	39.7	0.0	0.0	14.5	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	30.3	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	54.6	0.0	0.0	15.8	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	76.4	0.0	0.0	13.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	14:00:00-14:59:59	100.0	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	88.6	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	100.0	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	80.9	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	81.4	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	69.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	62.8	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	64.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	53.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	52.0	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
6/27/2016	00:00:00-00:59:59	83.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	56.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	15.6	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	11.1	0.0	0.0	0.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	100.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	53.9	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	31.4	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	30.7	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	30.7	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	55.8	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	30.1	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	37.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	47.0	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	58.4	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	100.0	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	90.5	0.0	0.0	12.9	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	77.0	0.0	0.0	11.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	77.8	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	84.9	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	68.6	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	68.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	66.1	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	68.6	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	62.8	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
6/28/2016	00:00:00-00:59:59	76.4	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	63.4	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	39.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	46.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	36.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	42.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	45.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
	07:00:00-07:59:59	25.3	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	39.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	31.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	30.8	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	100.0	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	53.8	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	69.9	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	55.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	60.2	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	87.4	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	100.0	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	81.4	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	80.9	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	78.9	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	68.6	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	73.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	66.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
6/29/2016	00:00:00-00:59:59	60.2	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	57.7	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	31.4	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	50.2	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	36.0	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	32.8	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	59.5	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	57.7	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	50.2	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	32.6	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	25.9	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	33.8	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	39.3	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	60.8	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	51.9	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	70.5	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	82.0	0.0	0.0	17.7	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	67.4	0.0	0.0	15.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	55.3	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	66.7	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	58.4	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	61.4	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	55.3	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	52.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%

Date	Time	HST8124_H2S	HST8141A_H2S	HST8141B_H2S	HST8224_H2S	HST8241A_H2S	HST8241B_H2S	DOUA OUTLET H_2S		DOUB OUTLET H_2S	
		INLET DOUA	OUTLET1 DOUA	OUTLET2 DOUA	INLET DOUB	OUTLET1 DOUB	OUTLET2 DOUB	HST8141A_H_2S	HST8141B_H_2S	HST8241A_H_2S	HST8241B_H_2S
		ppm	ppm	ppm	ppm	ppm	ppm				
6/30/2016	00:00:00-00:59:59	29.4	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	01:00:00-01:59:59	28.3	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	02:00:00-02:59:59	37.9	0.0	0.0	2.9	0.0	0.0	100%	100%	100%	100%
	03:00:00-03:59:59	27.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	04:00:00-04:59:59	29.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	05:00:00-05:59:59	50.1	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	06:00:00-06:59:59	44.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	07:00:00-07:59:59	25.9	0.0	0.0	1.6	0.0	0.0	100%	100%	100%	100%
	08:00:00-08:59:59	36.0	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	09:00:00-09:59:59	41.6	0.0	0.0	2.3	0.0	0.0	100%	100%	100%	100%
	10:00:00-10:59:59	51.3	0.0	0.0	3.3	0.0	0.0	100%	100%	100%	100%
	11:00:00-11:59:59	53.9	0.0	0.0	4.5	0.0	0.0	100%	100%	100%	100%
	12:00:00-12:59:59	52.6	0.0	0.0	5.1	0.0	0.0	100%	100%	100%	100%
	13:00:00-13:59:59	55.9	0.0	0.0	10.3	0.0	0.0	100%	100%	100%	100%
	14:00:00-14:59:59	78.9	0.0	0.0	9.7	0.0	0.0	100%	100%	100%	100%
	15:00:00-15:59:59	62.8	0.0	0.0	8.5	0.0	0.0	100%	100%	100%	100%
	16:00:00-16:59:59	75.8	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	17:00:00-17:59:59	75.8	0.0	0.0	9.1	0.0	0.0	100%	100%	100%	100%
	18:00:00-18:59:59	64.5	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	19:00:00-19:59:59	91.1	0.0	0.0	7.1	0.0	0.0	100%	100%	100%	100%
	20:00:00-20:59:59	79.6	0.0	0.0	7.7	0.0	0.0	100%	100%	100%	100%
	21:00:00-21:59:59	73.0	0.0	0.0	3.9	0.0	0.0	100%	100%	100%	100%
	22:00:00-22:59:59	68.6	0.0	0.0	6.5	0.0	0.0	100%	100%	100%	100%
	23:00:00-23:59:59	62.1	0.0	0.0	5.9	0.0	0.0	100%	100%	100%	100%

APPENDIX E

Locations for Sediment Sampling and Benthic Survey

The GPS Co-ordinates (in WGS84 Datum (ITRF96 Reference Frame)), Collection Time, Measured Water Depth and Tidal State of Monitoring Station

Station ID	Description	Original Location		Revised Location		Remarks	
		Northing	Easting	Northing	Easting	Reason for Location Change	Distance from Original Location (m)
B1	Butterfly Beach	825825.6	813517.1	825702	813719	Inaccessible*	237
B2	Castle Peak Beach	826530.7	815779.2	-	-	-	-
B3	Kadoorie Beach	826328.0	816098.4	826188	815954	Inaccessible*	201
B4	Cafeteria Old Beach	826240.2	816310.1	826031	816143	Inaccessible*	268
B5	Cafeteria New Beach	825888.4	816751.8	825697	816470	Inaccessible*	341
B6	Golden Beach	825493.2	816813.5	825431	816748	Inaccessible*	90
WSD1	Flushing Water Intake near Butterfly Beach	825511.1	813103.0	825447	813138	Inaccessible*	73
WSD2	Flushing Water Intake near LRT Terminus	825860.0	815241.3	-	-	-	-
U2	Secondary Contact RecreationSubzone at Lung Kwu Tan	827855.5	809704.9	827761	809488	Inaccessible*	237
NM6	Control Station	820121.5	807822.1	-	-	-	-
NM1	Control Station	823025.4	820503.9	-	-	-	-

Note: * Proposed location inaccessible by sampling vessel due to shallow water.

APPENDIX F

Event and Action Plan

Event and Action Plan for Odour Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
ACTION LEVEL				
Exceedance of action level or receipt of any odour complaint	1. Identify source/reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week; 4. Repeat odour patrol to confirm finding; and 5. If exceedance continues, notify the Contractor, IEC and SOR.	1. Check odour patrol results submitted by ET; 2. Check Contractor's mitigation measures. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify DSD; and 3. Ensure remedial measures properly implemented.	1. Notify the SOR, ET, IEC and DSD when receipt of odour complaint; 2. Rectify any unacceptable practice; and formulate remedial actions; and 3. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.
LIMIT LEVEL				
Exceedance of Limit level or receipt of two or more complaints in 3 months	1. Identify source / reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week; 4. Repeat odour patrols to confirm findings; 5. Increase odour patrol frequency to bi-weekly until no exceedance is detected at the ASR in the conservative 2 months and 6. If exceedance continues, notify the Contractor, IEC and SOR.	1. Check patrol results submitted by ET; 2. Discuss amongst SOR and Contractor on the potential remedial actions; 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify DSD; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; and 4. Ensure remedial measures properly implemented.	1. Notify the SOR, ET, IEC and DSD when receipt of odour complaints; 2. Modify or improve design as appropriate; 3. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance / complaint; 4. Implement the agreed proposals 5. Resubmit proposals if problem still not under control; and 6. Correspond to the complainant within 10 days to inform the cause of the nuisance and action taken.

Event and Action Plan for Odour Emission Monitoring

EVENT	ACTION			
	ET	IEC	SOR	CONTRACTOR
ACTION LEVEL				
Exceedance of action level	1. Identify source/reason of exceedance; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week; 4. Monitor H_2S level sensors readings to confirm finding; and 5. If exceedance continues, notify the Contractor, IEC and SOR	1. Check H_2S level sensors readings submitted by ET; 2. Discuss with ET and Contractor on the possible remedial actions as appropriate 3. Advise SOR on the effectiveness of the proposed remedial measures if any 4. Supervise implementation of remedial measures if any	1. Confirm receipt of notification of exceedance in writing; and 2. Notify DSD. 3. Ensure remedial actions (if any) properly implemented.	1. Rectify any unacceptable practice if any.
LIMIT LEVEL				
Exceedance of Limit level	1. Identify source / reason of exceedance or odour complaints; 2. Notify the Contractor, IEC and SOR of exceedance 3. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week; 4. Monitor H_2S level sensors readings to confirm findings; 5. If exceedance continues, notify the Contractor, IEC and SOR; and 6. If the exceedance is identified by olfactometric analysis, carry out further air sampling and olfactometry analysis to demonstrate the effectiveness of the remedial measures taken	1. Check H_2S level sensors readings and/or olfactometry analysis results submitted by ET; 2. Discuss amongst SOR and Contractor on the potential remedial actions; 3. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the SOR accordingly; 4. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance in writing; 2. Notify DSD; 3. In consolidation with the IEC, agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; and 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. Modify or improve system setting as appropriate; 2. Submit proposals for remedial actions to IEC within three working days of notification of odour exceedance; 3. Implement the agreed proposals; 4. Amend proposals if appropriate; and 5. If exceedance continues, consider what portion of the work is responsible and stop that portion of work until the exceedance is abated.

APPENDIX G

Weather Conditions

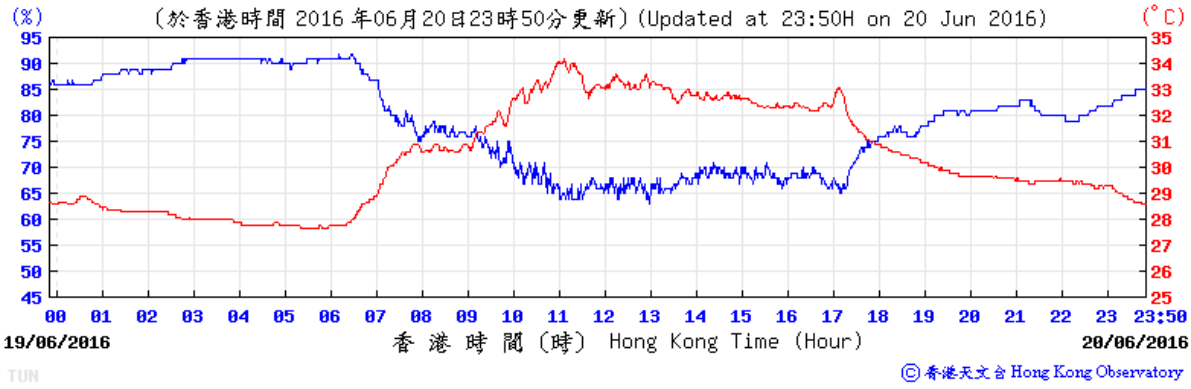
Daily Extract of Meteorological Observations, June 2016 – Tuen Mun Children and Juvenile Home

Day	Mean Pressure (hPa)	Air Temperature			Mean Dew Point (deg. C)	Mean Relative Humidity (%)	Total Rainfall (mm)	Prevailing Wind Direction (degrees)	Mean Wind Speed (km/h)
		Absolute Daily Max (deg. C)	Mean (deg.C)	Absolute Daily Min (deg. C)					
1	***	32.6	30.1	28.2	26.6	81.0	0.0	***	***
2	***	33.7	30.5	28.4	26.8	81.0	0.0	***	***
3	***	33.0	30.6	28.7	26.8	80.0	0.0	***	***
4	***	34.7	28.6	24.7	25.8	85.0	5.0	***	***
5	***	31.0	26.3	23.6	24.1	88.0	16.0	***	***
6	***	28.2	25.4	24.0	24.5	95.0	31.0	***	***
7	***	31.9	28.1	24.9	25.3	85.0	0.0	***	***
8	***	32.0	27.7	24.5	25.0	85.0	4.0	***	***
9	***	31.7	27.6	25.8	25.1	87.0	1.5	***	***
10	***	33.1	28.4	25.9	25.3	84.0	0.0	***	***
11	***	27.6	26.3	25.1	25.5	96.0	47.5	***	***
12	***	27.8	26.7	24.8	26.0	96.0	19.0	***	***
13	***	32.1	29.6	27.4	26.9	86.0	0.0	***	***
14	***	32.3	30.0	29.0	27.0	84.0	0.0	***	***
15	***	32.1	30.0	28.4	26.5	82.0	0.0	***	***
16	***	31.2	28.9	27.0	26.2	86.0	0.5	***	***
17	***	33.5	29.2	26.5	26.1	84.0	0.0	***	***
18	***	32.3	29.4	28.1	26.2	83.0	0.0	***	***
19	***	32.9	29.8	27.0	25.5	78.0	0.0	***	***
20	***	34.2	30.4	27.7	26.1	79.0	0.0	***	***
21	***	33.9	30.3	27.6	25.6	77.0	0.0	***	***
22	***	34.0	29.9	27.3	25.7	79.0	0.0	***	***
23	***	33.5	30.0	27.0	25.2	76.0	0.0	***	***
24	***	34.5	30.4	26.9	25.3	75.0	0.0	***	***
25	***	34.5	30.7	27.7	25.5	75.0	0.0	***	***
26	***	35.0	31.0	28.6	25.8	74.0	0.0	***	***
27	***	33.9	30.7	28.2	25.7	75.0	0.0	***	***
28	***	30.5	28.7	26.1	25.8	85.0	25.5	***	***
29	***	32.0	28.4	26.7	26.3	89.0	23.5	***	***
30	***	33.5	29.7	27.1	26.1	82.0	3.0	***	***

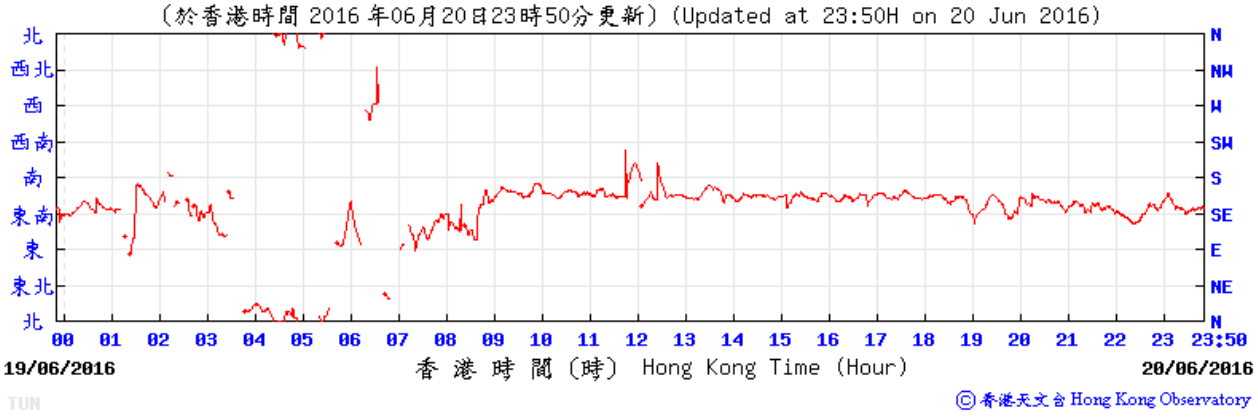
Note:
*** - information unavailable
# data incomplete
Rainfall measured in increment of 0.5 mm. Amount of < 0.5 mm cannot be detected.

Hourly Meteorological Conditions on 20 June 2016 at Tuen Mun Station

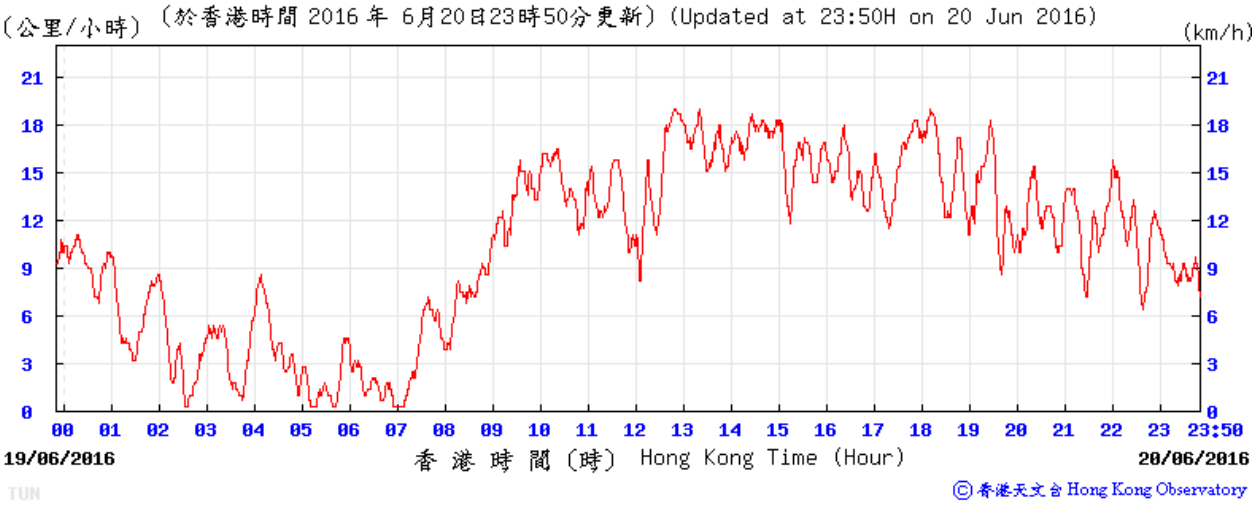
Temperature/ Humidity:



Wind Direction:



Wind Speed:



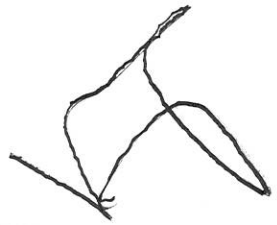
APPENDIX H

Landscape & Visual Impact Monitoring

Contract No. DC/2008/03
Design, Build and Operate Pillar Point Sewage Treatment Works
Establishment Period - 10th monthly L&V site audit

Site Inspection Date : 14 June 2016

Audited and Certified by:



Kenneth Ng (RLA No. 034 (99))

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
Issues Observed in this Audit				
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Tree Planting Area Photo no. G-01 to G-17	Item #1	Trees in ground floor garden were observed in poor condition below: Tree 390 was observed fungi on the tree trunk; Trees T001, T002, T221, T207, T208, T209 and R185 were observed in poor condition; Trees 128, 129, 131, 133-135, N84, R156, R157 were observed collapsed / poor form or and poor health condition; (Please see photo reference below)	It is recommended to carry out maintenance works for the trees. T001, T002, T221, T207, T208, T209, R185 and 390. The Contractor had submitted the tree felling proposal for trees N84, 128, 129, 131, 133-135, R156 and R157. Trees will be replaced after it is approved.

Area of Works	Items to be Monitored	Previous Observation	Establishment Works Stage	
			Observation	Recommendation/Action
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Trees Area Photo no. G-18	-	Construction materials were observed in tree protection zone during this site inspection. (Please see photo reference below)	It is recommended to remove the construction materials in tree protection zone.
Within Pillar Point Sewage Treatment Works	Location at Ground Floor Planting Trees Area Photo no. G-19	Item #3	Groundcover and lawn were observed in poor condition were observed during this site inspection.	It is strongly recommended to provide sufficient watering and carry out necessary maintenance works for the groundcover and lawn after manhole construction.

Tree tag was found damaged.

Uproot and girding root.

Leaning tree observed

Photo no. **G-01**: Tree tag no. **131** was collapsed during this observation..

Dieback and dead branch was observed

Existing wound was observed on the trunk

Tree tag was found damaged.

Photo no. **G-02**: Tree tag no. **133** was collapsed during this observation.

Dieback and dead branch was observed

Existing wound was observed on the trunk

Photo no. **G-03**: Tree tag no. **134** was observed in poor condition.

Few leaves were observed

Photo no. **G-04**: Tree tag no. **135** was observed in poor condition.

Few leaves were observed.

Photo no. **G-05**: Tree tag no. **128** was observed in poor condition.

Dieback and dead branch was observed

Existing wound was observed on the trunk

Photo no. **G-06**: Tree tag no. **129** was observed in poor condition.

Dieback and dead branch was observed

Existing wound was observed on the trunk

Photo no. **G-07**: Tree tag no. **N84** was observed in poor condition.

Fungi were observed on the trunk

Photo no. **G-08**: Tree no. **390** was observed in poor health.

Few leaves were observed.

Photo no. **G-09**: Tree no. T001 was observed in poor health.

Few leaves were observed.

Photo no. **G-10**: Tree no. T002 was observed in poor health.

Few leaves were observed.

Photo no. **G-11**: Tree no. T221 was observed in poor health.

Dieback and dead branch was observed

Dieback and dead branch was observed

Photo no. **G-12**: Tree tag no. **R157** was observed in poor condition.

Dieback and dead branch was observed

Photo no. **G-13**: Tree tag no. **R156** was observed in poor condition.

Dieback and dead branch was observed

Photo no. **G-14**: Tree tag no. **R185** was observed in poor condition.

Few leaves were observed.

Photo no. **G-15**: Tree no. 207 was observed in poor condition.

Few leaves were observed.

Photo no. **G-16**: Tree no. 208 was observed in poor condition .

Few leaf were observed.

Photo no. **G-17**: Tree no. 209 was observed in poor condition.

Photo no. **G-18**: Construction materials were observed in tree protection zone during this site inspection.

Photo no. **G-19**: Groundcover and Lawn were observed missing during the site inspection.

APPENDIX I

PPWQM Benthic Survey Monitoring Results

List of collected specimens at every monitoring station (May 2016)

Monitoring station: B1 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Ampelisca sp.	1	0.00					1	0.00			2	0.00
2	A	Corophium sp.	3	0.00	1	0.00			3	0.00	1	0.00	8	0.00
3	A	Idunella sp.									1	0.00	1	0.00
4	Ac	Balanoglossus sp.			1	1.99							1	1.99
5	B	Mactra sp.			2	0.01	1	0.00					3	0.01
6	B	Paphia undulata							1	4.39			1	4.39
7	B	Theora lata							1	0.00			1	0.00
8	C	Neoxenophthalmus obscurus			1	0.00			1	0.01	3	0.09	5	0.10
9	C	Tritodynamia horvathi							1	0.32			1	0.32
10	C	Typhlocarcinops denticarpus					1	0.51					1	0.51
11	Cn	Virgularia sp.			1	0.00							1	0.00
12	Ec	Amphioplus sp.			1	0.01							1	0.01
13	Ec	Protankyra bidentata							1	2.06			1	2.06
14	F	Pseudorhombus sp.					1	1.43					1	1.43
15	G	Monotygma sp.			1	0.01							1	0.01
16	G	Nassarius siquijorensis			1	0.11							1	0.11
17	G	Philine sp.	1	0.00									1	0.00
18	N	Nemertea spp.	1	0.00							1	0.00	2	0.00
19	P	Aglaophamus dibranchis	3	0.00			1	0.01	4	0.01	1	0.00	9	0.01
20	P	Cirriformia sp.					1	0.00					1	0.00
21	P	Ehlersileanira incisa hwanghaiensis			1	0.03							1	0.03
22	P	Glycera chirori									1	0.07	1	0.07
23	P	Linopherus paucibranchiata	1	0.00	1	0.00							2	0.00
24	P	Lumbrineris sp.									2	0.00	2	0.00
25	P	Mediomastus sp.	1	0.00	1	0.00							2	0.00
26	P	Micronephtys sphaerocirrata	2	0.00	2	0.00					5	0.00	9	0.00
27	P	Nereididae spp.							1	0.00			1	0.00

Monitoring station: B1 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
28	P	Otopsis sp.	2	0.00							1	0.00	3	0.0
29	P	Poecilochaetus sp.	1	0.00	1	0.00	1	0.00	1	0.00			4	0.00
30	P	Prionospio ehlersi	1	0.00									1	0.00
31	P	Sigambra hanaokai			1	0.00							1	0.00
32	P	Tharyx sp.	3	0.00	1	0.00					3	0.00	7	0.00
33	S	Oratosquilla mikado					1	0.07					1	0.07
34	Sp	Sipuncula spp.			2	0.00	4	0.01					6	0.01
		Column sum	**20**	**0.00**	**19**	**2.16**	**11**	**2.05**	**15**	**6.79**	**19**	**0.16**	**84**	**11.16**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B2			Sampling date: 15/5/2016											
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Ampelisca sp.			1	0.00	2	0.00			3	0.00	6	0.00
2	A	Corophium sp.	1	0.00	1	0.00	1	0.00			1	0.00	4	0.00
3	B	Tellina minuta			2	0.09			1	0.02	2	0.01	5	0.12
4	B	Timoclea lionota									1	0.02	1	0.02
5	C	Macrophthalmus latreillei							1	1.65			1	1.65
6	G	Philine sp.	1	0.01	1	0.01					1	0.02	3	0.03
7	N	Nemertea spp.			1	0.02			1	0.00	1	0.02	3	0.04
8	P	Aglaophamus dibranchis	1	0.00	1	0.00							2	0.00
9	P	Cabira incerta					1	0.00					1	0.00
10	P	Capitella sp.							1	0.00			1	0.00
11	P	Cossurella dimorpha			1	0.00							1	0.00
12	P	Decamastus sp.					1	0.00					1	0.00
13	P	Ehlersileanira incisa hwanghaiensis									2	0.00	2	0.00
14	P	Glycera chirori					1	0.07					1	0.07
15	P	Harmothoe sp.	1	0.00	2	0.00							3	0.00
16	P	Laonice cirrata					1	0.01					1	0.01
17	P	Lumbrineris sp.							1	0.00			1	0.00
18	P	Maldanidae spp.			1	0.00							1	0.00
19	P	Mediomastus sp.			3	0.00	2	0.00			4	0.00	9	0.01
20	P	Micronephtys sphaerocirrata									1	0.00	1	0.00
21	P	Nereididae spp.					1	0.00					1	0.00
22	P	Paralacydonia paradox					2	0.00			1	0.00	3	0.00
23	P	Poecilochaetus sp.	1	0.00							4	0.00	5	0.00
24	P	Prionospio malmgreni			1	0.00							1	0.00
25	P	Prionospio sp.	1	0.00									1	0.00
26	P	Sigambra hanaokai	1	0.00	5	0.00	1	0.00	1	0.00	5	0.00	13	0.00
27	P	Tharyx sp.			2	0.00	2	0.00			1	0.00	5	0.00
28	P	Thelepus sp.									1	0.01	1	0.01

Monitoring station: B2 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	S	Solenocera sp.					1	0.01					1	0.01
30	Sp	Sipuncula spp.	1	0.00	1	0.00							2	0.00
		Column sum	**8**	**0.02**	**23**	**0.12**	**16**	**0.09**	**6**	**1.66**	**28**	**0.07**	**81**	**1.96**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B3			Sampling date: 15/05/2016											
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	Ampelisca sp.			1	0.00	1	0.00					2	0.00
2	B	Anisocorbula lineata	1	0.01	1	0.01	1	0.01					3	0.03
3	B	Barbatia amygdalumtostum					1	0.12					1	0.12
4	B	Mactra sp.					1	0.00			3	0.00	4	0.00
5	B	Ruditapes philippinarum					3	0.00	1	0.00			4	0.00
6	B	Saccella sp.			1	0.00							1	0.00
7	B	Tellina minuta	2	0.00			1	0.01					3	0.01
8	B	Timoclea lionota			2	0.02	5	0.14	1	0.05			8	0.20
9	G	Gyrineum natator					1	0.03					1	0.03
10	G	Natica sp.					3	0.00			1	0.00	4	0.00
11	Le	Nebalia sp.					1	0.00					1	0.00
12	P	Aglaophamus dibranchis	2	0.00					1	0.00	3	0.00	6	0.01
13	P	Cabira incerta	1	0.00					1	0.00			2	0.00
14	P	Cossurella dimorpha									1	0.00	1	0.00
15	P	Laonice cirrata					1	0.00					1	0.00
16	P	Leocrates chinensis					1	0.00					1	0.00
17	P	Lumbrineris sp.			1	0.00							1	0.00
18	P	Mediomastus sp.	1	0.00	2	0.00	7	0.01	3	0.00			13	0.01
19	P	Micronephtys sphaerocirrata									1	0.00	1	0.00
20	P	Otopsis sp.					1	0.00	5	0.00	4	0.00	10	0.00
21	P	Poecilochaetus sp.					1	0.00					1	0.00
22	P	Sabellariidae spp.					1	0.00					1	0.00
23	P	Sigambra hanaokai					3	0.00					3	0.00
24	P	Sternaspis scutata			1	0.00					1	0.00	2	0.00
25	P	Tharyx sp.			1	0.00			1	0.00			2	0.00
26	S	Leptochela sp.							1	0.00			1	0.00
27	Sp	Sipuncula spp.	1	0.00					2	0.00			3	0.01
		Column sum	**8**	**0.01**	**10**	**0.02**	**33**	**0.33**	**16**	**0.06**	**14**	**0.01**	**81**	**0.44**

Monitoring station: B4 Sampling date: 15/05/2016														
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.	1	0.00	1	0.00							2	0.00
2	A	*Corophium* sp.			1	0.00	2	0.00					3	0.00
3	Ac	*Balanoglossus* sp.							1	0.00	2	0.00	3	0.00
4	B	*Anisocorbula lineata*	6	0.05	1	0.00	1	0.00	1	0.01			9	0.07
5	B	*Mactra* sp.	1	0.00	4	0.00							5	0.00
6	B	*Saccella* sp.	2	0.01					2	0.04	1	0.01	5	0.06
7	B	*Tellina minuta*	1	0.06			1	0.01	6	0.01			8	0.07
8	B	*Timoclea lionota*	2	0.03	3	0.04			1	0.06			6	0.12
9	Ec	*Heliocidaris crassispina*							1	0.54			1	0.54
10	Eh	*Arhynchite* sp.			1	0.00							1	0.00
11	F	*Odontamblyopus rubicundus*					1	0.62					1	0.62
12	G	*Acteocina* sp.							1	0.00			1	0.00
13	G	Dentaliidae spp.	1	0.01	1	0.00	1	0.00			1	0.01	4	0.02
14	G	*Philine* sp.			1	0.00							1	0.00
15	G	*Phos senticosus*									1	0.02	1	0.02
16	N	Nemertea spp.					2	0.00					2	0.00
17	P	*Aglaophamus dibranchis*					1	0.00					1	0.00
18	P	*Bhawania brevis*							1	0.00			1	0.00
19	P	*Ehlersileanira incisa hwanghaiensis*									1	0.00	1	0.00
20	P	*Lumbrineris* sp.	1	0.00	1	0.01	1	0.00			2	0.00	5	0.02
21	P	*Mediomastus* sp.	3	0.00	1	0.00			1	0.00			5	0.00
22	P	*Micronephtys sphaerocirrata*	2	0.00					1	0.00	1	0.00	4	0.00
23	P	*Otopsis* sp.	1	0.00	3	0.00	1	0.00					5	0.00
24	P	*Paralacydonia paradox*			1	0.00							1	0.00
25	P	*Sigambra hanaokai*	1	0.00									1	0.00
26	P	*Sternaspis scutata*			1	0.00	1	0.00					2	0.00
27	Sp	Sipuncula spp.							1	0.00			1	0.00
		Column sum	**22**	**0.15**	**20**	**0.06**	**12**	**0.64**	**17**	**0.66**	**9**	**0.05**	**80**	**1.56**

Monitoring station: B5 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.			2	0.00					1	0.00	3	0.00
2	A	*Corophium* sp.	6	0.00	2	0.00					1	0.00	9	0.00
3	B	*Anisocorbula lineata*							1	0.01			1	0.01
4	B	*Cycladicama* sp.					1	0.00					1	0.00
5	B	*Mactra* sp.					3	0.00	1	0.00			4	0.00
6	B	*Timoclea lionota*					2	0.03			1	0.01	3	0.05
7	C	*Eucrate* sp.									1	0.01	1	0.01
8	Cn	*Virgularia* sp.					1	0.00			1	0.00	2	0.01
9	Ec	Ophiurida spp.			1	0.01							1	0.01
10	G	*Philine* sp.			1	0.00			1	0.00			2	0.00
11	N	Nemertea spp.	3	0.01			1	0.00			1	0.00	5	0.01
12	P	*Aglaophamus dibranchis*	1	0.00			1	0.00	1	0.00	1	0.00	4	0.00
13	P	*Bhawania brevis*					1	0.00					1	0.00
14	P	*Cabira incerta*	1	0.00	1	0.00	1	0.00					3	0.00
15	P	*Chaetozone* sp.									1	0.00	1	0.00
16	P	*Glycinde gurjanovae*			1	0.00							1	0.00
17	P	*Leocrates chinensis*	1	0.01									1	0.01
18	P	*Linopherus paucibranchiata*	1	0.00	1	0.00							2	0.00
19	P	*Lumbrineris* sp.							1	0.00			1	0.00
20	P	*Mediomastus* sp.	1	0.00	1	0.00	1	0.00	2	0.00	3	0.00	8	0.00
21	P	*Micronephtys sphaerocirrata*									1	0.00	1	0.00
22	P	*Otopsis* sp.	3	0.00	1	0.00							4	0.00
23	P	*Paralacydonia paradox*					1	0.00					1	0.00
24	P	*Poecilochaetus* sp.									1	0.00	1	0.00
25	P	*Prionospio* sp.			1	0.00							1	0.00
26	P	*Sigambra hanaokai*							1	0.00			1	0.00
27	P	*Sternaspis scutata*	1	0.00					1	0.00			2	0.00
28	P	*Thelepus* sp.					1	0.00					1	0.00

Monitoring station: B5 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	Sp	*Apionsoma trichocephalus*									1	0.00	1	0.00
30	Sp	Sipuncula spp.	1	0.00									1	0.00
		Column sum	**19**	**0.02**	**12**	**0.02**	**14**	**0.05**	**9**	**0.01**	**14**	**0.03**	**68**	**0.13**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: B6 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.	1	0.00			5	0.00	2	0.00	2	0.00	10	0.00
2	B	*Anisocorbula lineata*	2	0.03	2	0.00							4	0.03
3	B	*Mactra* sp.									1	0.00	1	0.00
4	B	*Paphia undulata*					1	0.40					1	0.40
5	B	*Saccella* sp.					1	0.00					1	0.00
6	B	*Timoclea lionota*	1	0.00			1	0.09	1	0.07	3	0.24	6	0.39
7	C	*Xenophthalmus pinnotheroides*					1	0.39					1	0.39
8	Cn	*Virgularia* sp.					1	0.00	1	0.01	2	0.00	4	0.01
9	G	Dentaliidae spp.			1	0.00							1	0.00
10	G	*Philine* sp.									1	0.00	1	0.00
11	Is	*Cyathura* sp.							1	0.00			1	0.00
12	N	Nemertea spp.	1	0.00	1	0.00	1	0.00					3	0.00
13	P	*Aglaophamus dibranchis*					2	0.00					2	0.00
14	P	*Capitella* sp.			1	0.00	1	0.00					2	0.00
15	P	*Cirriformia* sp.			1	0.00	3	0.00					4	0.00
16	P	*Cossurella dimorpha*							1	0.00			1	0.00
17	P	*Ehlersileanira incisa hwanghaiensis*	1	0.00	1	0.00	1	0.00					3	0.00
18	P	*Glycera alba*					2	0.01					2	0.01
19	P	*Glycinde gurjanovae*					1	0.00					1	0.00
20	P	*Harmothoe* sp.	1	0.00									1	0.00
21	P	*Lumbrineris shiinoi*			1	0.00	1	0.00	2	0.00	2	0.00	6	0.00
22	P	*Lysidice ninetta*					2	0.00			1	0.00	3	0.00
23	P	*Lysippe* sp.					1	0.00					1	0.00
24	P	Maldanidae spp.					2	0.00					2	0.00
25	P	*Mediomastus* sp.	5	0.00	4	0.00	1	0.00	3	0.00	1	0.00	14	0.01
26	P	*Micronephtys sphaerocirrata*	2	0.00	1	0.00	1	0.00			1	0.00	5	0.00
27	P	*Nectoneanthes alatopalpis*			1	0.00			3	0.00	3	0.00	7	0.00
28	P	Nereididae spp.					1	0.00					1	0.00

Monitoring station: B6 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Notomastus* sp.	1	0.00									1	0.00
30	P	*Onuphis eremita*							1	0.00			1	0.00
31	P	*Paralacydonia paradox*					2	0.00			1	0.00	3	0.00
32	P	*Phylo ornatus*					1	0.00	1	0.00			2	0.00
33	P	*Pista* sp.					1	0.00					1	0.00
34	P	*Poecilochaetus* sp.							1	0.00			1	0.00
35	P	*Prionospio malmgreni*	1	0.00			1	0.00	1	0.00			3	0.00
36	P	*Sigambra hanaokai*			1	0.00							1	0.00
37	P	*Sternaspis scutata*			5	0.00	5	0.00	5	0.00	1	0.00	16	0.00
38	P	*Tharyx* sp.	2	0.00	1	0.00			3	0.00	1	0.00	7	0.00
39	S	*Alpheus digitalis*							1	0.01			1	0.01
40	Sp	Sipuncula spp.			2	0.00							2	0.00
		Column sum	**18**	**0.03**	**23**	**0.01**	**40**	**0.90**	**27**	**0.09**	**20**	**0.25**	**128**	**1.28**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: WSD1 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.			1	0.00					1	0.00	2	0.00
2	A	*Cheiriphotis* sp.	1	0.00	4	0.00	2	0.00	2	0.00			9	0.00
3	A	*Idunella* sp.					1	0.00					1	0.00
4	A	*Maera* sp.			1	0.00							1	0.00
5	B	*Angulus vestalioides*									1	0.03	1	0.03
6	B	*Mactra* sp.	1	0.00					1	0.00			2	0.01
7	B	*Ruditapes philippinarum*			5	0.00	2	0.01	2	0.10	3	0.07	12	0.18
8	B	*Timoclea lionota*							1	0.00	1	0.01	2	0.02
9	Cn	*Anthopleura* sp.	1	0.05									1	0.05
10	Ec	*Amphioplus* sp.	1	0.00							2	0.01	3	0.01
11	G	*Calyptraea* sp.			5	0.01	6	0.00			20	0.02	31	0.02
12	G	*Nassarius hepaticus*					1	2.32					1	2.32
13	G	*Philine* sp.							1	0.00	1	0.00	2	0.00
14	Hc	*Diogenes* sp.			1	0.02			2	0.13			3	0.15
15	Le	*Nebalia* sp.									2	0.00	2	0.00
16	P	*Amaeana* sp.			5	0.01							5	0.01
17	P	*Bhawania brevis*					1	0.00					1	0.00
18	P	*Capitella* sp.	1	0.00	3	0.00	3	0.00	4	0.00	1	0.00	12	0.01
19	P	*Cirriformia* sp.			6	0.00	12	0.00	14	0.00	1	0.00	33	0.01
20	P	*Eteone* sp.			2	0.00							2	0.00
21	P	*Eunice indica*	1	0.00			2	0.02					3	0.02
22	P	*Glycera alba*			1	0.00	2	0.00	1	0.00	5	0.01	9	0.01
23	P	*Glycera chirori*					2	0.02					2	0.02
24	P	*Glycinde gurjanovae*	1	0.00			1	0.00					2	0.00
25	P	*Harmothoe* sp.	1	0.00	2	0.00							3	0.00
26	P	*Linopherus paucibranchiata*			1	0.00							1	0.00
27	P	*Lysidice ninetta*			1	0.00	1	0.00			1	0.00	3	0.00
28	P	*Micronephtys sphaerocirrata*			2	0.00	1	0.00	1	0.00			4	0.00

Monitoring station: WSD1 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Nectoneanthes alatopalpis*							1	0.00	1	0.00	2	0.00
30	P	Nereididae spp.			1	0.00	1	0.00	3	0.00	1	0.00	6	0.00
31	P	*Phylo ornatus*							1	0.00			1	0.00
32	P	*Poecilochaetus* sp.	1	0.00									1	0.00
33	P	*Prionospio malmgreni*			1	0.00	1	0.00					2	0.00
34	P	*Tharyx* sp.	4	0.00	4	0.00	7	0.00	18	0.00	1	0.00	34	0.01
35	S	Unidentified shrimp larvae	1	0.00									1	0.00
36	Sp	Sipuncula spp.			2	0.00			12	0.03			14	0.03
		Column sum	**14**	**0.06**	**48**	**0.05**	**46**	**2.38**	**64**	**0.28**	**42**	**0.15**	**214**	**2.92**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: WSD2 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.	3	0.00	2	0.00	1	0.00	1	0.00			7	0.00
2	A	Amphipoda spp.					8	0.00	3	0.00	1	0.00	12	0.00
3	A	*Byblis* sp.	1	0.00									1	0.00
4	B	*Angulus vestalis*	1	0.00	1	0.29	1	0.01	3	0.01			6	0.31
5	B	*Anisocorbula lineata*							1	0.00	1	0.01	2	0.01
6	B	*Mactra* sp.	3	0.00							2	0.00	5	0.00
7	B	*Timoclea lionota*			2	0.02							2	0.02
8	Cn	*Edwardsia* sp.			1	0.03	1	0.00			1	0.02	3	0.05
9	Cn	*Virgularia* sp.					3	0.01			1	0.00	4	0.01
10	G	*Calyptraea* sp.	1	0.00			1	0.00					2	0.00
11	G	Dentaliidae spp.	1	0.00	1	0.00							2	0.01
12	G	*Monotygma eximia*									1	0.01	1	0.01
13	G	*Philine* sp.	5	0.01					1	0.00	1	0.00	7	0.01
14	Hc	*Diogenes* sp.									1	0.00	1	0.00
15	Is	*Cyathura* sp.			2	0.00							2	0.00
16	Le	*Nebalia* sp.									1	0.00	1	0.00
17	N	Nemertea spp.	1	0.06									1	0.06
18	P	*Capitella* sp.	2	0.00			1	0.00			5	0.00	8	0.00
19	P	*Cirriformia* sp.			1	0.00	5	0.00	1	0.00	10	0.00	17	0.00
20	P	*Ehlersileanira incisa hwanghaiensis*					1	0.00	1	0.00			2	0.00
21	P	*Eteone* sp.							1	0.00	2	0.00	3	0.01
22	P	*Eunice indica*					7	0.07	5	0.04	1	0.01	13	0.12
23	P	*Glycera alba*	1	0.00	1	0.01			2	0.00	3	0.00	7	0.01
24	P	*Glycinde gurjanovae*			1	0.00	1	0.03	1	0.00			3	0.03
25	P	*Harmothoe* sp.									1	0.00	1	0.00
26	P	*Laonice cirrata*					1	0.00					1	0.00
27	P	*Linopherus paucibranchiata*	1	0.00									1	0.00
28	P	*Lumbrineris* sp.	1	0.03			3	0.00	1	0.00	2	0.01	7	0.04

Monitoring station: WSD2 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Lysidice ninetta*	1	0.00			1	0.00	2	0.01	3	0.00	7	0.01
30	P	Maldanidae spp.									1	0.00	1	0.00
16	Le	*Nebalia* sp.									1	0.00	1	0.00
17	N	Nemertea spp.	1	0.06									1	0.06
18	P	*Capitella* sp.	2	0.00			1	0.00			5	0.00	8	0.00
19	P	*Cirriformia* sp.			1	0.00	5	0.00	1	0.00	10	0.00	17	0.00
20	P	*Ehlersileanira incisa hwanghaiensis*					1	0.00	1	0.00			2	0.00
21	P	*Eteone* sp.							1	0.00	2	0.00	3	0.01
22	P	*Eunice indica*					7	0.07	5	0.04	1	0.01	13	0.12
23	P	*Glycera alba*	1	0.00	1	0.01			2	0.00	3	0.00	7	0.01
24	P	*Glycinde gurjanovae*			1	0.00	1	0.03	1	0.00			3	0.03
25	P	*Harmothoe* sp.									1	0.00	1	0.00
26	P	*Laonice cirrata*					1	0.00					1	0.00
27	P	*Linopherus paucibranchiata*	1	0.00									1	0.00
28	P	*Lumbrineris* sp.	1	0.03			3	0.00	1	0.00	2	0.01	7	0.04
29	P	*Lysidice ninetta*	1	0.00			1	0.00	2	0.01	3	0.00	7	0.01
30	P	Maldanidae spp.									1	0.00	1	0.00
31	P	*Marphysa stragulum*									2	0.00	2	0.00
32	P	*Mediomastus* sp.	1	0.00			1	0.00					2	0.00
33	P	*Melinna* sp.							1	0.00			1	0.00
34	P	*Micronephtys sphaerocirrata*	1	0.00			1	0.00	2	0.00			4	0.00
35	P	Nereididae spp.			3	0.00	1	0.01	2	0.00			6	0.01
36	P	*Otopsis* sp.					1	0.00					1	0.00
37	P	*Paralacydonia paradox*					7	0.00	4	0.00	2	0.00	13	0.00
38	P	*Phylo ornatus*							1	0.00			1	0.00
39	P	*Prionospio malmgreni*					6	0.01	3	0.00	3	0.00	12	0.02
40	P	*Sigambra hanaokai*	1	0.00					1	0.00			2	0.00
41	P	*Sternaspis scutata*	2	0.00	7	0.02	12	0.00	1	0.00	2	0.00	24	0.02

Monitoring station: WSD2 Sampling date: 15/5/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
42	P	*Tharyx* sp.	2	0.00	2	0.00	6	0.00	7	0.00	17	0.00	34	0.01
43	Sp	Sipuncula spp.			2	0.02							2	0.02
		Column sum	**29**	**0.11**	**26**	**0.40**	**70**	**0.15**	**45**	**0.07**	**64**	**0.09**	**234**	**0.83**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: U2 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.			2	0.00			1	0.00	1	0.00	4	0.00
2	A	*Cheiriphotis* sp.	3	0.00			1	0.00					4	0.00
3	B	*Angulus emarginatus*			1	0.32			1	0.00			2	0.32
4	B	*Anisocorbula lineata*	1	0.02					1	0.01	8	0.05	10	0.08
5	B	*Clausinella isabellina*					1	0.30					1	0.30
6	B	*Diplodonta sowerbyi*					2	0.07	1	0.02			3	0.08
7	B	*Gari lessoni*	1	0.04									1	0.04
8	B	*Jitlada culter*			6	0.04	5	0.02					11	0.06
9	B	*Meretrix meretrix*	1	0.07									1	0.07
10	B	*Paphia undulata*	1	0.01									1	0.01
11	B	*Ruditapes philippinarum*	20	1.32	38	2.71	33	2.40	36	2.38	29	2.78	156	11.59
12	B	*Solen dunkerianus*			2	0.16	5	0.38	1	0.01			8	0.56
13	B	*Tellina minuta*			1	0.03							1	0.03
14	B	*Tellinides* sp.	7	0.04	1	0.00			6	0.04			14	0.09
15	B	*Timoclea lionota*	12	0.41	39	1.06	20	0.68	7	0.23	9	0.57	87	2.94
16	C	*Xenophthalmus pinnotheroides*							1	0.31			1	0.31
17	Cn	*Cerianthus* sp.					2	0.00					2	0.00
18	Cn	*Edwardsia* sp.	5	0.01			1	0.00					6	0.01
19	Cn	*Palythoa* sp.	1	0.73			2	2.29					3	3.03
20	Cn	*Virgularia* sp.									1	0.02	1	0.02
21	Ec	*Amphioplus depressus*			2	0.07	1	0.16	2	0.38			5	0.60
22	G	*Calyptraea* sp.									1	0.00	1	0.00
23	G	*Natica* sp.			1	0.06	1	0.03					2	0.09
24	G	*Philine* sp.									1	0.00	1	0.00
25	G	*Rhodopetala rosea*			1	0.00							1	0.00
26	Is	*Cyathura* sp.	2	0.00	1	0.00			4	0.00	2	0.00	9	0.00
27	Le	*Nebalia* sp.	2	0.00	5	0.00			1	0.00	3	0.00	11	0.00
28	N	Nemertea spp.	5	0.02	5	0.00	1	0.00	3	0.01	1	0.00	15	0.03

Monitoring station: U2 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Aglaophamus dibranchis*	1	0.00	1	0.00					2	0.00	4	0.00
30	P	*Capitella* sp.			3	0.01	1	0.00					4	0.01
31	P	*Eteone* sp.									1	0.00	1	0.00
32	P	*Glycera alba*			3	0.02	3	0.00	3	0.02	2	0.01	11	0.04
33	P	*Glycera chirori*					1	0.01					1	0.01
34	P	*Glycinde gurjanovae*	1	0.00	1	0.00			4	0.00	1	0.00	7	0.00
35	P	*Harmothoe* sp.	1	0.00									1	0.00
36	P	*Lumbrineris* sp.					1	0.00					1	0.00
37	P	*Magelona* sp.			1	0.00	2	0.00	1	0.00			4	0.00
38	P	*Malacoceros* sp.									1	0.00	1	0.00
39	P	*Micronephtys sphaerocirrata*	7	0.00	3	0.00	2	0.00	4	0.00	5	0.00	21	0.01
40	P	Nereididae spp.	2	0.02			1	0.00					3	0.02
41	P	*Onuphis eremita*	4	0.04	1	0.00	13	0.08	10	0.05	4	0.06	32	0.22
42	P	*Otopsis* sp.			1	0.00					1	0.00	2	0.00
43	P	*Owenia fusiformis*			1	0.05	4	0.01					5	0.06
44	P	*Paralacydonia paradox*	2	0.00	4	0.00	5	0.00	1	0.00			12	0.01
45	P	*Paraonis* sp.									1	0.00	1	0.00
46	P	*Pectinaria conchilega*							1	0.03			1	0.03
47	P	*Phylo ornatus*	8	0.01	4	0.00	8	0.00	7	0.01	4	0.00	31	0.03
48	P	*Poecilochaetus* sp.			1	0.00	2	0.00					3	0.00
49	P	*Prionospio malmgreni*	1	0.00			8	0.01	2	0.00	1	0.00	12	0.01
50	S	Unidentified juvenile shrimp							1	0.00	1	0.00	2	0.00
51	Sp	Sipuncula spp.	1	0.00	2	0.00	1	0.00	1	0.01	1	0.00	6	0.02
		Column sum	**89**	**2.74**	**131**	**4.54**	**127**	**6.47**	**100**	**3.48**	**81**	**3.50**	**528**	**20.74**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: NM1 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.									1	0.00	1	0.00
2	A	*Byblis* sp.			2	0.00	1	0.00	4	0.00			7	0.00
3	A	*Caprella* sp.	1	0.00									1	0.00
4	A	*Cheiriphotis* sp.			2	0.00			2	0.00	1	0.00	5	0.00
5	A	*Corophium* sp.					2	0.00	3	0.00			5	0.00
6	A	*Maera* sp.							3	0.00			3	0.00
7	B	*Mactra* sp.	1	0.00	2	0.00	4	0.00	1	0.00			8	0.00
8	B	*Paphia undulata*	3	0.04			2	0.06	2	0.07			7	0.17
9	B	*Ruditapes philippinarum*							3	0.08	5	0.03	8	0.11
10	B	*Saccella* sp.			3	0.05	1	0.01	1	0.01			5	0.07
11	C	*Neoxenophthalmus obscurus*			1	0.01	1	0.01			1	0.07	3	0.09
12	Cn	*Anthopleura* sp.							1	0.34			1	0.34
13	Cn	*Cavernularia obesa*					1	0.00	1	3.68			2	3.68
14	Cu	*Eocuma* sp.	2	0.00	1	0.00	1	0.62			1	0.00	5	0.62
15	Ec	*Amphipholis* sp.			1	0.06			7	1.84	1	0.03	9	1.93
16	Ec	*Ophiura pteracantha*							1	0.00			1	0.00
17	N	Nemertea spp.	4	0.00	3	0.01	1	0.04	1	0.00	3	0.11	12	0.15
18	P	*Aglaophamus dibranchis*	1	0.00	1	0.00	2	0.00			2	0.00	6	0.01
19	P	*Aglaophamus sinensis*							1	0.00			1	0.00
20	P	*Cabira incerta*					1	0.00					1	0.00
21	P	*Capitella* sp.	4	0.00	3	0.00	1	0.00	4	0.00	3	0.00	15	0.01
22	P	*Cossurella dimorpha*	1	0.00									1	0.00
23	P	*Ehlersileanira incisa hwanghaiensis*			3	0.00			1	0.00			4	0.00
24	P	*Eteone* sp.			1	0.00			1	0.00			2	0.00
25	P	*Glycera alba*									1	0.01	1	0.01
26	P	*Glycera chirori*	1	0.01									1	0.01
27	P	*Glycinde gurjanovae*					1	0.00					1	0.00
28	P	*Harmothoe* sp.			1	0.00					3	0.00	4	0.00

Monitoring station: NM1 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Laonice cirrata*							1	0.00			1	0.00
30	P	*Linopherus paucibranchiata*									1	0.00	1	0.00
31	P	*Lumbrineris shiinoi*			1	0.00	1	0.00					2	0.00
32	P	*Lumbrineris* sp.							1	0.02			1	0.02
33	P	Maldanidae spp.			1	0.00			2	0.01			3	0.01
34	P	*Mediomastus* sp.							1	0.00			1	0.00
35	P	Nereididae spp.							1	0.00	1	0.00	2	0.00
36	P	*Onuphis eremita*							1	0.01			1	0.01
37	P	*Ophelina acuminata*			1	0.15							1	0.15
38	P	*Piromis congoense*							4	0.04			4	0.04
39	P	*Poecilochaetus* sp.			1	0.00			1	0.00			2	0.00
40	P	*Prionospio ehlersi*	1	0.00									1	0.00
41	P	*Prionospio malmgreni*			1	0.00			2	0.00	1	0.00	4	0.00
42	P	*Sigambra hanaokai*	1	0.00			1	0.00	1	0.00			3	0.00
43	P	*Tharyx* sp.			2	0.00	1	0.00	3	0.00			6	0.00
44	Sp	*Apionsoma trichocephalus*									1	0.00	1	0.00
45	Sp	Sipuncula spp.					1	0.00	4	0.00	1	0.00	6	0.01
		Column sum	**20**	**0.06**	**31**	**0.28**	**23**	**0.74**	**59**	**6.13**	**27**	**0.26**	**160**	**7.47**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

Monitoring station: NM6 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
1	A	*Ampelisca* sp.	10	0.00			3	0.00	1	0.00	4	0.00	18	0.00
2	A	*Ceradocus* sp.					1	0.00					1	0.00
3	A	*Cheiriphotis* sp.	2	0.00	3	0.00	2	0.00	11	0.00	1	0.00	19	0.00
4	A	*Corophium* sp.	2	0.00	1	0.00	3	0.00	1	0.00	2	0.00	9	0.00
5	B	*Angulus emarginatus*	14	0.02	2	0.00			3	0.01	6	0.02	25	0.05
6	B	*Anisocorbula lineata*	2	0.03					1	0.01			3	0.04
7	B	*Diplodonta sowerbyi*							2	0.01			2	0.01
8	B	*Jitlada culter*	2	0.01									2	0.01
9	B	*Mactra* sp.									1	0.00	1	0.00
10	B	*Modiolus metcalfei*							1	0.00			1	0.00
11	B	*Paphia undulata*							1	0.37			1	0.37
12	B	*Saccella* sp.					1	0.02					1	0.02
13	B	*Tellina minuta*	2	0.00									2	0.00
14	B	*Timoclea lionota*	3	0.31									3	0.31
15	C	*Hexapinus granuliferus*			1	0.07							1	0.07
16	C	*Neoxenophthalmus obscurus*			1	0.02			1	0.16			2	0.18
17	C	*Paranursia abbreviata*									1	0.15	1	0.15
18	Cn	*Anthopleura* sp.							1	0.08			1	0.08
19	Cn	*Palythoa* sp.	1	0.03									1	0.03
20	Cn	*Virgularia* sp.	1	0.00									1	0.00
21	Ec	*Amphioplus depressus*	17	1.14	5	0.38	6	0.60	15	0.88	27	1.51	70	4.51
22	G	*Calyptraea* sp.			1	0.00	2	0.51					3	0.51
23	G	Dentaliidae spp.	2	0.00	1	0.00			1	0.00	1	0.00	5	0.01
24	G	*Philine* sp.							1	0.00			1	0.00
25	Hc	*Diogenes* sp.			1	0.06			1	0.00			2	0.06
26	Is	*Cyathura* sp.	1	0.00			2	0.00					3	0.00
27	Le	*Nebalia* sp.	1	0.00	1	0.00							2	0.00
28	N	Nemertea spp.	2	0.00			1	0.00	1	0.00			4	0.00

Monitoring station: NM6 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
29	P	*Aglaophamus dibranchis*	1	0.00									1	0.00
30	P	*Cabira incerta*	2	0.00									2	0.00
31	P	*Capitella* sp.					3	0.00	3	0.00			6	0.00
32	P	*Cirriformia* sp.	12	0.00	1	0.00			5	0.00	6	0.00	24	0.00
33	P	*Cossurella dimorpha*			1	0.00			2	0.00			3	0.00
34	P	*Glycera alba*	1	0.00					2	0.00	1	0.00	4	0.00
35	P	*Glycera chirori*	2	0.00					2	0.01			4	0.01
36	P	*Glycinde gurjanovae*	1	0.00	1	0.00	1	0.00			1	0.00	4	0.00
37	P	*Harmothoe* sp.	5	0.00	2	0.00	3	0.00	3	0.00	4	0.00	17	0.00
38	P	*Isolda* sp.					2	0.00					2	0.00
39	P	*Lumbrineris shiinoi*	2	0.00					2	0.00			4	0.00
40	P	*Lumbrineris* sp.					1	0.00					1	0.00
41	P	*Lysidice ninetta*	2	0.00									2	0.00
42	P	*Magelona* sp.					1	0.00					1	0.00
43	P	Maldanidae spp.	1	0.00			1	0.00					2	0.00
44	P	*Micronephtys sphaerocirrata*	2	0.00	1	0.00			1	0.00	3	0.00	7	0.00
45	P	Nereididae spp.	6	0.00	1	0.00			4	0.00			11	0.00
46	P	*Notomastus* sp.	1	0.00									1	0.00
47	P	*Ophiodromus angustifrons*	1	0.00							1	0.00	2	0.00
48	P	*Owenia fusiformis*	4	0.05	2	0.01	1	0.04	1	0.13	6	0.10	14	0.33
49	P	*Paralacydonia paradox*	2	0.00					6	0.00	4	0.00	12	0.00
50	P	*Phylo ornatus*	3	0.00									3	0.00
51	P	*Piromis congoense*	1	0.00									1	0.00
52	P	*Pista* sp.	4	0.01					2	0.00	4	0.02	10	0.02
53	P	*Poecilochaetus* sp.	3	0.00					3	0.00	1	0.00	7	0.00
54	P	*Prionospio malmgreni*	8	0.01	2	0.00	2	0.00	6	0.00	6	0.01	24	0.02
55	P	*Sigambra hanaokai*	1	0.00	1	0.00							2	0.00
56	P	*Sternaspis scutata*	4	0.00									4	0.00

Monitoring station: NM6 Sampling date: 15/05/2016													
No	Group	Species	1st Grab		2nd Grab		3rd Grab		4th Grab		5th Grab		Row Sum	
			ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.	ind.	wt.
57	P	*Syllis* sp.	1	0.00									1	0.00
58	P	*Tharyx* sp.	11	0.00	1	0.00	3	0.00	20	0.00	3	0.00	38	0.00
59	S	*Alpheus* sp.			1	0.07							1	0.07
60	Sp	*Apionsoma trichocephalus*	2	0.00	4	0.00			3	0.00	1	0.00	10	0.01
61	Sp	*Phascolosoma esculenta*	1	0.00									1	0.00
		Column sum	**146**	**1.61**	**35**	**0.63**	**39**	**1.19**	**107**	**1.68**	**84**	**1.82**	**411**	**6.93**

A = Amphipod, B = Bivalve, C = Crab, Co = Copepod, Cu = Cumacean, Ec = Echinoderm, Eh = Echiuran, F = Fish G = Gastropod, N = Nemertean, P = Polychaete, S = Shrimp, Sp = Sipunculan
ind. = no. of individual / 0.1 m^2; wt. = wet weight, g / 0.1 m^2 wt = 0.00 / 0.1 m^2: The specimen with total biomass less than 0.01 / 0.1 m^2

APPENDIX J

Test Report of PPWQM Ecotoxicological Assessment

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

APPLICANT: **ATAL-Degremont Joint Venture**
Pillar Point STWS,
No 101, Lung Mun Road,
MongHauShek, TuenMun, N.T

ATTN: **Mr. Norman Cheng**

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	1 of 25

Sample Description: **Flow-weighted Composite Water Sample** (which was composited by Wellab Staff, from 24 water samples as received from customer said to be effluent samples from Pillar Point Wastewater Treatment Plant)

Laboratory No.: 24925

Sampling Date: Effluent water samples were collected between 2016-05-19 and 2016-05-20

Sample Received Date: 2016-05-20

Sample No.: 24925-25

Test Requested & Methodology:

Item	Parameter	Ref. Method	Limit of Reporting
I	7-Days Dinoflagellate Growth Inhibition Test Using *Prorocentrum dentatum*	EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test, February 2009	N/A
II	4-Days Settlement Test of Barnacle (*Balanus amphitrite*) Cypris Larvae		N/A
III	14-Days Survival and Growth Test Using the Marine Medaka (*Oryzias melastigma*)		N/A

Remarks: 1) Uncertainty is calculated as 2S.D.
2) N/A = Not Applicable

****

PREPARED AND CHECKED BY:
For and On Behalf of **WELLAB Ltd.**

EVA WONG
Chief Biologist

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	2 of 25

1. SAMPLE INFORMATION

1.1 Sample Information, Receiving and Storage Conditions

Sample Description:	24 water samples as received from customer said to be effluent			
Sampling Date	2016-05-19 and 2016-05-20			
Sample Receive Date	2016-05-20			
Sample Pretreatment	24 water samples were composited in Wellab			
Sample Composite Date:	2016-05-20			
Sample No. & Sample ID:	24925-1)	2016/5/19 10:00	24925-13)	2016/5/19 22:00
	24925-2)	2016/5/19 11:00	24925-14)	2016/5/19 23:00
	24925-3)	2016/5/19 12:00	24925-15)	2016/5/20 00:00
	24925-4)	2016/5/19 13:00	24925-16)	2016/5/20 01:00
	24925-5)	2016/5/19 14:00	24925-17)	2016/5/20 02:00
	24925-6)	2016/5/19 15:00	24925-18)	2016/5/20 03:00
	24925-7)	2016/5/19 16:00	24925-19)	2016/5/20 04:00
	24925-8)	2016/5/19 17:00	24925-20)	2016/5/20 05:00
	24925-9)	2016/5/19 18:00	24925-21)	2016/5/20 06:00
	24925-10)	2016/5/19 18:00	24925-22)	2016/5/20 07:00
	24925-11)	2016/5/19 20:00	24925-23)	2016/5/20 08:00
	24925-12)	2016/5/19 21:00	24925-24)	2016/5/20 09:00
Temperature of Sample(s) at Receipt:	2-6°C			
Sampling Container:	24 20-L plastic bottle			
Composite Sample Volume:	280L			
Composite Sample No & Sample ID:	24925-25 Flow-weighted composite sample			
Test Sample:	24925-25 only			
Sample Storage Condition after Receipt:	Store in dark at 4 ± 2°C until testing			

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	3 of 25

2. 7-Days Dinoflagellate Growth Inhibition Test using *Prorocentrum dentatum*

2.1 Test Method

This 7-day toxicity test on water sample with *Prorocentrum dentatum* was conducted using the EPD WETT Standard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Prorocentrum dentatum*was exposed to the five concentrations of test sample for a 7-day test period. The endpoints were cell density and specific growth rate.

2.2 Summary of Test Sample - Dinoflagellate7-Days Growth Inhibition Test Particulars

Type of Test	Static Non-Renewal
Test Start and End Date (Time)	Start: 2016-05-21 (11:00) End: 2016-05-28 (11:00)
Test Organism:	*Prorocentrum dentatum*
Source:	NIEA Stock Culture
Stock Culture Cultivation:	Stock Culture were Cultured in Same Conditions as Testing Conditions
Test Duration:	7Days
Temperature:	22 ± 1°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	7.5-8.5
Lightand Light Intensity:	"Cool White" Spectrum Fluorescent Light, 3500-4200lx
Light Cycle:	12h Light, 12h Dark
Test Chambers:	150mL Erlenmyer flask
Test Solution Volume:	25mL
Dilution Water:	Seawater collected in Sai Kung Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	5 days Log Phase Growing Cell at Density of 3.0 x 10^5 cell/ mL
Initial Density of Test Organisms per Chamber:	1.2 x 10^4 cell /mL
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	None
Aeration:	None

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

2.3 Summary of Test Sample Dinoflagellate 7-Days Growth Inhibition Test Particulars (Cont.)

Observations:	Colour and Appearance of Culture
Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Nutrient Regime:	f/2 Medium without Silicate
Effect:	Cell density and Specific Growth Rate
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Negative control cell density shall have increased by 16 times in 7 days Coefficient of variation of average growth in control replicate <20%
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS, data were analyzed according to USEPA requirement (version1.8.7.16)

2.4 Summary of Reference Toxicant Dinoflagellate 7-Days Growth Inhibition Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	7-Day EC50 for Cadmium ion determined by CETIS (version1.8.7.16)
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test Sample Toxicity Test

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

2.5 Test Results (Dinoflagellate 7-Days Growth Inhibition Test

- Cell Density on Day 0, Day 1, Day 3 and Day 7

24925-25 Test Concentration (%)	Replicate	Cell Density (cell/mL)			
		Day 0	Day 1	Day 3	Day 7
0 (Negative Control)	1	12000	14000	38000	304000
	2	12000	11000	33000	288000
	3	12000	13000	36000	296000
6.25	1	12000	11000	33000	320000
	2	13000	11000	36000	311000
	3	12000	13000	36000	303000
12.5	1	12000	13000	36000	312000
	2	11000	13000	37000	323000
	3	12000	12000	36000	308000
25	1	12000	12000	37000	311000
	2	12000	13000	35000	284000
	3	13000	12000	37000	322000
50	1	11000	11000	18000	64000
	2	11000	12000	21000	60000
	3	12000	13000	22000	68000
100	1	12000	11000	12000	32000
	2	13000	12000	15000	35000
	3	14000	14000	17000	29000

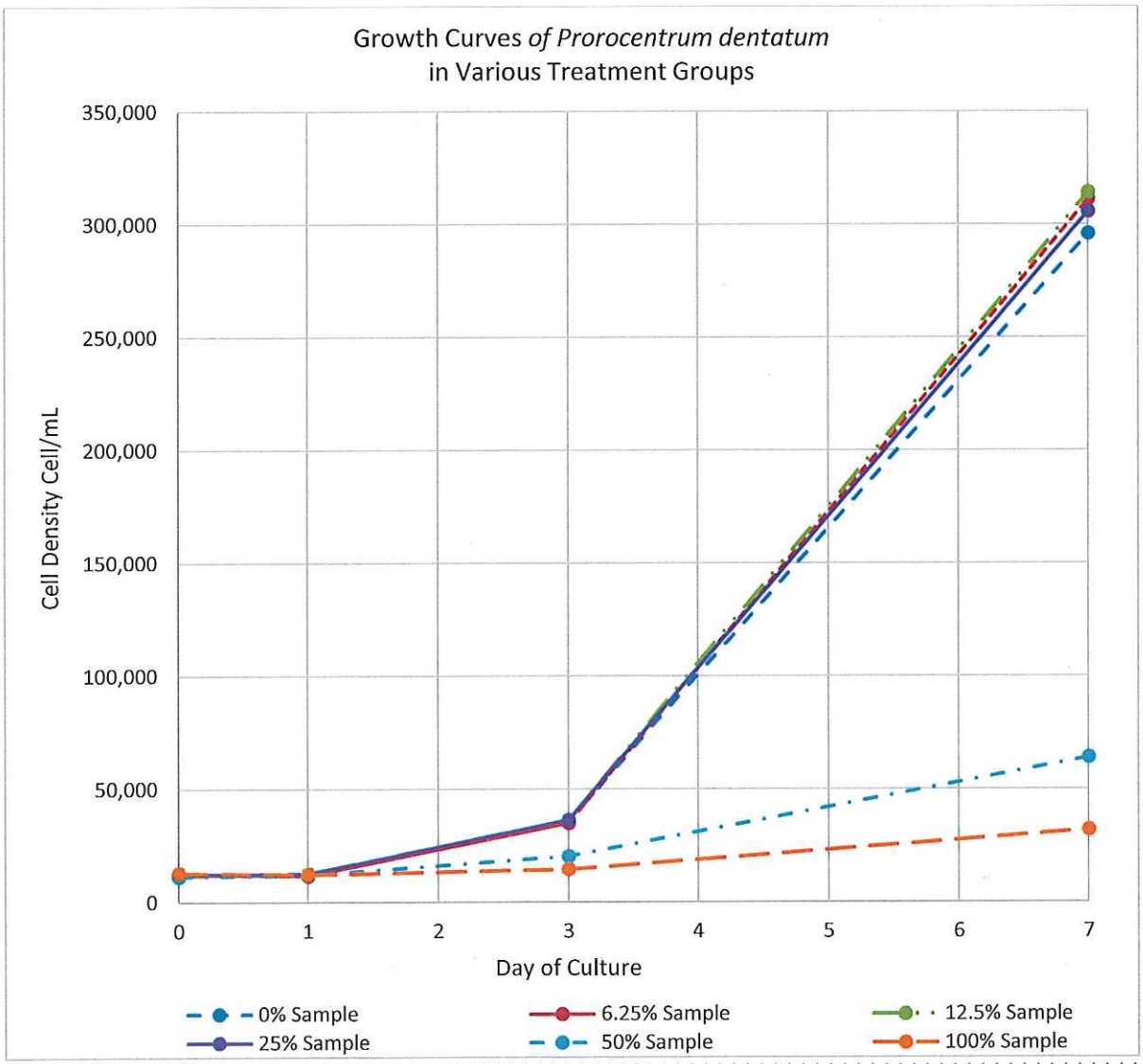
****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	6 of 25

2.6 Graph 1: Growth Curve *of Prorocentrum dentatum*in Various Treatment Groups



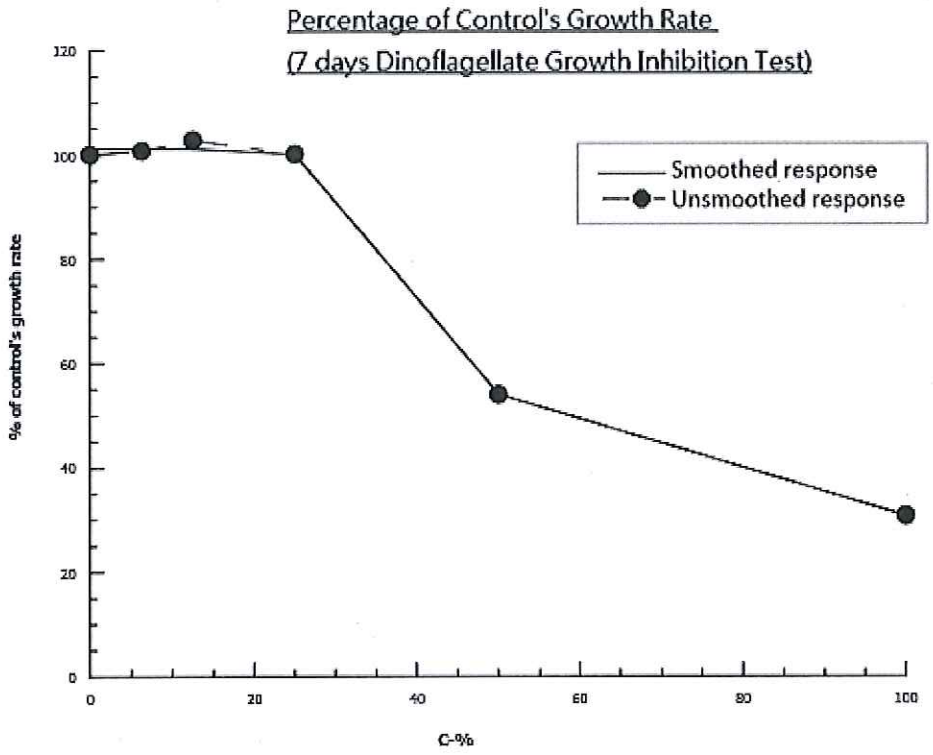
****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	7 of 25

2.7 Percentage of Control's Growth Rate (Dinoflagellate 7-Days Growth Inhibition Test)



****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

2.8 Test Result Summary (Dinoflagellate 7-Days Growth Inhibition Test)

24925-25 Test Concentration (%)	Replicate	Day 7 Specific Growth Rate	Day 7 Percentage Inhibition of Growth Rate (%)	Replicate Mean (%)
0 (Negative Control)	1	0.462	-0.8	0.00
	2	0.454	0.8	
	3	0.458	0.0	
6.25	1	0.469	-2.4	-0.73
	2	0.454	0.9	
	3	0.461	-0.7	
12.5	1	0.465	-1.7	-2.77
	2	0.483	-5.4	
	3	0.464	-1.2	
25	1	0.465	-1.5	-0.10
	2	0.452	1.3	
	3	0.459	-0.1	
50	1	0.252	45.1	46.03
	2	0.242	47.1	
	3	0.248	45.9	
100	1	0.140	69.4	71.93
	2	0.141	69.1	
	3	0.104	77.3	

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

2.9 Test Result Summary and Interpretation of Dinoflagellate 7-Days Growth Inhibition Test

24925-25 Test Concentration (%)	Day 7 Percentage Inhibition of Growth Rate (%)		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	-0.8	0.00	No
	0.8		
	0.0		
6.25	-2.4	-0.73	No
	0.9		
	-0.7		
12.5	-1.7	-2.77	No
	-5.4		
	-1.2		
25	-1.5	-0.10	No
	1.3		
	-0.1		
50	45.1	46.03	Yes
	47.1		
	45.9		
100	69.4	71.93	Yes
	69.1		
	77.3		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration (LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	55.4% (58.1, 52.4)		

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

2.10 QC Records - Dinoflagellate 7-Days Growth Inhibition Test, Test Sample and Reference Toxicant Test Validity Criteria

- Test Organism Performance

Parameters		Results	Control Limit
Dinoflagellate 7-Days Growth Inhibition Test	Negative Control 7-Days Growth Rate	0.458	>0.4
	Coefficient of variation of Average Growth of Negative Control	2.7%	<20%
	96-h EC50	4.10mg/L	3.50-5.78mg/L
	95% Confidence Interval	3.36-4.65mg/L	N/A

2.11 Dinoflagellate 7-Days Growth Inhibition Test Validity Criteria (Water Quality)

24925-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Light Intensity (lx)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	29.9	28.4	7.5	6.9	8.1	7.9	4100	3600	22	21
6.25	29.9	28.3	7.5	6.9	8.1	7.9				
12.5	29.7	28.3	7.5	6.9	8.1	7.9				
25	29.9	28.4	7.6	6.8	8.2	7.9				
50	29.7	28.5	7.5	7.0	8.2	7.8				
100	29.5	28.2	7.5	6.9	8.2	7.9				
Acceptance criteria	28-32		>5mg/L		7.5-8.5		3500-4200lx		21-23°C	

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	11 of 25

3. 4-Days Settlement Test of Barnacle (*Balanus amphitrite*) Cypris Larvae

3.1 Test Method

This 4-day toxicity test on water sample with *Balanus amphitrite* cypris larvae was conducted using the EPD WETT Standard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Balanus amphitrite* cypris larvae was exposed to the five concentrations of test sample for a 4-day test period. The endpoints was percentage settlement.

3.2 Summary of Test Sample 4-Days Settlement Barnacle Cypris Larvae Test Particulars

Type of Test	Static Renewal
Test Start and End Date (Time)	Start: 2016-05-21 (17:00) End: 2016-05-25 (17:00)
Test Organism:	*Balanus amphirite*
Source:	Field Collection
Test Duration:	4 days
Temperature:	25 ± 1°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	8.0± 2
Light and light intensity:	Full Spectrum Fluorescent Light
Light Cycle:	15h Light, 9h Dark
Test Chambers:	Sterilized 6-well Tissue Culture Plates, Non Treated Surface
Test Chamber size:	Well Volume:15.5mL, Surface Area:9.6cm^2
Test Solution Volume:	10mL
Dilution Water:	Seawater collected in Sai Kung Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	Cypris Larvae
Number of Test Organisms per Chamber:	20
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	90% every 24h
Aeration:	None

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

3.3 Summary of Test Sample 4-Days Settlement Barnacle Cypris Larvae Test Particulars (Cont.)

Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Feeding	None
Effect:	Settlement
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Negative Control Mean Percentage Settlement >50%
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS (version1.8.7.16), data were analyzed according to USEPA requirement

3.4 Summary of Reference Toxicant 4-Days Settlement Barnacle Cypris Larvae Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	4-Day EC50 for Cadmium ion Determined by CETIS (version1.8.7.16)
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test Sample Toxicity Test

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	13 of 25

3.5 Test Results

- Test Result Summary (4-Days Settlement Barnacle Cypris Larvae Test)

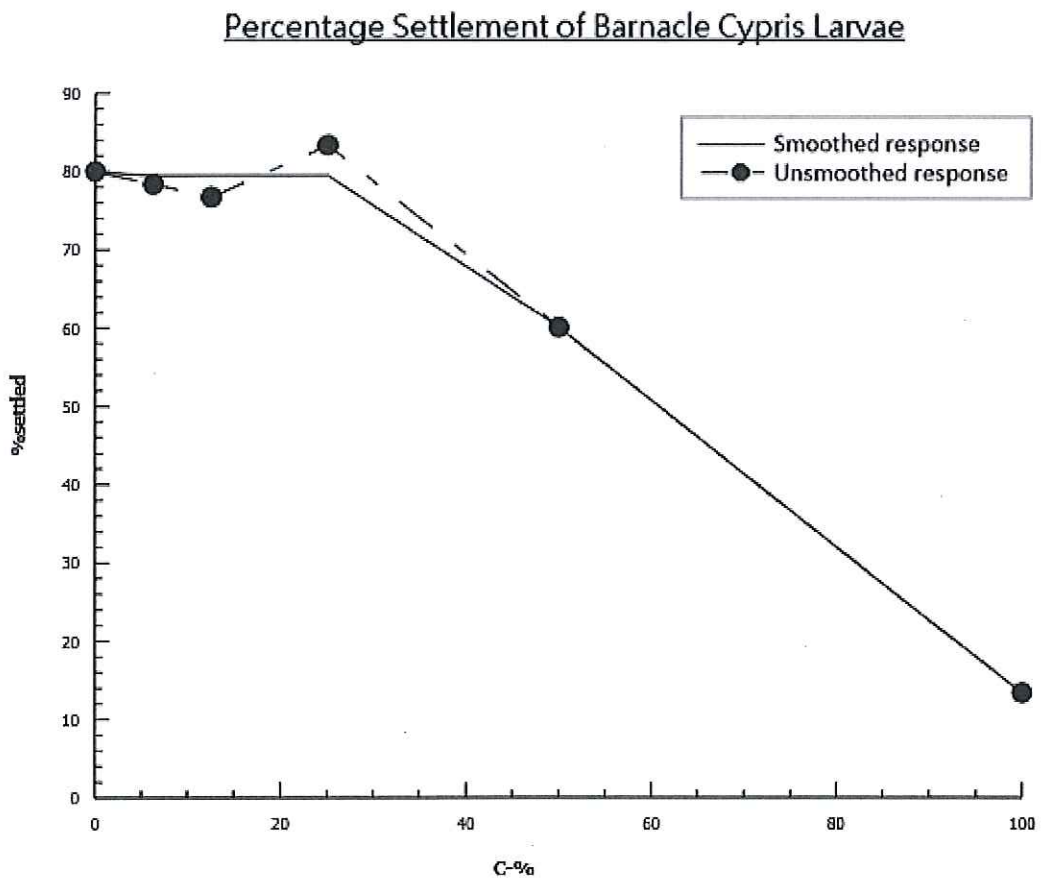
24925-25 Test Concentration (%)	Replicate	Number Exposed	Number Settled	Percentage Settlement (%)	Mean Percentage Settlement (%)
0 (Negative Control)	1	20	16	80	80.0
	2	20	15	75	
	3	20	17	85	
6.25	1	20	15	75	78.3
	2	20	16	80	
	3	20	16	80	
12.5	1	20	17	85	76.7
	2	20	15	75	
	3	20	14	70	
25	1	20	18	90	83.3
	2	20	16	80	
	3	20	16	80	
50	1	20	12	60	60.0
	2	20	11	55	
	3	20	13	65	
100	1	20	3	15	13.3
	2	20	3	15	
	3	20	2	10	

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	14 of 25

3.6 Graph 3: 4-Days Barnacle Cypris Larvae Settlement Test, Percentage Settlement



****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

3.7 Test Result Summary and Interpretation of 4-Days Barnacle Cypris Larvae Settlement Test

24925-25 Test Concentration (%)	Day 4 Percentage Settlement (%)		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	80	80.0	No
	75		
	85		
6.25	75	78.3	No
	80		
	80		
12.5	85	76.7	No
	75		
	70		
25	90	83.3	No
	80		
	80		
50	60	60.0	Yes
	55		
	65		
100	15	13.3	Yes
	15		
	10		
No Observable Effect Concentration (NOEC)	25%		
Lowest Observed Effect Concentration (LOEC)	50%		
EC50 (Upper, Lower Confidence Level)	67.3% (72.8%, 58.9%)		

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	16 of 25

3.8 QC Records (4-Days Settlement Barnacle Cypris Larvae Test)

- 4-Days Barnacle Cypris Larvae Settlement Test, Test Sample and Reference Toxicant Test Validity Criteria (Test Organism Performance)

Parameters		Results	Control Limit
4-Days Barnacle Cypris Larvae Settlement Test	Negative Control 4-Days Mean Percentage Settlement	80.0%	>50%
	96-h EC50	0.38mg/L	0.23-0.65mg/L
	95% Confidence Interval	0.25-0.50mg/L	N/A

3.9 4-Days Barnacle Cypris Larvae Settlement Test (Water Quality)

24925-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	29.8	28.2	7.4	6.8	8.1	7.9	25	24
6.25	29.7	28.5	7.4	7.0	8.1	7.9		
12.5	29.9	28.1	7.4	6.8	8.2	7.9		
25	29.6	28.2	7.5	6.9	8.1	7.9		
50	29.9	28.4	7.5	6.8	8.2	7.9		
100	29.8	28.5	7.4	7.0	8.1	7.9		
Acceptance Criteria	28-32		>5mg/L		7.8-8.2		24-26°C	

Remarks: 1) > = more than
2) N/A = Not Applicable

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	17 of 25

4. 14-Days Survival and Growth Test Using the Marine Medaka (*Oryzias melastigma*)

4.1 Test Method

This 14-day toxicity test on water sample with *Oryzias melastigma* was conducted using the EPD WETT Standard Operating Procedure (2009) "Standard Operating Procedures for Whole Effluent Toxicity Test (WETT)". *Oryzias melastigma* was exposed to the five concentrations of test sample for a 14-day test period. The endpoints were mortality, growth and growth rate.

4.2 Summary of Test Sample Marine Medaka 14-Days Survival and Growth Test Particulars

Type of Test	Static Renewal, 1/2 Water Change Every 2 Days
Test Start and End Date (Time)	Start: 2016-05-21 (12:00) End: 2016-06-04 (12:00)
Test Organism:	*Oryzias melastigma*
Source:	NBRP Stock Culture
Test Duration:	14 Days
Temperature:	28 ± 2°C
Salinity:	30± 2ppt
Dissolved Oxygen:	>5mg/L
pH:	8.0± 0.2
Light:	Full Spectrum Fluorescent Light
Light Cycle:	12h Light, 12h Dark
Test Chambers:	30L Glass Tank
Test Solution Volume:	10L
Dilution Water:	Seawater collected in Sai Kung. Adjusted to 30 ± 2 ppt, filter through a 0.45μm filter and UV sterilized
Age of Test Organisms:	6-8 weeks Post Hatched, Length 0.9-1.3cm
Number of Test Organisms per Chamber:	10
Number of Replicate Chambers per Treatment:	3
Renewal of Test Solution:	1/2 Test Solution Volume Every 48h
Aeration:	Gentle

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	18 of 25

4.3 Summary of Test Sample 14-Days Survival and Growth Test Particulars (Cont.)

Observations:	Fish Behavior and Mortality
Physical / Chemical Data:	Temperature, Dissolved Oxygen, pH, Salinity
Feeding / Feeding Regime:	Feed to Satiation Three Times per Day (TetraBits in the Morning and Evening and Brine Shrimp Larvae in the Afternoon)
Effect:	Mortality, Growth and Growth Rate
Endpoints:	NOEC, LOEC and EC50
Test Acceptability Criteria:	Mean Control Mortality ≤ 15% Significant Increase in Body Weight in Seawater Control at the end of the 14 Days Test
Deviation from Test Method:	No Deviation from Test Method
Statistical Analysis	Comparisons were made according to EPD (2009), Standard Operating Procedures for Whole Effluent Toxicity Test. Data reported as percentages were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Shapiro-Wilk test and equality of variance using Barlett's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. Calculate EC50 using CETIS(version1.8.7.16), data were analyzed according to USEPA requirement

4.4 Summary of Reference Toxicant 14-Days Survival and Growth Test Particulars

Reference Toxicant	Cadmium ion (from Anhydrous Cadmium Chloride)
Stock Solution Concentration	20000mg/L Cd^{2+}
Statistical Analysis	14 days EC50 for Cadmium ion Determined by CETIS (version1.8.7.16)
Test Solution Volume:	20L
Number of Test Organisms per Chamber:	20
Number of Replicate Chambers per Treatment:	5
Other Test Conditions	Same as Test Sample Toxicity Test

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

4.5 Test Results (Marine Medaka 14-Days Survival and Growth Test)

- Fish Weight on Day 0 (mg)

24925-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Weight on Day 0 (mg)										Mean (mg)	Replicate Mean (mg)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	14.5	15.4	15.8	15.3	14	14.7	16.8	14.9	15.7	14.1	15.1	14.99
	2	10	14.7	17.3	14.9	12.6	13.5	14.5	15.4	15.7	17.4	13.9	15.0	
	3	10	16.5	14.6	13.6	12.9	14.7	13.9	15.8	17.4	15.2	14.1	14.9	
6.25	1	10	14.4	15.1	14.5	16.3	16.9	14.7	14	15.8	14.8	13.8	15.0	14.95
	2	10	14.4	13.8	14.1	15.5	14.7	15.3	14.3	16.3	12.9	14.1	14.5	
	3	10	13.6	14.7	16.9	15.4	14.2	16	14.8	16.2	15.2	15.9	15.3	
12.5	1	10	15.1	15.5	16	15.4	14.8	17.2	14.3	15.6	15.8	15.2	15.5	15.11
	2	10	14.7	13.1	15	16.1	15.7	16.8	15.7	16.3	14.2	14.9	15.3	
	3	10	14.6	13.5	15.8	16.7	14.4	15.8	12.5	15.2	13.3	14.2	14.6	
25	1	10	14.5	16.5	14.6	16.7	14.6	14.7	14.9	14.9	15.1	14.3	15.1	14.99
	2	10	14.6	17.6	15.9	15.7	14.6	14.4	13.1	16	14.5	14.8	15.1	
	3	10	16.2	12.8	13.7	15.7	14	17.6	15.4	14.6	14.1	13.7	14.8	
50	1	10	15.4	13.8	14	17.7	14	16.9	16.4	13.8	13.8	14.8	15.1	14.91
	2	10	14.3	15.5	12.8	13.6	13.2	16.5	12.9	15.7	15.2	16.7	14.6	
	3	10	14.5	14.2	13.3	14.2	15	15.7	15.7	15.4	16.8	15.4	15.0	
100	1	10	15.2	14.9	12.9	16.4	17.2	13.6	16.2	13.4	14.4	14.8	14.9	14.81
	2	10	13	15.7	14.5	13.5	14.7	14.4	15.3	14.9	15.9	14.9	14.7	
	3	10	14.4	12.7	12.6	14.2	16.2	14.9	17.6	15.5	16.6	13.7	14.8	

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	20 of 25

4.6 Fish Length on Day 0 (mm)

24925-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Length on Day 0 (mm)										Mean (mm)	Replicate Mean (mm)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	10	12	11	11	10	10	10	9	13	12	10.8	10.73
	2	10	12	11	10	11	13	10	9	9	10	10	10.5	
	3	10	12	12	11	11	11	13	9	10	10	10	10.9	
6.25	1	10	10	13	11	12	12	11	11	11	11	11	11.3	11.13
	2	10	11	11	11	11	12	12	11	10	11	12	11.2	
	3	10	10	12	11	12	12	11	11	10	10	10	10.9	
12.5	1	10	10	9	11	12	12	11	11	10	10	11	10.7	10.63
	2	10	11	11	12	12	11	9	10	10	11	9	10.6	
	3	10	10	12	12	12	11	10	9	10	10	10	10.6	
25	1	10	12	11	9	10	10	10	12	11	11	10	10.6	10.83
	2	10	10	11	12	12	10	11	11	10	11	10	10.8	
	3	10	10	13	12	11	11	12	11	10	10	11	11.1	
50	1	10	10	11	12	11	11	10	13	11	10	10	10.9	10.70
	2	10	10	11	12	12	10	9	11	10	10	11	10.6	
	3	10	9	10	11	12	10	11	11	11	10	11	10.6	
100	1	10	10	12	12	11	10	11	11	10	9	11	10.7	10.50
	2	10	11	9	11	11	12	10	10	11	10	11	10.6	
	3	10	10	9	9	10	10	11	12	12	9	10	10.2	

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

4.7 Fish Weight on Day 14 (mg)

24925-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Weight on Day 14 (mg)										Mean (mg)	Replicate Mean (mg)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	40.5	42.3	39.5	47.1	43.6	45.7	42.1	43.0	41.6	39.0	42.4	42.93
	2	10	40.2	44.4	46.8	41.2	39.5	36.6	43.0	49.3	40.1	37.7	41.9	
	3	10	42.4	47.8	47.8	45.1	40.1	42.5	45.7	43.5	43.9	45.9	44.5	
6.25	1	10	36.9	38.1	40.9	40.6	40.2	42.7	43.7	39.8	43.0	36.2	40.2	41.66
	2	10	43.4	43.0	44.9	37.4	46.6	39.7	42.8	45.4	41.5	39.6	42.4	
	3	10	42.4	42.6	43.9	44.9	42.4	45.8	40.8	43.7	37.9	39.1	42.4	
12.5	1	10	45.5	39.7	41.0	43.5	44.3	45.4	47.0	42.3	44.6	41.4	43.5	41.97
	2	10	37.7	39.6	40.7	42.8	42.2	37.4	41.6	40.6	40.5	40.4	40.4	
	3	10	40.3	43.6	43.9	41.7	39.2	38.2	42.6	44.9	45.9	40.7	42.1	
25	1	10	39.3	43.9	42.9	43.9	44.1	43.4	42.9	45.6	42.5	45.7	43.4	43.40
	2	10	43.8	45.2	45.1	40.9	46.6	46.1	44.3	44.8	42.7	41.4	44.1	
	3	10	45.0	47.1	44.8	43.2	43.9	43.3	39.6	37.7	40.4	41.9	42.7	
50	1	10	41.5	38.3	38.8	40.3	40.4	38.9	38.6	39.0	37.0	42.7	39.6	41.01
	2	10	43.5	40.0	46.7	45.3	40.9	48.1	43.0	42.1	45.8	42.5	43.8	
	3	10	40.1	39.0	39.8	40.9	39.1	40.0	41.9	40.6	37.6	38.0	39.7	
100	1	10	26.1	29.1	28.5	35.5	33.7	34.6	38.1	31.9	31.8	34.4	32.4	32.08
	2	10	30.2	34.2	34.2	29.2	32.5	28.9	30.5	33.5	32.5	32.9	31.9	
	3	10	30.7	36.0	36.3	34.6	27.5	27.3	28.7	33.6	34.4	30.9	32.0	

4.8 Fish Length on Day 14 (mm)

24925-25 Test Concentration (%)	Replicate	No. of Fish per Replicate	Fish Length on Day 14 (mm)										Mean (mm)	Replicate Mean (mm)
			1	2	3	4	5	6	7	8	9	10		
0 (Negative Control)	1	10	16	17	15	14	15	13	16	15	14	17	15.2	14.97
	2	10	17	15	14	15	14	14	16	15	15	14	14.9	
	3	10	13	16	15	15	15	14	14	14	15	17	14.8	
6.25	1	10	16	15	15	15	14	15	15	15	15	13	14.8	14.83
	2	10	13	17	15	15	12	15	16	14	14	15	14.6	
	3	10	13	15	15	15	16	14	15	17	15	16	15.1	
12.5	1	10	13	13	15	14	15	15	16	15	17	16	14.9	15.20
	2	10	14	14	15	17	15	16	17	14	17	16	15.5	
	3	10	15	14	15	17	15	16	16	15	15	14	15.2	
25	1	10	16	15	16	17	16	15	15	14	13	17	15.4	15.17
	2	10	15	14	14	15	14	16	14	15	15	14	14.6	
	3	10	14	15	17	16	15	17	16	14	17	14	15.5	
50	1	10	14	14	16	16	15	16	16	15	16	14	15.2	14.97
	2	10	15	15	15	17	14	15	14	14	15	17	15.1	
	3	10	15	14	16	13	15	15	13	15	15	15	14.6	
100	1	10	14	12	12	13	16	13	14	12	15	14	13.5	13.23
	2	10	10	11	12	15	12	13	13	10	13	15	12.4	
	3	10	12	12	15	14	14	14	16	16	13	12	13.8	

****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	22 of 25

4.9 Test Result Summary (Marine Medaka 14-Days Survival and Growth Test)

24925-25 Test Concentration (%)	Replicate	Survival (%)	Mortality (%)	Average Growth Rate (mg/day)	Replicate Mean (mg)	Percentage Increase in Weight (%)	Replicate Mean (%)
0 (Negative Control)	1	100	0	1.95	2.00	180.7	186.38
	2	100	0	1.92		179.4	
	3	100	0	2.11		199.1	
6.25	1	100	0	1.80	1.91	167.5	178.78
	2	100	0	1.99		191.8	
	3	100	0	1.93		177.0	
12.5	1	100	0	2.00	1.92	180.6	177.86
	2	100	0	1.79		164.6	
	3	100	0	1.96		188.4	
25	1	100	0	2.02	2.03	187.9	189.46
	2	100	0	2.07		191.6	
	3	100	0	1.99		188.8	
50	1	100	0	1.75	1.86	162.6	175.35
	2	100	0	2.08		199.1	
	3	100	0	1.76		164.3	
100	1	100	0	1.25	1.23	117.2	116.64
	2	100	0	1.23		117.0	
	3	100	0	1.23		115.6	

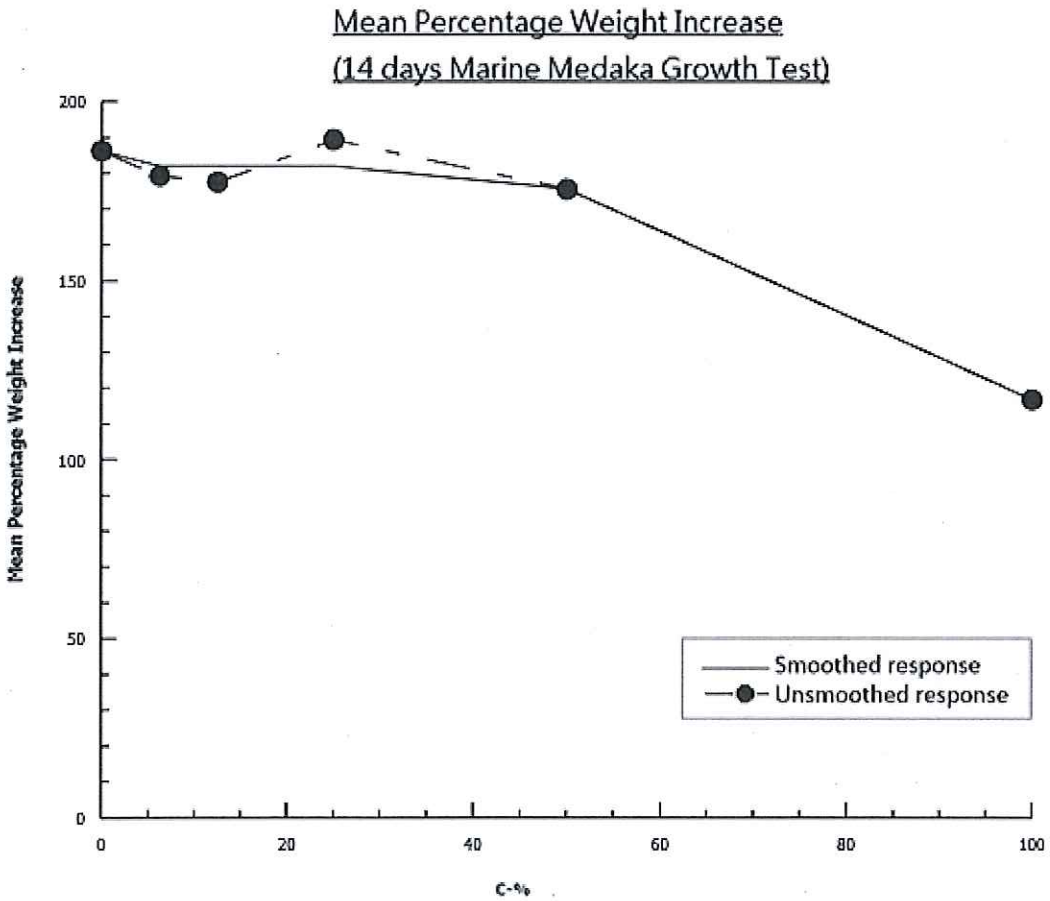
****

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	23 of 25

4.10 Graph 4: Marine Medaka 14-Days Survival and Growth Test Mean percentage Weight Increase



****

WELLAB 匯力 Testing & Research

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15

4.11 Test Result Summary and Interpretation of Marine Medaka 14-Days Survival and Growth Test

24925-25 Test Concentration (%)	Average Growth Rate (mg/day)			Percentage Increase in Weight (%)		
	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control	Replicate results	Mean	Significant Different ($p<0.05$) from Negative Control
0 (Negative Control)	1.95	2.00	No	180.7	186.38	No
	1.92			179.4		
	2.11			199.1		
6.25	1.80	1.91	No	167.5	178.78	No
	1.99			191.8		
	1.93			177.0		
12.5	2.00	1.92	No	180.6	177.86	No
	1.79			164.6		
	1.96			188.4		
25	2.02	2.03	No	187.9	189.46	No
	2.07			191.6		
	1.99			188.8		
50	1.75	1.86	No	162.6	175.35	No
	2.08			199.1		
	1.76			164.3		
100	1.25	1.23	Yes	117.2	116.64	Yes
	1.23			117.0		
	1.23			115.6		
No Observable Effect Concentration (NOEC)	50%			50%		
Lowest Observed Effect Concentration (LOEC)	100%			100%		
EC50	>100%			>100%		
EC25 (Upper, Lower Confidence Level)	75.0% (85.4%, 55.7%)			76.3% (86.2%, 54.4%)		

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable

****

WELLAB 匯力 Testing & Research

WELLAB LIMITED
Rms 1214, 1502, 1516, 1701 & 1716,
Technology Park, 18 On Lai Street,
Shatin, N.T., Hong Kong.
Tel: 2898 7388 Fax: 2898 7076
Website: www.wellab.com.hk

TEST REPORT

Report No.:	24925
Date of Issue:	2016-06-15
Date Received:	2016-05-20
Date Tested:	2016-05-20
Date Completed:	2016-06-15
Page:	25 of 25

4.12 QC Records

- Marine Medaka Sample and Reference Toxicant Test Validity Criteria (Test Organism Performance)

Parameters		Results	Control Limit
14-days Survival and Growth Toxicity Test	Initial Length	9-13mm	9-13mm
	Negative Control Survival	100%	Average≥85%
	Negative Control Growth	Significant Growth	Significant Growth
Reference Toxicant Test	Initial Length	5 length groups (9, 10, 11, 12, 13mm), 4 per tank	5 length groups (9, 10, 11, 12, 13mm), 4 per tank
	Negative Control Survival	100%	Average≥90%
	14-Days EC50	1.93mg/L	1.18-3.11mg/L
	95% Confidence Interval	1.89-1.96mg/L	N/A

4.13 Marine Medaka Survival and Growth Test Validity Criteria (Water Quality)

24925-25 Test Concentration (%)	Salinity (ppt)		Dissolved Oxygen (mg/L)		pH (pH unit)		Temperature (°C)	
	Max	Min	Max	Min	Max	Min	Max	Min
0 (Negative Control)	29.9	28.4	7.6	6.9	8.1	7.8	29	28
6.25	29.9	28.2	7.6	6.9	8.2	7.8		
12.5	29.9	28.4	7.5	6.9	8.2	7.8		
25	29.9	28.2	7.5	6.8	8.2	7.8		
50	29.8	28.1	7.6	6.9	8.1	7.9		
100	29.8	28.2	7.5	6.9	8.2	7.9		
Acceptance Criteria	28-32		>5mg/L		7.8-8.2		26-30°C	

Remarks: 1) < = less than, > = more than
2) N/A = Not Applicable

**********END OF REPORT**********