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Report No.: 0041/17/ED/0315B

Monthly EM&A Report May 2018

Client : Drainage Services Department

Project : Contract No. CM 14/2016
Environmental Team for Operational
Environmental Monitoring and Audit for Siu
Ho Wan Sewage Treatment Works

Report No.: : 0041/17/ED/0315B

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Reviewed by: Cyrus C. Y. Lai

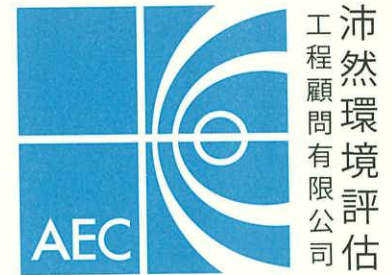
Certified by:

A handwritten signature in black ink, appearing to be "Colin K. L. Yung", written over a horizontal line.

Colin K. L. Yung
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Our Ref: 1458/18-0099

15 June 2018

By Post and E-mail

Drainage Service Department
Projects and Development Branch
Consultants Management Division
42/F, Revenue Tower,
5 Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. CHUNG Ching Hong, Romeo (E/CM9)

Dear Sir,

**RE: CONTRACT NO. CM 13/2016
INDEPENDENT ENVIRONMENTAL CHECKER FOR OPERATIONAL ENVIRONMENTAL
MONITORING AND AUDIT FOR SIU HO WAN SEWAGE TREATMENT WORKS (SHWSTW)
MONTHLY ENVIRONMENTAL MONITORING AND AUDIT (EM&A) REPORT (MAY 2018)**

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for May 2018 (Report No.: 0041/17/ED/0315B) received from the Environmental Team (ET), Messrs. Fugro Technical Services Ltd., on 15 June 2018 via email.

We would like to inform you that we have no adverse comment on the captioned submission and hereby verify the same in accordance with Condition 4.3 of the Environmental Permit (EP) for the captioned Project (Permit No.: EP-076/2000).

Should you have any queries, please feel free to contact the undersigned, or our Mr. Rodney IP at 2815 7028.

Yours faithfully,

For and on behalf of
Allied Environmental Consultants Ltd.

Grace M. H. KWOK
Independent Environmental Checker

GK/ri/rc

c.c. Fugro Technical Service (ET Leader)
AECOM

Attn: Mr. Colin YUNG
Attn: Ms. Joanne TSOI

(By E-mail)
(By E-mail)

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- Appendix C Event and Action Plan for Air Quality Monitoring**
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EXECUTIVE SUMMARY

This Monthly Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. CM 14/2016 – “Environmental Monitoring and Audit for Operation of Siu Ho Wan Sewage Treatment Works” (hereafter referred to as “the Contract”) for the Drainage Services Department (DSD) of Hong Kong Special Administrative Region. Fugro Technical Services Limited (hereafter referred to as “FTS”) was appointed as the Environmental Team (ET) by DSD, to implement the Environmental Monitoring & Audit (EM&A) programme in accordance with the Operational EM&A Plan of the Contract.

The Contract is part of the “Upgrading of Siu Ho Wan Sewage Treatment Works” (hereinafter referred as “the Project”) which was classified as “Designated Project” under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap 499) and Environmental Impact Assessment (EIA) Report (Register No. EIAR-124BC) was completed in September 1997. The current Environmental Permit (EP) No. EP-076/2000 was issued in August 2000 to DSD.

In accordance with the EP, an approved operational EM&A Plan was submitted. According to the approved EM&A plan, air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis of H₂S, in addition, water quality monitoring, sediment quality monitoring, benthic survey, Chinese White Dolphin (CWD) monitoring and waste management are the key environmental concern of the Project.

This is the tenth Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 May 2018 to 31 May 2018 (the “reporting period”).

Breaches of Action and Limit Levels

Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 2 and 7 May 2018. No exceedances of Action/Limit levels at Air Sensitive Receivers (ASR) were recorded and no non-compliance of odour monitoring at ASR were recorded in the reporting period.

No Water quality monitoring, sediment quality monitoring and benthic survey were carried out in the reporting period. No specific Action/Limit level has to be followed since the purpose of the monitoring is to collect data for future purpose.

Compliant Log

There was no complaint received in relation to the environmental impact during the report period.

Notifications of Summons and Successful Prosecutions

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

Summary of the Environmental Mitigations Measures

Mitigation measures specified in the EP and EIA Report such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust was implemented during the reporting period.

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Future Key Issues

The key issues to be considered in the coming reporting month include:

Potential environmental impacts arising from the operation of Siu Ho Wan Sewage Treatment Works (SHWSTW) are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of CWDs.

During this reporting period, H₂S data collected (total 2 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW as the wind direction during the measurement was in a non-ideal direction (N) or interfered by other dominant odour source in the surrounding environment (e.g. gasoline). Due to inadequacy of representative data, current H₂S measurement and olfactometry analysis was considered as unsuitable way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). In order to assess whether SHWSTW is the major H₂S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H₂S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.

Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

1. INTRODUCTION

1.1 Background

- 1.1.1 The Project "Upgrading of Siu Ho Wan Sewage Treatment Works" is to upgrade SHWSTW from the preliminary treatment level to Chemically Enhanced Primary Treatment (CEPT) level with Ultraviolet (UV) disinfection facilities. The Project is required to comply with the Environmental Permit (EP) in respect of the construction and operation phases of the Plant.
- 1.1.2 Under the EIAO, the Project was classified as "Designated Project". The Environmental Impact Assessment (EIA) study was completed in September 1997 with the EIA Report of Register No. EIAR-124BC, Operational Environmental Monitoring and Audit (EM&A) Plan and the EP of No. EP-076/2000 was issued in August 2000 to Drainage Services Department (DSD).
- 1.1.3 The CEPT part has been completed and was put into operation in March 2005. The UV disinfection works were substantially completed in December 2006. It is considered that the operation of the Project shall be deemed to start when the UV disinfection facilities have been completely installed and tested.

1.2 Project Description

- 1.2.1 The project proponent was DSD. AECOM was commissioned by DSD as the Engineer for the Project. Allied Environmental Consultants Limited (AEC) was commissioned by DSD as the Independent Environmental Checker (IEC) in the operation phase of the Project. FTS was appointed as the ET by DSD to implement the EM&A programme for the operation phase of the Project including air quality monitoring, water quality monitoring, sediment quality and benthic survey and CWD monitoring.

1.3 Project Organization

- 1.3.1 The project organization for environmental works is shown in **Appendix A**. The contact person and telephone numbers of key personnel for the captioned project are shown in **Table 1.1**.

Table 1.1 Contact Persons and Telephone Numbers of Key Personnel

Organization	Role	Contact Person	Telephone No.	Fax No.
DSD	Project Proponent Representative	Mr. Romeo Chung	2594 7266	3104 6426
AECOM	Engineer Representative (ER)	Ms. Joanne Tsoi	3922 9423	3922 9797
AEC	Independent Environmental Checker (IEC)	Ms. Grace Kwok	2815 7028	2815 5399
FTS	ET Leader (ETL)	Mr. Colin Yung	3565 4114	2450 8032

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1.4 Work Undertaken during the Report Period

1.4.1 During this reporting period, the principal work activities included:

- Perform comprehensive operation and maintenance services for the electrical, mechanical and electronic systems/equipment at SHWSTW.
- Alleviate as far as practicable the impact that the facilities and sewage systems imposed on the environment of Hong Kong.

2. AIR QUALITY MONITORING

2.1 Methodology of H₂S Concentration Monitoring

2.1.1 15-min H₂S concentration was measured using a Jerome 631-X analyzer. This analyzer is capable of measuring H₂S concentration in the range of 1 ppb to 50 ppm with a resolution of 1 ppb and operates within a temperature range of 0°C to 40°C at an air flow rate of 0.15 L/min. Odour gas samples were drawn by built-in a suction pump of the analyzer and passed through a gold film sensor. The trace level of H₂S of the samples were determined electrochemically on the gold film sensor. Meteorological conditions including temperature, wind speed, wind direction and relative humidity were also measured at the time of the monitoring. Table 2.1 summarizes the equipment used in H₂S monitoring.

Table 2.1 Equipment used for H₂S Concentration Monitoring

Equipment	Manufacturer / Model	Serial Number	Sensor Number	Calibration Date	Next Calibration Date
Gold Film Hydrogen Sulphide Analyzer	JEROME X631 0003	2966	14-11-23-R2D	2 June 2017	1 June 2018

2.2 Methodology of Odour Patrol Monitoring

2.2.1 Odour patrol monitoring was carried out in accordance with the European Standard method: BS EN13725, to ensure the odour sensitivities of all patrol members are within 20-80 ppb/V. Environmental conditions were record as follows:

- i. Prevailing Weather Condition;
- ii. Wind Direction;
- iii. Wind Speed;
- iv. Location where Odour is detected;
- v. Source of Odour detected;
- vi. Perceived intensity of Odour detected;
- viii. Duration of Odour detected; and
- ix. Characteristics of Odour detected

The perceived intensity is classified into 5 categories as shown in **Table 2.2** below.



Table 2.2 Categories of Odour Intensity

Odour Level	Odour Intensity	Classification Criteria
0	Not detected	No odour perceives or an odour so weak that it cannot be readily characterised or described
1	Slight	Identifiable odour, barely noticeable
2	Noticeable	Identifiable odour, noticeable
3	Strong	Identifiable odour, strong
4	Extreme	Severe odour

2.3 Methodology of Odour Sampling and Olfactometry Analysis

- 2.3.1 Odour gas samples were collected in a Nalophan sampling bag placed inside a vacuum air-tight sampler using passive sampling technique. Approximately 60 liter of gas sample was collected at each sampling. All samples collected on the sampling day were returned to laboratory for olfactometry analysis within 24 hours and analyzed within 2 hours upon receiving.
- 2.3.2 ALS Technichem (HK) Pty Ltd. (HOKLAS Reg. No. 066), was appointed to be the laboratory for olfactometry analysis of the gas sample.
- 2.3.3 The odour concentration of the samples were determined by Forced-choice Dynamic Olfactometer in accordance with the European Standard Method: BS EN13725. Testing were also performed by a panel of six members who have been trained to comply with the requirement of European Standard Method: BS EN13725. All testing were completed within 24 hours upon sampling.

2.4 Monitoring Location

- 2.4.1 H₂S concentration monitoring, odour patrol monitoring and odour sampling were carried out at ASR, Cheung Tung Road near the Bus Repot at the west of the Siu Ho Wan Treatment Plant. The location of ASR is shown in **Figure 1**.

2.5 Monitoring Frequency and Duration

The durations and frequencies of H₂S concentration measurement, odour patrolling and odour sampling are summarized in **Table 2.3** below.

Table 2.3 Durations and Frequencies of Air Quality Monitoring Programme

	Duration	Frequency
H ₂ S concentration monitoring	15 minutes	¹ Weekly basis for 6 months during the initial operation stage
Odour patrol		
Odour sampling for olfactometry analysis	³ 15 minutes	² First week of the odour patrol monitoring

Remark:

- 1) In case excessive odour nuisance was detected during the odour patrol monitoring or the standard of the 5 odour units cannot be complied with during the odour panel monitoring, the odour patrol monitoring and H₂S concentration monitoring shall be extended for a period of three months to cater for the warm-up period of the functioning of the additional mitigation measures.

- 2) In case the relationship between H₂S concentration (ppb) with the odour unit (OU/m³) cannot conclude from the correlation study carried out at the first week of the odour patrol monitoring due to invalid data, additional odour sampling for olfactometry analysis shall be carried out for the correlation study.
- 3) Sufficient air samples (approximate 60L) may be collected in less than 15 minutes during odour sampling.

2.5.1 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

2.6 Event and Action Plan

2.6.1 Action and limit levels for air quality monitoring are presented in **Table 2.4**.

Table 2.4 Action and Limit Levels for Air Quality Monitoring

Parameter	Action	Limit
Odour	One complaint received for specific odour event	Two or more independent complaints receive for specific odour event

2.6.2 The event and action plan for air quality monitoring is provided in **Appendix C**.

2.7 Quality Assurance and Quality Control

2.7.1 A control sample was collected by purging odour-free nitrogen gas from a certified gas cylinder on site at each sampling.

2.7.2 Calibration of the analyzer is conducted every year at the laboratory of the manufacturer. The calibration certificates for the analyzers are shown in **Appendix D**.

2.7.3 In order to ensure the analyzer is functioning properly, manual sensor regeneration and zero adjustment were performed before each set of odour monitoring.

2.8 Monitoring Results and Observations

2.8.1 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 2 and 7May 2018.

2.8.2 The meteorological data including temperature, wind speed and direction of the reporting period at ASR is summarised in **Table 2.5**.



Table 2.5 Summary of Meteorological Data in Reporting Period

Date	Time	Temperature (° C)	Relative Humidity (%)	Wind Direction	Wind speed (km/h)
2 May 2018	09:55 – 10:10	29.0	80.0	N	0.9
7 May 2018	10:02 – 10:17	28.0	79.0	E	1.2

2.8.3 The monitoring results in the reporting period are summarised in **Table 2.6**. Graphical plots of results and details of monitoring data are shown in **Appendix E**.

Table 2.6 Summary of Air Quality Monitoring Result in Reporting Period

Monitoring Location	Monitoring Parameter				
	H ₂ S concentration* (ppb)		Odour Patrol^ (Odour Level)	Olfactometry Analysis of odour (OU/m ³)	
	Range	Average	Range	Range	Average
ASR	1 - 3	2.0	1 - 1	13 - 17	15

Remark:

*The value of H₂S Concentration was taken in average of 15 min for each measurement.

^Odour Level: 0 – Not detected, 1 – Slight, 2 – Moderate, 3 – Strong, 4 – Extreme

- 2.8.4 According to the approved EM&A plan, a correlation study has to be carried out to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). However in the reporting period, H₂S data collected in reporting period (total 2 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW. In the measurement conducted on 2 May 2018, non-ideal wind direction (N) was recorded during the measurement. In other words, the wind direction was not from SHWSTW towards ASR.
- 2.8.5 For the measurements on 7 May 2018, only non-target smell (gasoline) was recorded from onsite odour patrol which indicated that no effluent smell could be recorded during the measurement and the result of olfactometry analysis to nature of odour was non-specified. Hence, the result (17 OU) from olfactometry analysis could be considered interfered and dominated by non-target smell from the surrounding environment. Therefore the measured H₂S data from the reporting period could not reflect the odour impact from SHWSTW during operational phase and correlation between the H₂S concentration and the olfactometry analysis was unable to be drawn in the reporting period.
- 2.8.6 Due to non-ideal wind direction (e.g. N) or domination of non-target smell (e.g. gasoline) during the measurements conducted in past 10 months, inadequacy of representative data was result in the past 10 months. Current H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). In order to assess whether SHWSTW is the major H₂S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H₂S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.
- 2.8.7 No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period. Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the compliance of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore, no non-compliance of odour monitoring at ASR were recorded in the reporting period.
- 2.8.8 Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.
- 2.8.9 In addition to the specific sources of odour (e.g. gasoline) recorded in the reporting period that would contribute to the odour nuisance at ASR, some other odour sources in neighbouring environment such as nearby Refuse Transfer Station might also affect the results of H₂S concentration monitoring and odour monitoring.
- 2.8.10 Odour mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment unit prior to stack exhaust were implemented during the reporting period.

3. WATER QUALITY MONITORING

3.1 Monitoring Location

3.1.1 In accordance with Section 5 of the EM&A Plan, water quality monitoring should be carried out at 8 designated monitoring locations (2 impact stations and 6 control stations) during the first five years of the operational phase of the Project. The monitoring locations shall be the same monitoring locations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring location is shown in **Table 3.1**. The monitoring locations of water quality monitoring are also shown in **Figure 2**.

Table 3.1 Location of Water Quality Monitoring

Sampling Location		Easting	Northing
A	The Brothers, Control Station	816 100	822 500
B	The Brothers, Control Station	816 680	822 440
C	Siu Ho Wan Outfall, Impact Station	816 800	820 180
D	Siu Ho Wan Outfall, Impact Station	817 160	820 360
E	Cheung Sok, Control Station	819 817	821 655
F	Cheung Sok, Control Station	820 158	821 922
G	Tai Ching Chau, Control Station	822 214	822 692
H	Tai Ching Chau, Control Station	822 494	822 939

3.2 Monitoring Parameter

3.2.1 The monitoring parameters for water quality monitoring are summarized in **Table 3.2**.

Table 3.2 Parameters for Water Quality Monitoring

Monitoring Parameters	
In-situ Measurement	Laboratory Analysis
Dissolved oxygen (mg/L)	<i>E. coli</i> (cfu/100ml)
Temperature (degree Celsius)	5-day BOD (mg/l)
pH value	Suspended Solids (mg/l)
Water depth (m)	Ammonia as N (mg/l)
Salinity (ppt)	Nitrate as N (mg/l)
Turbidity (NTU)	Nitrite as N (mg/l)
Current Speed (m/s)	Total inorganic nitrogen (mg/l)
Current Direction (degree magnetic)	Total phosphorus (soluble and particulate) (mg/l)



3.2.2 Apart from the parameters listed in the **Table 3.2**, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena shall be also recorded.

3.2.3 The tidal data will be obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by the Hydrographic Office of Marine Department. Location of the tide gauge is shown in **Figure 3**.

3.3 Monitoring Equipment

3.3.1 A multifunctional meter (YSI 6920 V2/ Aqua TROLL 600) was used to measure dissolved oxygen (DO), concentration, DO saturation, temperature, salinity, pH and turbidity, simultaneously at the same location and water depth. An Acoustic Doppler Current Profiler (ADCP) which integrated with echo sounder function was used to measure water depth, current velocity (speed and direction). The measured data by ADCP will then be downloaded on site to computer on board. The measured water depth data by ADCP shall be electronically logged and available for output. All measurement data from the multiparameter monitoring device and ADCP will be integrated with the GPS data from the DGPS logging device, so that data collected at a specific time and location can be shown. The water sampler shall be tied with the multiparameter monitoring device (with water depth probe to determine the exact sampling depth at which a sample is collected). The equipment employed for the monitoring and sampling and their specifications are presented in **Table 3.3**.

Table 3.3 Water Quality Monitoring and Sampling Equipment

Parameter	Equipment	Model	Range	Equipment Accuracy
Temperature, Dissolved Oxygen, salinity, pH, Turbidity, Sampling Depth	Water Quality Monitoring Device	1) YSI 6920V2-2-M Sonde 2) Aqua TROLL 600 Multiparameter Sonde	Temp: -5 to 50°C DO: 0-50mg/L DO%: 0-500% Sal: 0 to 70 ppt pH: 0 to 14 pH units Turb: 0-1000NTU Depth: 0-61 meters	Temp: ±0.15°C DO: ±0.1mg/L or 1% (whichever greater) for 0-20mg/L; ±15% for 20-50mg/L (with correction for salinity and temperature) Sal: ±1% or 0.1ppt (whichever greater) pH: ±0.2 units Turb: ±2% or 0.3NTU (whichever greater) Depth: ±0.12m
Water Depth, Current Speed, Current Direction	Acoustic Doppler Current Profiler	RiverSurveyor M9	Water Depth: 0-80m	Water Depth: 1% Current speed: ±0.25% of measured velocity or ±0.2cm/s Current direction: ±2degree magnetic
Positioning	DGPS	Simrad MX521B Smart Antenna with Simrad MX610 CDU	NA	GPS: ±1m
Water Sampling	Water Sampler	Aquatic Research Transparent PC Vertical Water Sampler 2.2L / 3L / 5L	NA	NA



3.3.2 Apart from the equipment mentioned in Section 3.3.1, a Class III commercially licensed vessel was used as survey vessel. DGPS logging device with accuracy $\pm 1\text{m}$ at 95% confidence level shall be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey shall be automatically and electronically logged. Powered winch shall be used on-board the Survey Vessel to assist the monitoring. Experienced supervisor was present throughout the monitoring exercise on the Survey Vessel.

3.3.3 Water samples were collected by water sampler and stored in high density polythene bottles and sterilized glass bottles (for bacterial analysis), packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory on the same day of collection for analysis. All sampling bottles were pre-rinsed with the same water samples. The sampling bottles were then taken to a HOKLAS accredited laboratory for analysis of *E. coli*, BOD₅, Suspended Solids, NH₃-N, NO₃-N, NO₂-N, Total inorganic nitrogen, Total phosphorus (soluble and particulate).

3.4 Laboratory Measurement and Analysis

3.4.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is appointed to be the laboratory for analysis of water samples. The methods adopted by the laboratories and the reporting limits are detailed in **Table 3.4**.

Table 3.4 Laboratory Measurement/Analysis Methods and Reporting Limits

Analysis Description	Method	Reporting limits
<i>E. coli</i>	DoE Section 7.8, 7.9.4.2& 7.9.4.4 plus in situ urease test	1 cfu/100mL
5-day Biochemical Oxygen Demand	APHA 5210B	1 mg/L
Total Suspended Solid	APHA 2540D	0.5 mg/L
Ammonia as N	APHA 4500 NH3: G	0.005 mg/L
Nitrate as N	APHA 4500 NO3: I	0.005 mg/L
Nitrite as N	APHA 4500 NO2 B&H	0.005 mg/L
Total Inorganic Nitrogen	By Calculation	0.01 mg/L
Total phosphorus (soluble and particulate)	APHA 4500 P: J	0.01 mg/L

3.5 Monitoring Frequency and Duration

- 3.5.1 The water quality monitoring programmed shall be carried out once per two months for a period of five years of the operational phase of the Project.
- 3.5.2 Water quality monitoring for two tides at 8 designated locations will be carried out for each monitoring event. For each location at each tide, duplicate samples for in-situ parameter and laboratory analysis at 3 designated water depths (1 m below water surface, mid-depth and 1 m above the seabed) will be taken and analyzed.
- 3.5.3 The monitoring schedule for the present and next reporting period is provided in **Appendix B**.

3.6 Quality Assurance / Quality Control

- 3.6.1 The equipment is in compliance with the requirements set out in the EM&A plan. All in-situ monitoring instruments were calibrated by a HOKLAS-accredited laboratory or by standard solutions. Calibration of temperature, DO, salinity, pH and turbidity is conducted in three month interval. Copies of calibration certificates for the water quality monitoring equipment are attached in **Appendix F**.
- 3.6.2 During the measurements of DO concentration, DO saturation, salinity, turbidity, pH and temperature, duplicate readings were taken. If the difference between the first and second readings of DO or turbidity was more than 25% of the value of the first reading, the reading was discarded and further readings were taken.
- 3.6.3 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

3.7 Event and Action Plan

- 3.7.1 Since the purpose of the water quality monitoring is to collect data for future propose, no specific event and action has to be followed.

3.8 Monitoring Results and Observations

- 3.8.1 Water quality monitoring has been conducted in April 2018. No water quality monitoring is carried out in reporting period.

4. SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY

4.1 Monitoring Location

4.1.1 In accordance with Section 6 of the EM&A Plan, sediment quality monitoring and benthic survey should be carried out at 8 designated monitoring locations (2 impact stations and 6 control stations) during the first five years of the operational phase of the Project. The proposed monitoring locations shall be the same monitoring locations that were used for the baseline monitoring programme and have been approved by EPD. The coordinates of the monitoring location is shown in **Table 4.1**. The monitoring locations of sediment quality monitoring and benthic survey are also shown in **Figure 2**.

Table 4.1 Location of Sediment Quality Monitoring and Benthic Survey

Sampling Location		Easting	Northing
A	The Brothers, Control Station	816 100	822 500
B	The Brothers, Control Station	816 680	822 440
C	Siu Ho Wan Outfall, Impact Station	816 800	820 180
D	Siu Ho Wan Outfall, Impact Station	817 160	820 360
E	Cheung Sok, Control Station	819 817	821 655
F	Cheung Sok, Control Station	820 158	821 922
G	Tai Ching Chau, Control Station	822 214	822 692
H	Tai Ching Chau, Control Station	822 494	822 939

4.2 Monitoring Parameter

4.2.1 The monitoring parameters for sediment quality monitoring and benthic survey are summarized in **Table 4.2**.

Table 4.2 Parameters for Sediment Quality Monitoring and Benthic Survey

Monitoring Parameters	
Sediment Quality Monitoring	Rinsate Blank for Benthic Survey
Grain size profilit* (i.e. Particle Size Distribution) (%)	Cadmium (µg/L)
Total organic carbon* (%)	Chromium (µg/L)
pH value	Copper (µg/L)
Ammonia as N (mg-N/kg)	Lead (µg/L)
Total nitrogen (mg-N/kg)	Mercury ((µg/L)
Total phosphorus (mg-N/kg)	Nickel (µg/L)
Cadmium (mg/kg)	Zinc (µg/L)
Chromium (mg/kg)	Arsenic (µg/L)
Copper (mg/kg)	Silver (µg/L)
Lead (mg/kg)	
Mercury (mg/kg)	
Nickel (mg/kg)	
Zinc (mg/kg)	
Arsenic (mg/kg)	



Monitoring Parameters	
Sediment Quality Monitoring	Rinsate Blank for Benthic Survey
Silver (mg/kg)	

*Grain size profile and total organic carbon is determined from the sediment sampled collected for benthic survey.

4.2.2 Apart from the parameters listed in the Table 4.2, other relevant supplementary information such as monitoring location, time, weather conditions and any special phenomena shall be also recorded.

4.2.3 The tidal data will be obtained from the tide gauge installed in Ma Wan Marine Traffic Station, managed by the Hydrographic Office of Marine Department. Location of the tide gauge is shown in **Figure 3**.

4.3 Sampling Equipment

4.3.1 Ponar grab sampler (capacity of ~ 1 litre) shall be used for collection of samples for sediment analysis. The grab shall be capable of collecting sufficient amount of surficial (top 5 cm) sediment for the required analysis in a single deployment at each sampling location. The grab shall be constructed with non-contaminating material to prevent sample contamination. Photos of ponar grab sampler are shown in **Appendix F**.

4.3.2 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) shall be used for collecting sediment samples for benthic survey. The top of the grab shall have openings to allow the easy flow of water through the grab as it descends. The openings shall be covered with 0.5 mm mesh to prevent the loss of any benthic fauna once a sediment sample is taken. In addition the top openings shall be sealable by movable flaps which shall close when the grab is hauled to surface. Photos of modified Van Veen grab sampler are shown in **Appendix F**.

4.3.3 Class III commercially licensed vessel was used as survey vessel. DGPS logging device in the ADCP with accuracy ±1m at 95% confidence level shall be installed on the survey vessel to ascertain that measurement can be made accurately on the specific transects. All GPS data collected during the whole survey shall be automatically and electronically logged. Powered winch shall be used on-board the Survey Vessel to assist the monitoring. 4 fixed sieve stations shall be equipped on Survey Vessel. Experienced supervisor was present throughout the monitoring exercise on the Survey Vessel.

4.4 Sampling Procedure

Benthic Survey, Particle Size Distribution and TOC Analysis

4.4.1 A modified Van Veen grab sampler (capacity of ~ 11.3 litres) shall be deployed at each of the benthic survey locations to collect single grab sample at each location. The grab sampler should be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment shall be rejected. Samples will be placed in a plastic box with an identification card. Sub-samples (approximately 1 kg) should be splitted up for analysis of particle size distribution and TOC. The remaining sediment samples should be washed gently to separate the benthic organisms and the sediment using a watering hose with marine seawater supply, by a sieve stack (comprising 1 mm and 0.5 mm meshes). Benthic organisms remaining on the sieve should be removed into pre-labeled ziplock plastic



bags. A 10% solution of buffered formalin containing Rose Bengal in seawater will be added to the bag to ensure tissue preservation. Samples will be sealed in plastic containers for transport to the laboratory for sorting and identification of benthic organisms.

Sediment Quality Monitoring (Except Particle Size Distribution and TOC Analysis)

- 4.4.2 Ponar grab sampler (capacity of ~ 1 litres) shall be deployed at each of the benthic survey locations to collect single grab sample at each location. The grab sampler should be lowered through the water column slowly at a constant rate (approximately 30 cm/s) to prevent the formation of a pressure wave that may disturb surficial deposits. The grab will then be retrieved and evaluated on board of the survey vessel. Any sample showing uneven penetration or only partially filled with sediment shall be rejected. Samples will be placed in a plastic box with an identification card. Sediment samples will be then transferred into brand new soil jars with QA/QC monitoring for laboratory analysis. Samples shall be preserved and stored in accordance with approved SOP of HOKLAS accredited laboratory and the recommendations stipulated in ETWB TC (W) No. 34/2002.
- 4.4.3 Sediment samples shall be collected and packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory on the same day of collection for analysis.

4.5 Laboratory Measurement and Analysis

- 4.5.1 ALS Technichem (HK) Pty Ltd (HOKLAS Reg. No. 066), is appointed to be the laboratory for analysis of sediment samples. The methods adopted by the laboratories and the reporting limits are detailed in **Table 4.3**.

Table 4.3 Laboratory Measurement/Analysis Methods and Reporting Limits

Analysis Description	Method	Reporting limits
Particle Size Distribution	Geospec 3: 2001 Test method 8.1, 8.5 and 8,7 (Wet Sieve and Hydrometer Method)	1%
Total Organic Carbon	APHA 5310B	0.05%
pH value	APHA 4500H: B	0.1 pH unit
Ammonia as N	APHA 4500 NH3: B&G	0.5 mg/kg
Total Nitrogen	APHA 4500 Norg: D & APHA 4500 NO3: I	10 mg/kg
Total Phosphorus	APHA 4500P: B&H	10 mg/kg
Cadmium	USEPA 6020A Digestion method: 3051A	0.1 mg/kg
Chromium		0.5 mg/kg
Copper		0.2 mg/kg
Lead		0.2 mg/kg
Mercury		0.05 mg/kg
Nickel		0.2 mg/kg
Zinc		0.5 mg/kg
Arsenic		0.5 mg/kg
Silver		0.1 mg/kg

4.6 Taxonomic Identification of Benthic Organism

- 4.6.1 Taxonomic identification of benthic organisms will be performed using stereo dissecting and high-power compound microscopes where it is necessary. Benthic organisms will be counted

and identified to lower taxonomic levels as far as practicable with biomass (wet weight, to 0.01gram) of each individual recorded. If breakage of soft-bodied organism occurs, only anterior portions of fragments will be counted, although all fragments will be retained and weighted for biomass determinations (wet weight, to 0.01gram). Data of species abundance and biomass will be recorded.

4.6.2 Data collected during surveys will be presented and summarized in tables and graphics. Species/taxon richness and abundance of marine benthic fauna communities will be analyzed by Shannon-Weiner diversity and Pielou's Evenness.

4.7 Monitoring Frequency and Duration

4.7.1 The sediment quality monitoring and benthic survey programmed shall be carried out once per two months for a period of five years of the operational phase of the Project. Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future reference, only a single round of sediment quality monitoring and benthic survey at 8 designated locations will be carried out for each monitoring event. For each location, only a single sample will be taken and analyzed.

4.8 Quality Assurance / Quality Control

4.8.1 A rinsate blank shall be collected in each monitoring location before each sediment sampling for benthic survey, so as to monitor the effectiveness of field decontamination procedure.

4.8.2 The laboratory incorporates a variety of QA/QC monitoring programme into their testing system. Where applicable or available, the quality of the analysis will be monitored by conducting the following QC analysis:

For each batch of 20 samples:

- A minimal of 1 laboratory method blank will be analyzed;
- A minimal of 1 sample duplicate will be analyzed;
- A minimal of 1 sample matrix spike will be analyzed.

4.9 Event and Action Plan

4.9.1 Since the purpose of the sediment quality monitoring and benthic survey is to collect data for future propose, no specific event and action has to be followed.

4.10 Monitoring Results and Observations

4.10.1 Sediment quality monitoring and benthic survey have been conducted in April 2018. No sediment quality monitoring and benthic survey is carried in the reporting period.

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5. CHINESE WHITE DOLPHIN MONITORING

5.1 Data Interpretation

5.1.1 In accordance with Section 4.1 of the EM&A Plan, relevant information on the distribution and abundance of CWDs in Hong Kong should be obtained from the Agriculture, Fisheries and Conservation Department (AFCD), and be reviewed on a bimonthly basis during the operational phase of the Project for a period of 5 years.

5.1.2 The latest AFCD's report, "*Monitoring of Marine Mammals in Hong Kong Waters (2016-17)*", in terms of the distribution and abundance of CWDs, was reviewed in the Monthly EM&A report in August 2017. According to the advice from AFCD, the data of distribution and abundance of CWDs would only be available in the annual reports for Monitoring of Marine Mammals In Hong Kong Waters which cover monitoring data from 1 April to 31 March (next year). The next annual report (2017-18) shall be published around June 2018. The updated status of the distribution and abundance of CWDs will be provided once the annual report (2017-18) is uploaded to AFCD's webpage.

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6. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

6.1 Implementation Status

- 6.1.1 Although no site inspection is prescribed during the operation of the Plant in accordance with the approved EM&A Plan, SHWSTW is reminded to fully and properly implement mitigation measures specified in the EP and EIA Report. Mitigation measures such as aeration, chemical dosing system, covering or enclosing the pressing and sludge thickening facilities and ventilating air to a biological treatment prior to stack exhaust was implemented in the reporting period. A summary of mitigation measures implementation schedule is provided in **Appendix G**.



7. ADVICE ON THE SOLID AND LIQUID WASTE MANAGEMENT STATUS

7.1.1 SHWSTW is reminded to fully comply with EP conditions. All measures and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented. During the reporting period, following measures in related to solid and liquid waste management was implemented:

- The influent of waste water shall be treated by CEPT with UV disinfection;
- Trip-ticket system shall be implemented for sludge and sediment;
- The acceptance criteria for Landfill disposal should be followed;
- Chemical waste should be properly handled and stored temporarily in designated chemical waste storage area on site in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

7.1.2 A summary of mitigation measures implementation schedule is provided in **Appendix G**.

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8. SUMMARY OF EXCEEDANCE OF THE ENVIRONMENTAL QUALITY PERFORMANCE LIMITS

8.1.1 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out on 2 and 7 May 2018. No exceedances of Action/Limit levels at ASR were recorded.

8.1.2 Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the compliance of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore, no non-compliance of odour monitoring at ASR were recorded in the reporting period.

9. SUMMARY OF ENVIRONMENTAL COMPLAINTS

9.1.1 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period. Summaries of complaints, notification of summons and successful prosecutions are presented in **Table 9.1** and **Table 9.2**.

Table 9.1 Cumulative Statistics on Complaints

Environmental Parameters	Cumulative No. Brought Forward	No. of Complaints This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0

Table 9.2 Cumulative Statistics on Notification of Summons and Successful Prosecutions

Environmental Parameters	Cumulative No. Brought Forward	No. of Notification of Summons and Prosecutions This Month	Cumulative Project-to-Date
Air	0	0	0
Noise	0	0	0
Water	0	0	0
Waste	0	0	0
Others	0	0	0
Total	0	0	0



10. FUTURE KEY ISSUES

10.1.1 The key issues to be considered in the coming reporting month include:

- i. Potential environmental impacts arising from the operation of SHWSTW are mainly associated with air quality, water quality, sediment quality, benthic ecology, waste management and distribution and abundance of CWDs.
- ii. As inadequacy of representative data was result in the past 10 months, current H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). In order to assess whether SHWSTW is the major H₂S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H₂S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval.
- iii. Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.

11. CONCLUSION

- 11.1.1 Air quality monitoring i.e. H₂S concentration monitoring, odour patrol monitoring and olfactometry analysis was carried out in the reporting month. No exceedances of Action/Limit levels at ASR were recorded as no complaint was received during the reporting period. Although results of olfactometry analysis from the odour sampling during the reporting period exceeded the criterion of 5 odour units (based on averaging time of 5 seconds at the nearest ASR), onsite odour patrol monitoring indicated that the measurements were affected by other dominant odour or non-ideal wind directions and no relationship can be drawn from the H₂S concentration and the exceeded results of the odour unit from the olfactometry analysis so far in the reporting period. Besides, based on the onsite odour patrol monitoring and the records of wind direction, the exceedances from the olfactometry analysis were not project-related. Therefore, no non-compliance of odour monitoring at ASR were recorded in the reporting period.
- 11.1.2 During this reporting period, H₂S data collected (total 2 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW. In the measurement conducted on 2 May 2018, non-ideal wind direction (N) was recorded during the measurement. In other words, the wind direction was not from SHWSTW towards ASR.
- 11.1.3 For the measurements on 7 May 2018, only non-target smell (gasoline) was recorded from onsite odour patrol which indicated that no effluent smell could be recorded during the measurement and the result of olfactometry analysis to nature of odour was non-specified. Hence, the result (17 OU) from olfactometry analysis could be considered interfered and dominated by non-target smell from the surrounding environment. Therefore the measured H₂S data from the reporting period could not reflect the odour impact from SHWSTW during operational phase and correlation between the H₂S concentration and the olfactometry analysis was unable to be drawn in the reporting period. As inadequacy of representative data was result in the past 10 months, current H₂S measurement and olfactometry analysis was considered as unlikely way to establish the relationship of H₂S concentration (ppb) with the odour unit (OU/m³). In order to assess whether SHWSTW is the major H₂S source to ASR, three additional air quality monitoring events were conducted on February 2018. The data showed that site boundary of SHWSTW and the location of ASR is not appropriate for the correlation study as the change of both odour level and H₂S concentrations at ASR were not sensitive to that at site boundary of SHWSTW. Alternative methods shall be proposed and submitted for EPD's approval. Since six months air quality monitoring and additional three months air quality monitoring had been conducted according to Section 2.2 of OEM&A Plan without any complaint or non-compliance recorded, air quality monitoring was temporarily suspended until alternative methods of correlation study was approved by EPD. The temporary suspension was approved by EPD's memo dated 14 May 2018.
- 11.1.4 No water quality monitoring, sediment quality monitoring and benthic survey were conducted in the reporting period.
- 11.1.5 The latest AFCD's report, "*Monitoring of Marine Mammals in Hong Kong Waters (2016-17)*", in terms of the distribution and abundance of CWDs, was reviewed in the Monthly EM&A report in August 2017. According to the advice from AFCD, the data of distribution and abundance of CWDs would only be available in the annual reports for Monitoring of Marine Mammals In Hong Kong Waters which cover monitoring data from 1 April to 31 March (next year). The next annual report (2017-18) shall be published around June 2018. The updated status of the distribution and abundance of CWDs will be provided once the annual report

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(2017-18) is uploaded to AFCD's webpage. The updated status of the distribution and abundance of CWDs will be provided once the annual report (2017-18) is uploaded to AFCD's webpage.

11.1.6 SHWSTW is reminded to fully *comply with EP conditions*. All *environmental mitigation measures* and recommendations in the EP, EIA Report and approved waste management plan shall be fully and properly implemented.

11.1.7 No complaint (written or verbal), inspection notice, notification of summons or prosecution was received in relation to the environmental impact during the report period.

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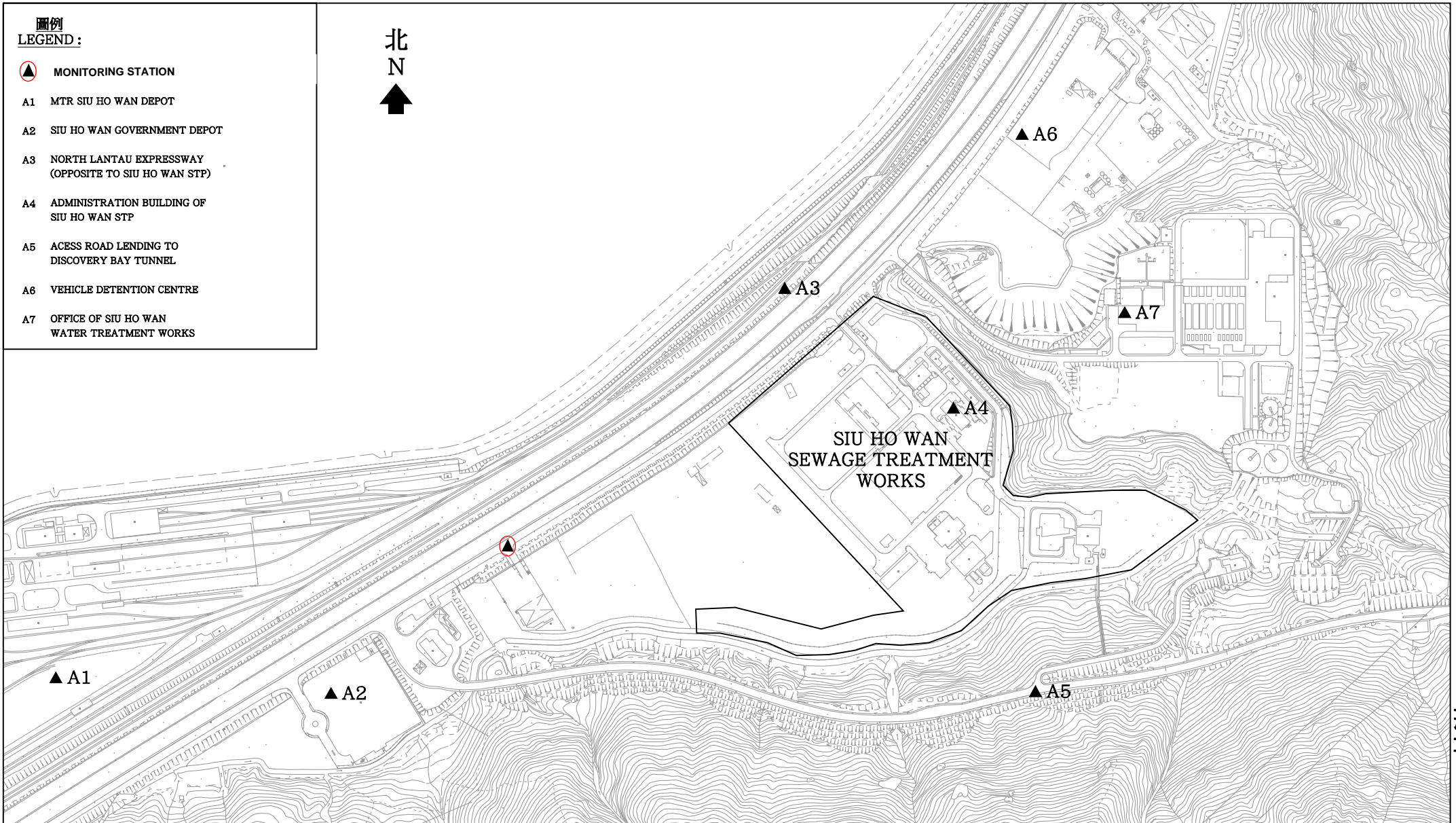
Report No.: 0041/17/ED/0315B


Figure 1

Monitoring Location of Air Sensitive Receiver

圖例
LEGEND :

-  **MONITORING STATION**
- A1** MTR SIU HO WAN DEPOT
- A2** SIU HO WAN GOVERNMENT DEPOT
- A3** NORTH LANTAU EXPRESSWAY
(OPPOSITE TO SIU HO WAN STP)
- A4** ADMINISTRATION BUILDING OF
SIU HO WAN STP
- A5** ACCESS ROAD LENDING TO
DISCOVERY BAY TUNNEL
- A6** VEHICLE DETENTION CENTRE
- A7** OFFICE OF SIU HO WAN
WATER TREATMENT WORKS



<p>圖則名稱 drawing title</p> <p>UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN ODOUR PATROL MONITORING STATIONS</p>	繪畫 drawn	日期 date	圖則編號 drawing no.	比例 scale	
	C.W. CHAN	16-08-2006	DCM/2006/063	N.T.S.	
	核對 checked	日期 date	保留版權 COPYRIGHT RESERVED		
	C.K. LAM	16-08-2006	 <p>香港特別行政區政府渠務署 DRAINAGE SERVICES DEPARTMENT GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION</p>		
批核 approved	日期 date				
S.K. WONG	16-08-2006				
部門 office	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION				

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Figure 2

Monitoring Locations of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey



816000E

818000E

820000E

822000E

822000N

大小磨刀
BROTHERS

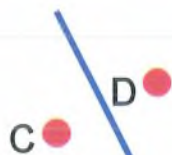
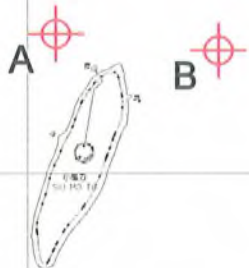
820000N




CO-ORDINATES OF CONTROL STATIONS :

CONTROL STATION No.	CO-ORDINATES	
	NORTHING	EASTING
A	822500	816100
B	822440	816680
E	821655	819817
F	821922	820158
G	822692	822214
H	822939	822494

CO-ORDINATES OF IMPACT STATIONS :

IMPACT STATION No.	CO-ORDINATES	
	NORTHING	EASTING
C	820180	816800
D	820360	817160

圖例
LEGEND :

-  IMPACT STATION
-  CONTROL STATION
-  SUBMARINE OUTFALL

圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT
BASELINE MONITORING - LOCATION OF MONITORING STATIONS

繪畫 drawn

H.K. LAI

日期 date

06-02-2004

核對 checked

C.K. LAM

日期 date

04-03-2004

批核 approved

S.K. WONG

日期 date

04-03-2004

部門 office

顧問工程管理部

CONSULTANTS MANAGEMENT DIVISION

圖則編號 drawing no.

DCM/2004/002

比例 scale

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Figure 3 Location of the Tide Gauge

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Figure 2 - Location of the Tide Gauge

Source: Google Maps

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Figure 4

Location of Survey Areas of Chinese White Dolphins

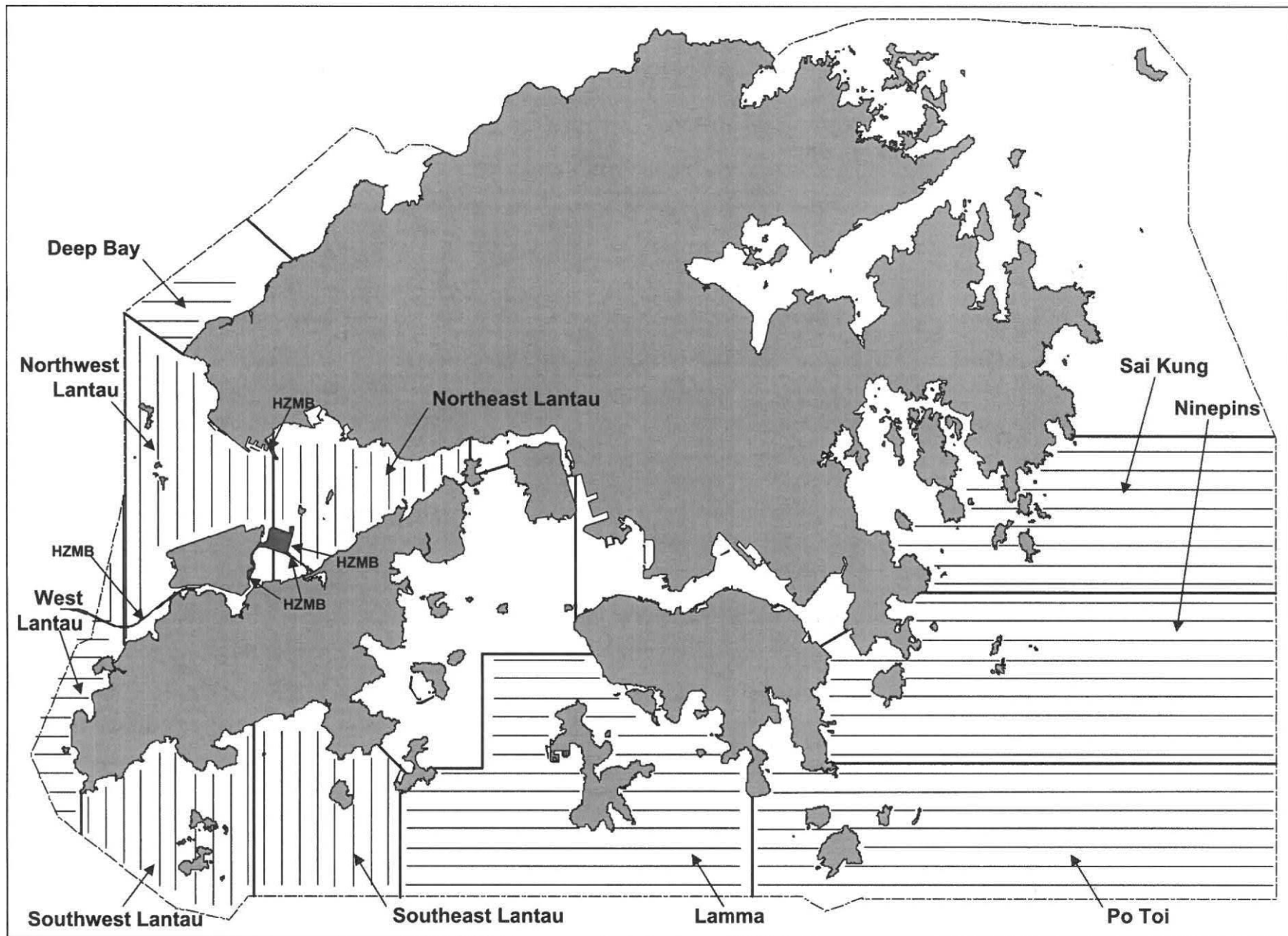


Figure 2 Ten Line-Transect Survey Areas within the Study Area chosen for the Present Monitoring Study (2016-17)

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Appendix A Project Organization Chart

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Appendix B

Monitoring Schedule for Present and Next Reporting Period

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Monitoring Schedule for Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
		1 May	2 H ₂ S concentration monitoring and odour patrol monitoring and odour sampling	3	4	5
6	7 H ₂ S concentration monitoring and odour patrol monitoring and odour sampling	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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Monitoring Schedule for Next Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
					1 June	2
3	4	5	6	7	8	9
10	11	12	13	14 Water Quality Monitoring and Sediment Quality Monitoring and Benthic Survey Mid-Flood (06:02) Mid-Ebb (12:52)	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.

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Report No.: 0041/17/ED/0315B

Appendix C

Event and Action Plan for Air Quality Monitoring

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EVENT	ACTION		
	ET	IEC	*Operator
Action Level			
One complaint received for specific odour event	<ol style="list-style-type: none"> 1. Check Operator's working methods; 2. Discuss with Operator on required remedial actions 	<ol style="list-style-type: none"> 1. Discuss with ET and Operator on the possible remedial actions; 2. Advise the Operator on the effectiveness of the proposed remedial measures; 3 Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Identify/ confirm source with ET; 2. Discuss with ET for remedial actions required; 3. Ensure remedial actions properly implemented 4. Rectify any unacceptable practice; 5. Amend operation methods if appropriate
Limit Level			
More than one complaint	<ol style="list-style-type: none"> 1. Investigated the causes of complaint; 2. Check Operator's working methods; 3. Carry out analysis of Operator's working procedures to determine possible mitigation to be implemented; 4. Arrange meeting with ET and EPD to discuss the remedial actions to be taken; 5. Discuss with EPD and the Operator on the required remedial actions; 6. Submit proposals for remedial actions within 3 working days of notification; 7. Assess effectiveness of Operator's remedial actions and keep EPD informed of the results; 8. Amend proposal if appropriate; 9. Resubmit proposal if problem still not under control 	<ol style="list-style-type: none"> 1. Discuss amongst ET and the Operator on the potential remedial actions; 2. Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the Operator accordingly; 3. Supervise implementation of remedial measures 	<ol style="list-style-type: none"> 1. Indentify/ confirm source with ET; 2. Confirm receipt of notification of failure in writing; 3. Inform ET, IEC and EPD; 4. Discuss with EPD and ET on the required remedial actions; 5. Ensure remedial actions properly implemented; 6. Take immediate action to avoid further exceedance; 7. Implement the agreed proposals

* The operator who is the constructor responsible for the operation during the maintenance period.

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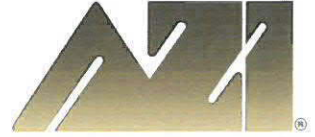
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Report No.: 0041/17/ED/0315B

Appendix D

Copy of Calibration Certificates of H₂S Analyzer



Certification of Instrument Calibration

Guyline (Asia) Ltd
Rm 1611, Eastern Harbour Centre
Quarry Bay,

RMA # 2459849

This is to certify that the Jerome X631 0003 Gold Film Hydrogen Sulfide Analyzer, Serial Number 2966, with Sensor Number 14-11-23-R2D, was calibrated with standard units traceable to NIST.

Calibration Status as Received: **Out of Calibration**

		Actual	Calibration Gas	Allowable Range
Incoming:	Range 1	0.346 ppm H2S	0.500 ppm H2S	+/- 6%
	RSD %	10.17		<5%
Outgoing:	Range 1	0.476 ppm H2S	0.500 ppm H2S	+/- 6%
	RSD %	2.18		<5%

Calibration Status as Left: **In Calibration**

Estimated Uncertainty of Calibration System: 2.8%

Calibration Date: 02-Jun-2017 Recalibration Date: 01-Jun-2018

Temperature °F: % Relative Humidity:

Cheryl Hradek

Approved By: _____
Title: Cheryl Hradek - Quality Control

Date Approved: 05-Jun-2017

Equipment Used:

- H2S Calibration Standard:** CC-57152 NIST#: 1385481
Calibration Date: 17-Aug-2016 **Calibration Date Due:** 18-Aug-2019
- Mass Flow Controller B:** 124604 NIST#: 152971
Calibration Date: 28-Nov-2016 **Calibration Date Due:** 28-Nov-2017
- Mass Flow Controller D:** 124602 NIST#: 151792
Calibration Date: 08-Nov-2016 **Calibration Date Due:** 08-Nov-2017
- Digital Multimeter:** 66961028 NIST#: 7000660
Calibration Date: 28-Mar-2017 **Calibration Date Due:** 28-Mar-2018
- Flowmeter:** US10H44183 NIST#: 1813; 1817; 1796
Calibration Date: 08-Nov-2016 **Calibration Date Due:** 09-Nov-2017

Calibration Procedure Used: 730-0032

Arizona Instrument certifies that the above listed instrument meets or exceeds all published specifications and has been calibrated using standards whose accuracy are traceable to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY within the limitations of the Institute's calibration services, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of self-calibration techniques.

Disclaimer: Any unauthorized adjustments, removal or breaking of QC seals, or other customer modifications on your Jerome Analyzer WILL VOID this factory calibration. Because any of the above acts could affect the calibration and readings of the instrument, their certification will no longer be valid and, further, Arizona Instrument LLC WILL NOT be responsible for any liabilities created as a result of using the instrument after such adjustments, seal removal, or modifications.

As long as a functional test is within range, according to the procedure outlined in the Operator's Manual, the instrument is performing correctly.

This document shall not be reproduced, except in full, without the written approval of Arizona Instrument.

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Appendix E

Results and Graphical Presentation of Air Quality Monitoring

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	02 May 2018
Monitoring Location:	ASR
Start Time:	09:55
End Time:	10:10
Temperature (°C)	29.0
Wind Speed (m/s)	0.9
Wind Direction	N
Relative Humidity (%)	80

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-05-02	09:55:06	0.003
2018-05-02	09:56:06	0.003
2018-05-02	09:57:06	0.003
2018-05-02	09:58:06	0.002
2018-05-02	09:59:06	0.001
2018-05-02	10:00:06	0.003
2018-05-02	10:01:06	0.003
2018-05-02	10:02:06	0.002
2018-05-02	10:03:06	0.001
2018-05-02	10:04:06	0.003
2018-05-02	10:05:06	0.002
2018-05-02	10:06:06	0.002
2018-05-02	10:07:06	0.002
2018-05-02	10:08:06	0.002
2018-05-02	09:09:06	0.002
Average H2S conc. (ppm)		0.002

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	07 May 2018
Monitoring Location:	ASR
Start Time:	10:02
End Time:	10:17
Temperature (°C)	28.0
Wind Speed (m/s)	1.2
Wind Direction	E
Relative Humidity (%)	79

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-05-07	10:03:08	0.001
2018-05-07	10:04:08	0.001
2018-05-07	10:05:08	<0.001
2018-05-07	10:06:08	0.001
2018-05-07	10:07:08	0.002
2018-05-07	10:08:08	0.001
2018-05-07	10:09:08	<0.001
2018-05-07	10:10:08	<0.001
2018-05-07	10:11:08	0.001
2018-05-07	10:12:08	<0.001
2018-05-07	10:13:08	0.001
2018-05-07	10:14:08	0.002
2018-05-07	10:15:08	0.001
2018-05-07	10:16:08	0.001
2018-05-07	10:17:08	<0.001
Average H2S conc. (ppm)		0.001

Note: Result which lower than the detection range(<0.001) is regarded as 0.001 in calculating average H2S concentration.

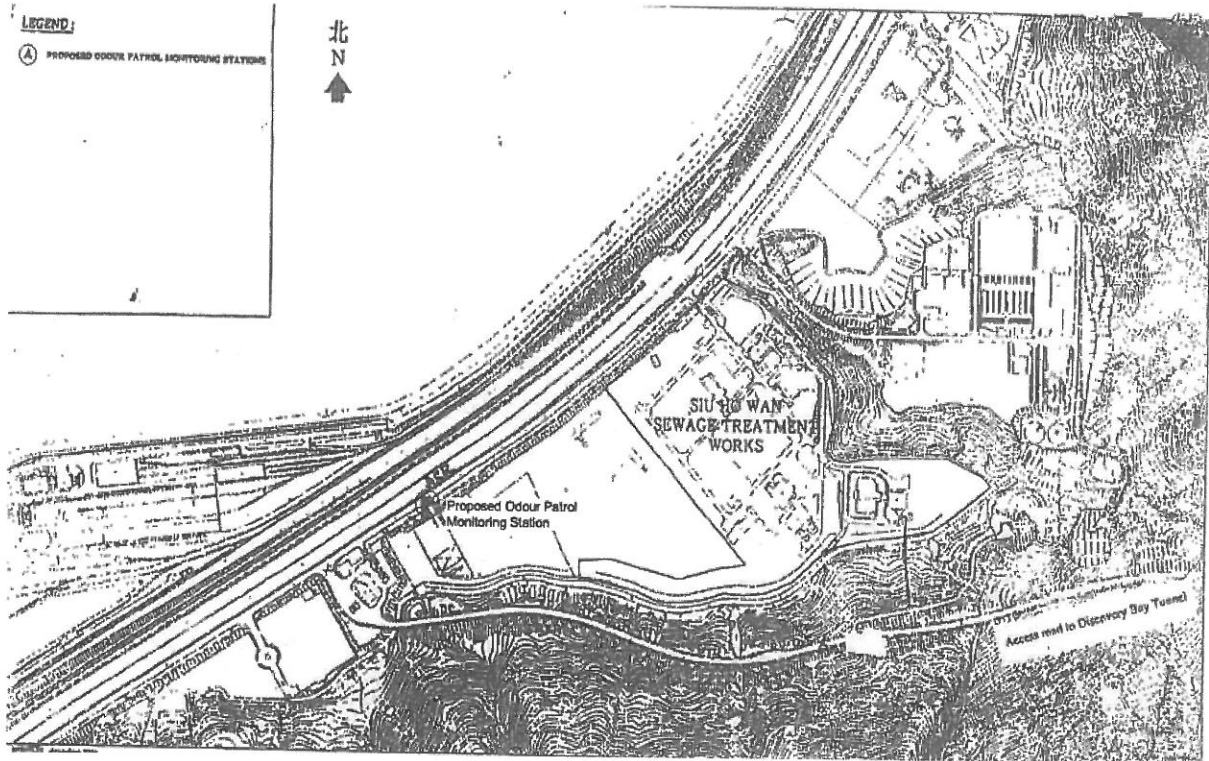
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Contract No. CM 14/2016 Environmental Team for Operational Environmental Monitoring and Audit for Siu Ho Wan Sewage Treatment Works Odour Patrol Monitoring Report



Odour Patrol Monitoring Date: 2-5-2018

Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	29°C	Start Time:	9:55	End Time:	10:10
Wind Speed:	0.9 m/s	Wind Direction:	N		
Nature of Odour:	Gasoline				
*Odour Intensity: (tick as appropriate)	<input type="checkbox"/> Not detected	<input checked="" type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

*Classification Criteria:

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

Slight : Identifiable odour, barely noticeable

Noticeable : Identifiable odour, noticeable

Strong : Identifiable odour, strong

Extreme : Severe odour

Recorded by: [Signature]
Name: WAN KA HO
Date: 2-5-2018

Checked by: [Signature]
Name: CHOI KAM HO
Date: 2-5-2018

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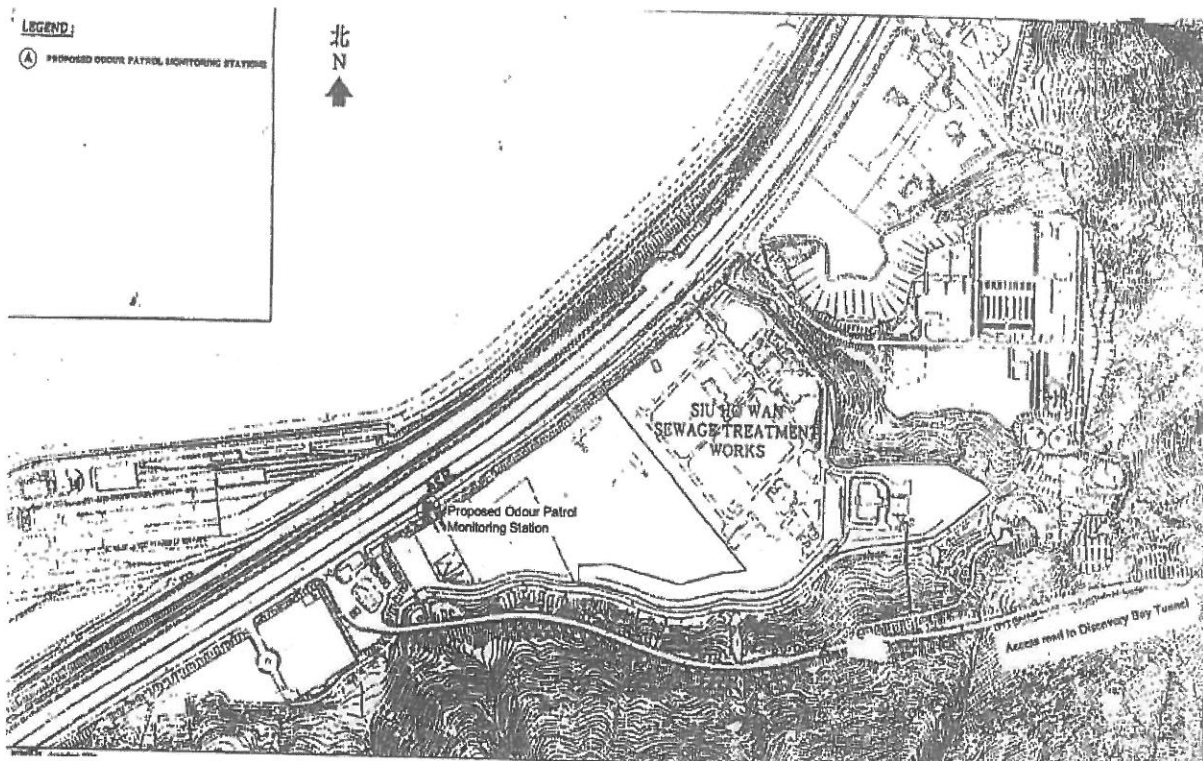
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Contract No. CM 14/2016 Environmental Team for Operational Environmental Monitoring and Audit for Siu Ho Wan Sewage Treatment Works Odour Patrol Monitoring Report



Odour Patrol Monitoring Date: 7-5-2018

Weather: cloudy

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	<u>28°C</u>	Start Time:	<u>10:02</u>	End Time:	<u>10:17</u>
Wind Speed:	<u>1.2ms⁻¹</u>	Wind Direction:	<u>E</u>		
Nature of Odour:	<u>Gasoline</u>				
*Odour Intensity: (tick as appropriate)	<input type="checkbox"/> Not detected	<input checked="" type="checkbox"/> Slight	<input type="checkbox"/> Noticeable	<input type="checkbox"/> Strong	<input type="checkbox"/> Extreme

*Classification Criteria:

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

Slight : Identifiable odour, barely noticeable

Noticeable : Identifiable odour, noticeable

Strong : Identifiable odour, strong

Extreme : Severe odour

Recorded by: Nok
Name: Wong Ka Nok
Date: 7-5-2018

Checked by: AK
Name: CHOI KAM HO
Date: 2-5-2018

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CERTIFICATE OF ANALYSIS

CLIENT:	Furgo Technical Services Limited	WORK ORDER:	HK1830514
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	1
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	02 May 2018
SITE:	Siu Ho Wan	DATE OF ISSUE:	01 June 2018
PO:	---	SAMPLE TYPE:	Air
		NO. OF SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 2nd May, 2018 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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

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

PP

Richard Fung
General Manager - Hong Kong

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METHOD STATEMENT

A. Odour Concentration

1. Odour Sampling

Odour gas sample was collected by passive sampling technique. A Nalophan™ sampling bag was placed inside an air-tight sampler and then drawn to vacuum. Approximately 60 litre of gas sample was collected into the sampling bag for testing.

The sample was collected at the ASR of the Siu Ho Wan and shown in Appendix 1.

2. Olfactometry Testing

Odour concentration was determined by a Forced-choice Dynamic Olfactometer in accordance with the European Standard Method (EN13725).

This European Standard specifies a method for the objective determination of the odour concentration of a gaseous sample using dynamic olfactometry with human assessors and the emission rate of odours emanating from point sources, area sources with outward flow and area sources without outward flow.

This European Standard is applicable to the measurement of odour concentration of pure substances, defined mixtures and undefined mixtures of gaseous odorants in air or nitrogen, using dynamic olfactometry with a panel of human assessors being the sensor.

The unit of measurement is the odour unit per cubic metre: OU_e/m^3 . The odour concentration is measured by determining the dilution factor required to reach the detection threshold. The odour concentration at the detection threshold is by definition 1 OU_e/m^3 . The odour concentration is then expressed in terms of multiples of the detection threshold. The range of measurement including pre-dilution prior to the olfactometry analysis is typically from 10^1 OU_e/m^3 to 10^7 OU_e/m^3 .

Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

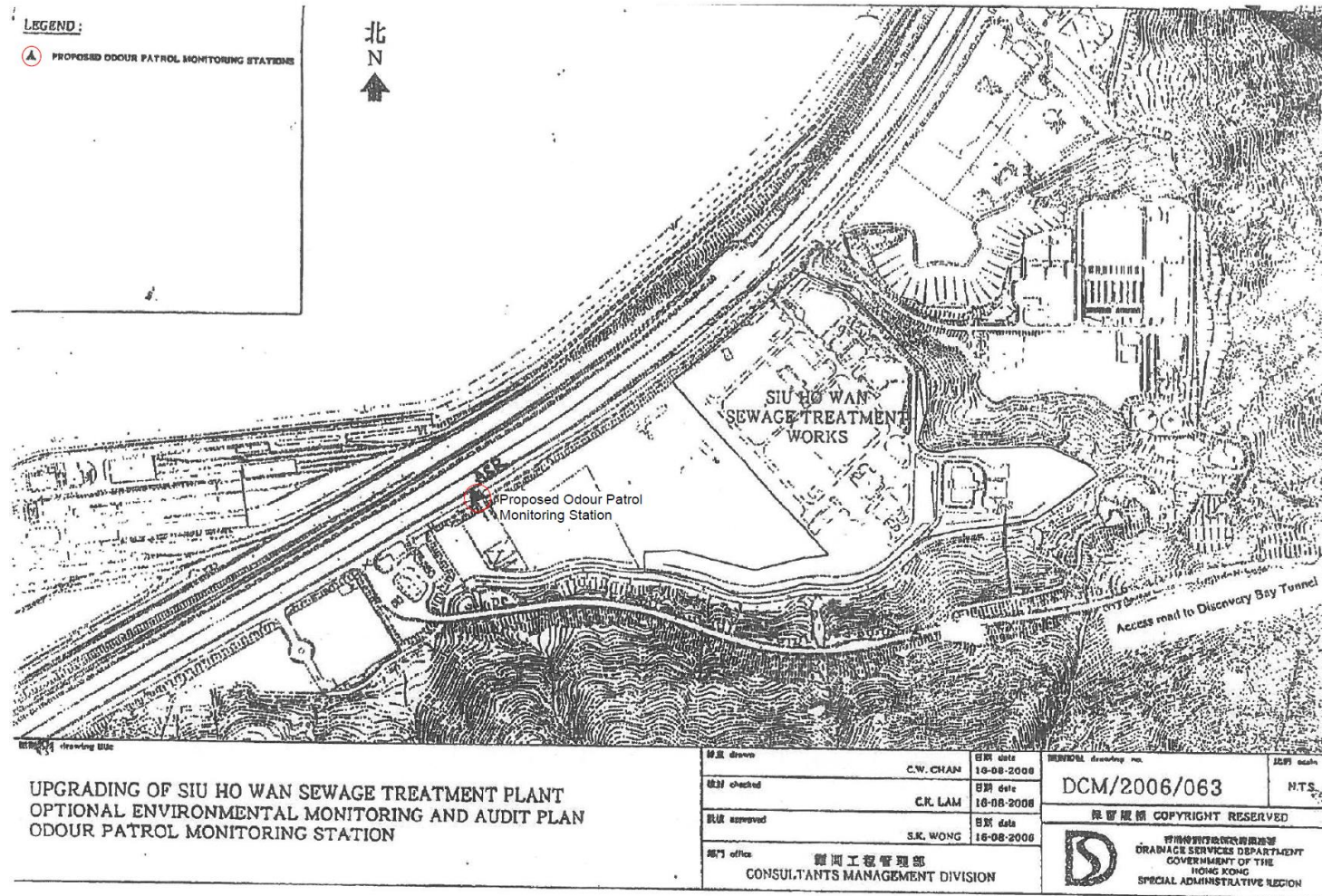
ALS Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction
HK1830514-A001	Siu Ho Wan - ASR	Air	2 May 2018	09:55	5	13	29	80	0.9	North

Remark:

1. *LOR denotes limit of reporting.*
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.
3. The collected sample volume of the gas sample is sufficient for olfactometry analysis.

APPENDIX 1

A1.1. Layout of the Sampling Location





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Kwai Chung, N.T., Hong Kong
T +852 2610 1044 F +852 2610 2021

CERTIFICATE OF ANALYSIS

CLIENT:	Furgo Technical Services Limited	WORK ORDER:	HK1830515
CONTACT:	Cyrus Lai	LABORATORY:	Hong Kong
ADDRESS:	Room 723 & 725, 7/F, Block B, Profit Industrial Building 1-15 Kwai Fung Crescent, Kwai Chung Hong Kong	SUB-BATCH:	1
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	DATE RECEIVED:	07 May 2018
SITE:	Siu Ho Wan	DATE OF ISSUE:	01 June 2018
PO:	---	SAMPLE TYPE:	Air
		NO. OF SAMPLES:	1

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 7th May, 2018 at Siu Ho Wan.

The sample(s) were analysed and reported on an as received basis.

NOTES

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

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

PP 
Richard Fung
General Manager - Hong Kong

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The unit of measurement is the odour unit per cubic metre: OU_e/m^3 . The odour concentration is measured by determining the dilution factor required to reach the detection threshold. The odour concentration at the detection threshold is by definition 1 OU_e/m^3 . The odour concentration is then expressed in terms of multiples of the detection threshold. The range of measurement including pre-dilution prior to the olfactometry analysis is typically from 10^1 OU_e/m^3 to 10^7 OU_e/m^3 .

Olfactometry Testing was performed by using the Scentroid™ SS6000 Olfactometer. The testing was performed by at least five qualified panellists who have been selected through an n-butanol screening test.

All testing finished within 24 hours after sample receipt.

**RESULT****1. Odour Concentration**

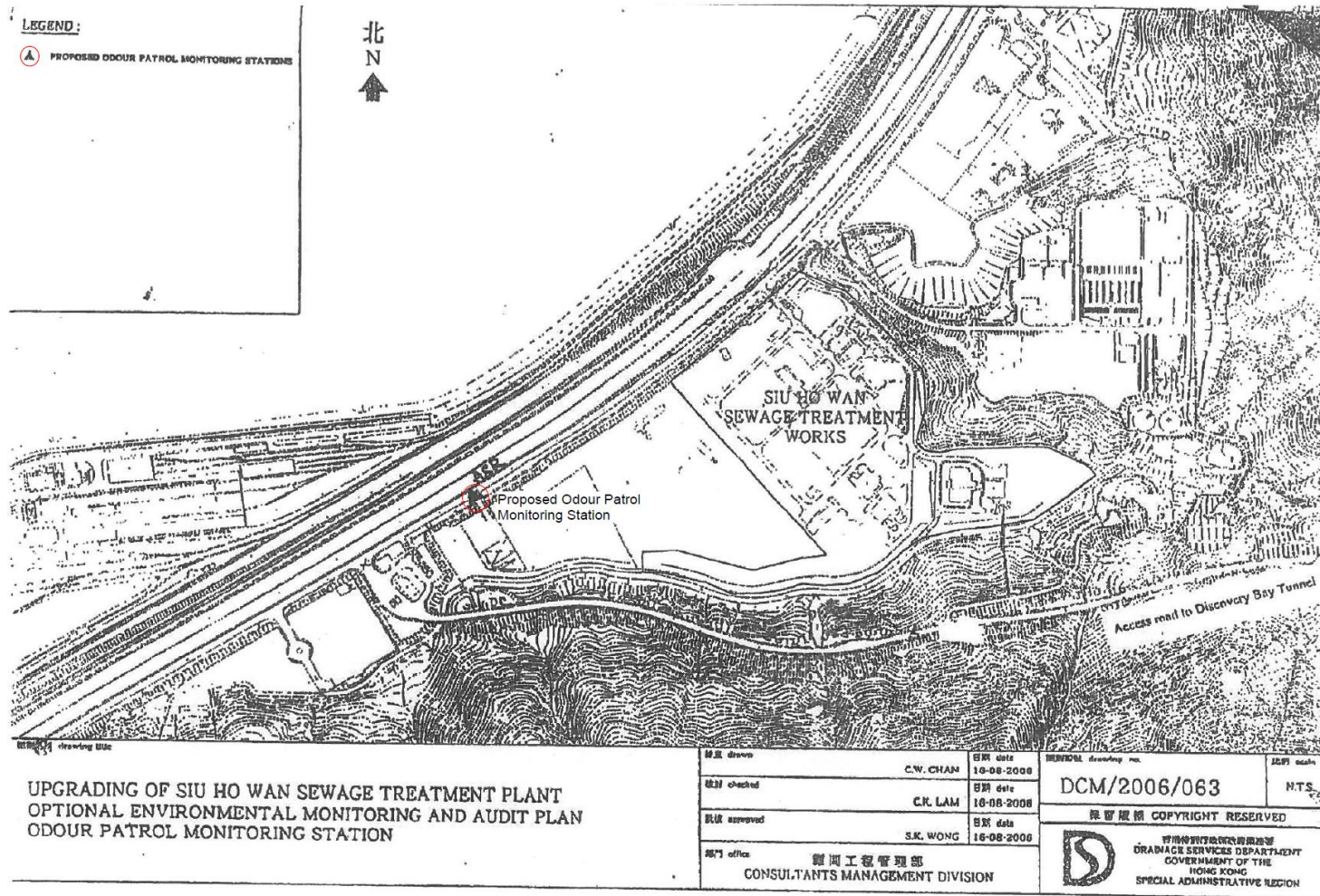
ALS Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction
HK1830515-A001	Siu Ho Wan - ASR	Air	7 May 2018	10:02	5	17	28	79	1.2	East

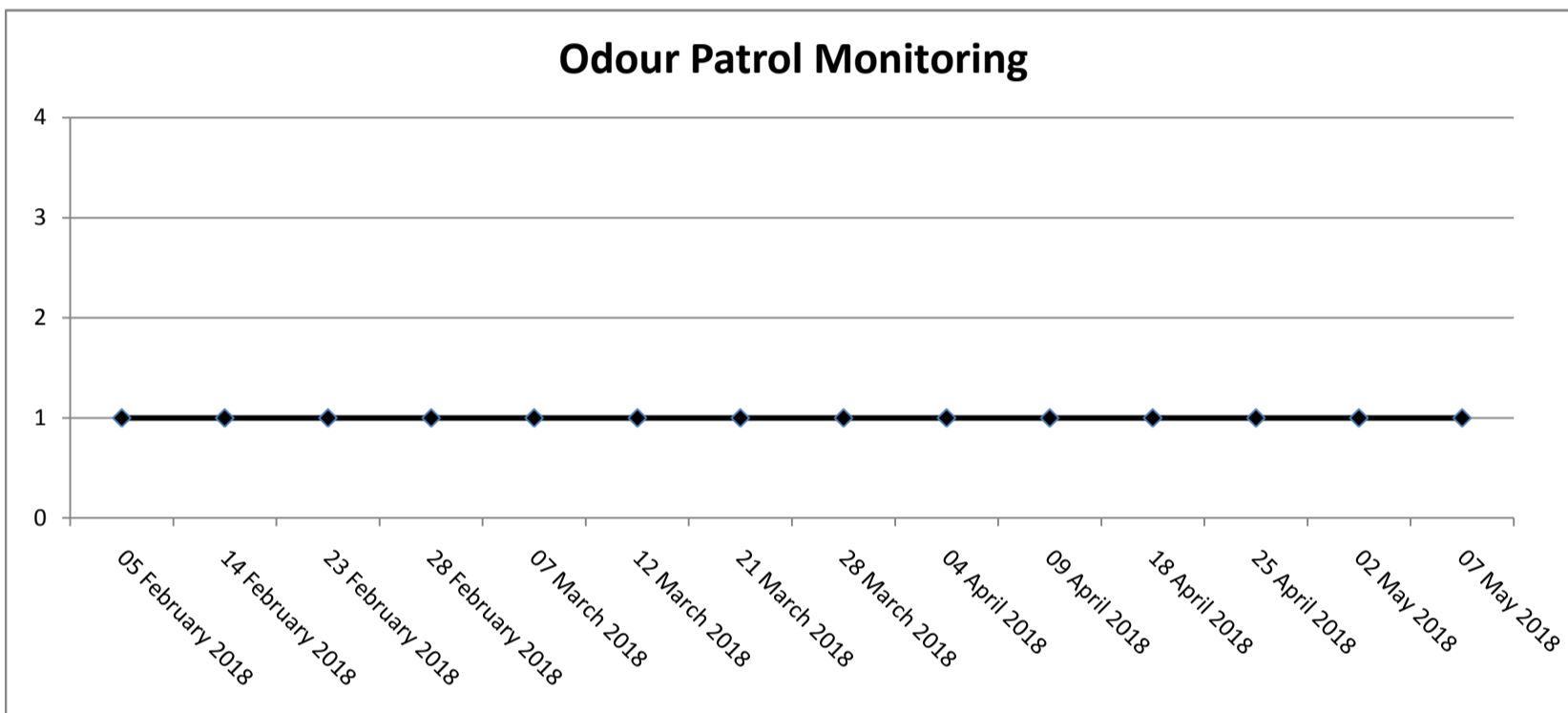
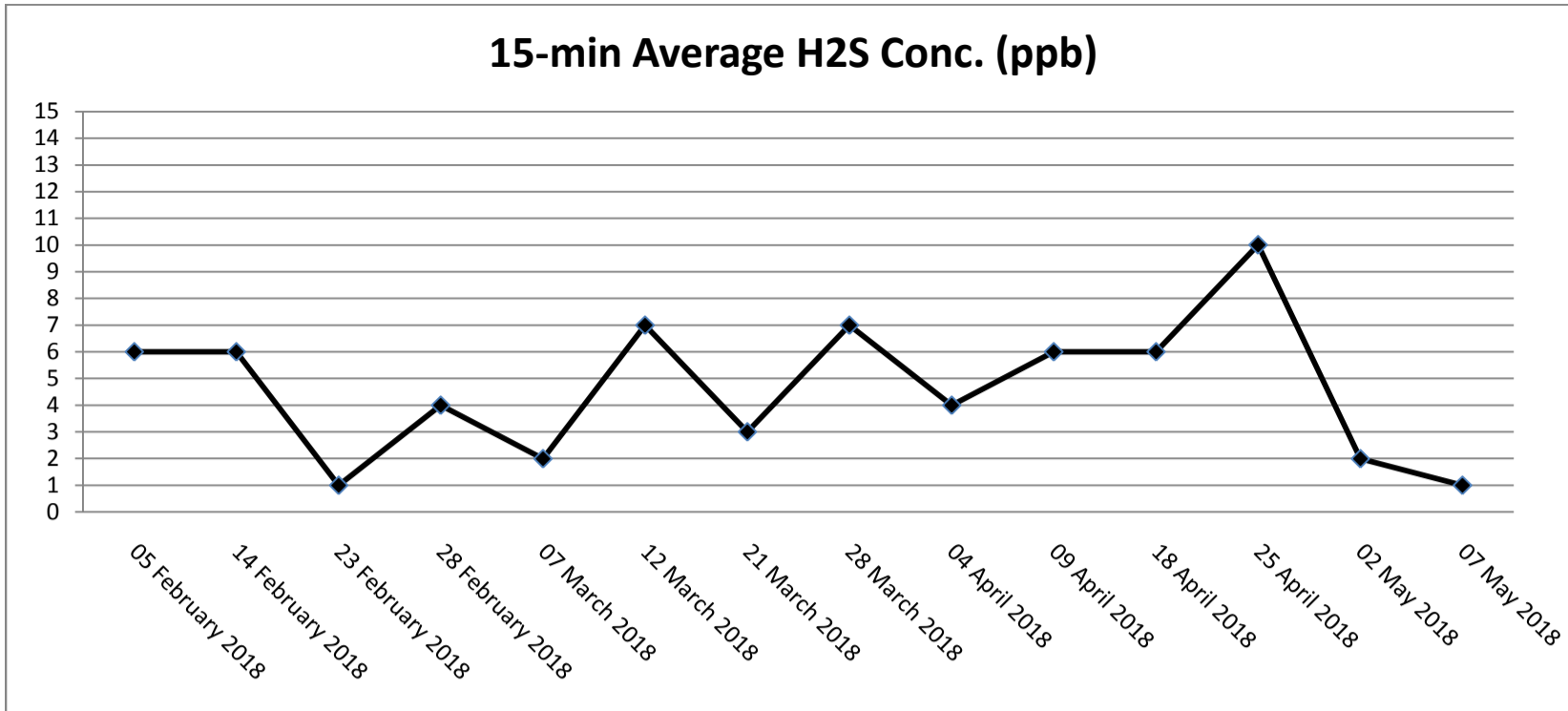
Remark:

1. *LOR denotes limit of reporting.*
2. The Ambient temperature, relative humidity, wind speed and wind direction were measured and provided by the client.
3. The collected sample volume of the gas sample is sufficient for olfactometry analysis.

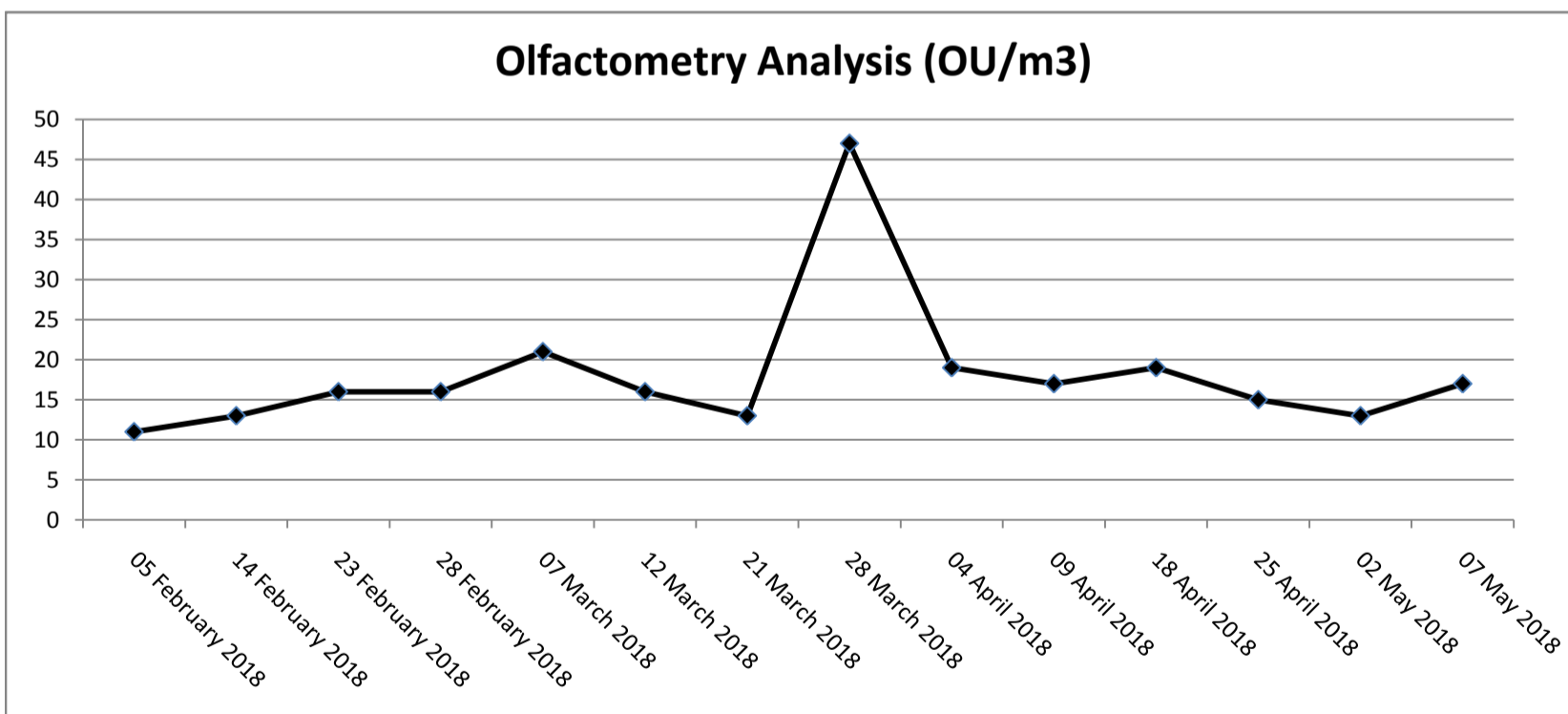
APPENDIX 1

A1.1. Layout of the Sampling Location





Note:
Y-axis refers to the Odour Level: 0 - Not Detected; 1- Slight; 2 - Moderate; 3 - Strong; 4 - Extreme



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Appendix F

Photos of Grab Samplers

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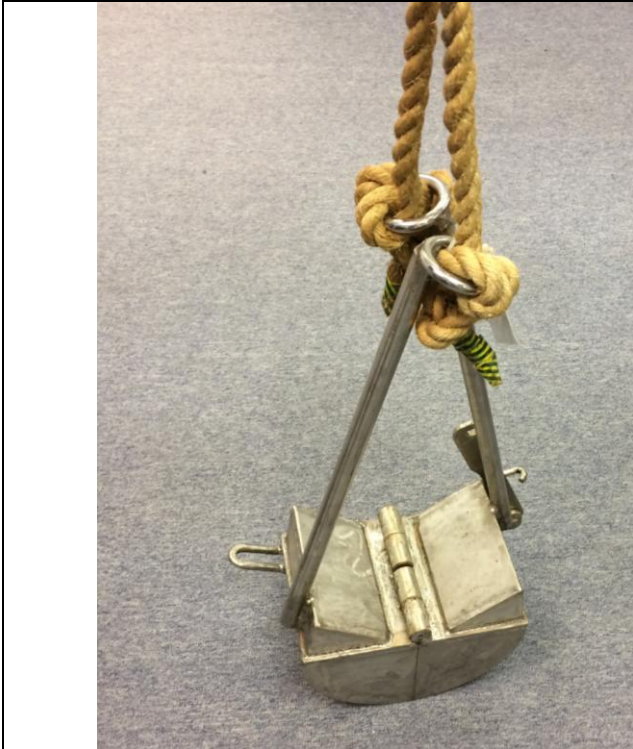


Photo 1. A polar grab sampler



Photo 2. Grab dimension 1



Photo3. Grab dimension 2



Photo4. Grab dimension 3

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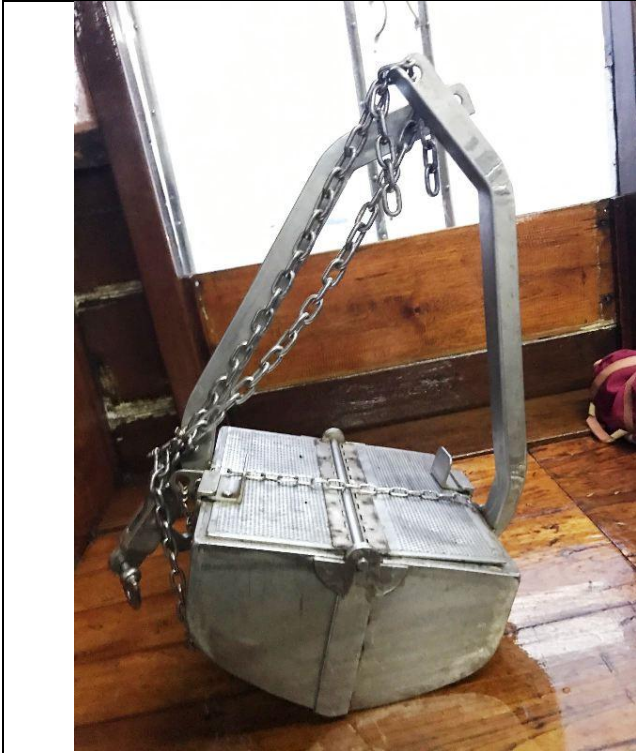


Photo 1. A modified Van Veen grab sampler



Photo 2. Grab dimension 1



Photo 3. Grab dimension 2



Photo 4. Grab dimension 3

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Appendix G

Environmental Mitigation Implementation Schedule (EMIS)

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Report No.: 0041/17/ED/0315B

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
Air Quality					
NA	4.5	NA	Odour reduction measures like aeration, chemical dosing system shall be implemented to reduce any odour impacts to an acceptable level.	SHWSTW	Implemented
3.4	4.5	NA	Sewage treatment works including sludge thickening tanks, the sludge pump house and sludge press house shall be completely enclosed.	SHWSTW	Implemented
3.4	4.5	NA	Exhaust air shall be ventilated to an odour scrubber prior to discharge. Ventilating air to a biological treatment unit with 95% odour removal efficiency prior to stack exhaust shall be implemented	SHWSTW	Implemented
Water Quality					
3.3	NA	4.01	To avoid impacts on the marine ecology due to effluent discharge, the disinfection facility as in Part B of the EP shall be equipped with an UV disinfection system capable of removing at least 99.9% of E.coli from the sewage	SHWSTW	Implemented
Waste Management					
3.6	NA	NA	Transportation of sludge shall be carried out in fully enclosed containers, or be placed in sludge skips with tarpaulin covers	SHWSTW	Implemented
NA	NA	5.02	Trip-ticket system mentioned shall be implemented. Trip-ticket is required for each truckload delivered to the landfills facilities according to WBTC No. 31/2004.	SHWSTW	Implemented
NA	NA	5.02	The acceptance criteria for Landfill disposal should be followed, i.e. solid content of sludge waste should be more than 30%.	SHWSTW	Implemented
NA	NA	5.02	The disposal of grit & debris (if any) generated during primary screening works should follow the requirement set in the WMP Section 4.05.	SHWSTW	Implemented
NA	NA	5.03	The wet sludge should be temporarily stored at the sludge buffer tank. It should then be transported to the centrifuge building for dewatering and discharged to the container for disposal. The whole process should be managed by the automatic electronic electronic system and monitored by the operators during operation.	SHWSTW	Implemented
NA	NA	5.04	The other solid waste material such as sediment and grit, refuse containers or collection bags should be temporarily stored in slips at designated area. Operators should ensure sufficient space is identified and provided for temporary storage of waste materials to facilitate collection. Storage of waste material on site will be kept to a minimum to avoid nuisance to local residents.	SHWSTW	Implemented
NA	NA	5.05	Chemical wastes which likely to be generated by activities arise from the maintenance, shall followed the Waste Disposal (Chemical Waste) (General) Regulation, includes Schedule 1 of the Regulation.	SHWSTW	Implemented
NA	NA	5.06	In case of unlikely occurred chemical spillage, procedures should be followed as according to the WMP Section 5.06.	SHWSTW	Implemented
NA	NA	5.07	Temporary storage areas should be identify and provided for the temporary storage of general	SHWSTW	Implemented

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Report No.: 0041/17/ED/0315B

EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
			refuse to facilitate collection		
NA	NA	5.07	Domestics wastes refuse generated on-site will be stored in enclosed bins or compaction units separately	SHWSTW	Implemented
NA	NA	5.07	Sufficient dustbins should be provided for domestic waste if required.	SHWSTW	Implemented
NA	NA	5.07	Domestics wastes should be cleared daily and will be disposed off to the nearest licensed landfill or refuse transfer station.	SHWSTW	Implemented
NA	NA	5.07	Spearate labeled bins should be provided to segregate the waste generated by workforce. Waste recycle collector should be employed to collect the segregated waste	SHWSTW	Implemented
NA	NA	5.07	Cardboard and paper packaging (for plant, equipment and materials) should be recovered on site, properly stockpiled in dry condition and covered to prevent cross contamination by other materials.	SHWSTW	Implemented
NA	NA	5.07	Office waste should be minimized through using papers on both sides. Communication by electronic means should be used as far as possible.	SHWSTW	Implemented
NA	NA	5.07	The burning of refuse on-site is prohibited by law and shall not be undertaken	SHWSTW	Implemented
NA	NA	5.07	Toilet wastewater shall be transported to the STW for treatment	SHWSTW	Implemented
NA	NA	5.07	Arrangement for collection of recyclable materials by recycling contractors should be followed as according to the WMP Section 5.07.	SHWSTW	Implemented
NA	NA	5.08	All recycling materials removed by the recycling contractors should be properly recorded before the removal. The natures and quantities of the recycling materials, the date of removal and the name of the recycling contractor should be recorded.	SHWSTW	Implemented
NA	NA	5.09	To maintain the site in a clean and tidy condition during the operation, general measures specified in the WMP should be implemented on site at all times. Regular site inspections shall be undertaken by the management team to ensure the measures are implemented.	SHWSTW	Implemented
NA	NA	5.10	Daily cleaning should be performed daily after work within the plant and the public areas immediately next to the site.	SHWSTW	Implemented
NA	NA	5.11	The work officer in charge of the corresponding area should perform daily inspection on the items mentioned in the WMP Section 5.10. If observations were discovered, the work officer should record the result of the inspection on an inspection checklist with photos taken and submitted to the inspectors or Chief Technical Officer for review on the following day. Any deficiency should be rectified promptly.	SHWSTW	Implemented
NA	NA	5.12	Weekly tidying should be performed weekly within the site.	SHWSTW	Implemented
NA	NA	5.13	The inspector should perform Weekly Inspection on the items mentioned in the WMP Section 5.12. If observations were discovered, the work officer should record the result on an inspection checklist and submitted to the Chief Technical Officer for review on the following day. Any deficiency should be rectified promptly.	SHWSTW	Implemented

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EP Ref.	EIA Ref.	WMP Ref.	Environmental Protection Measures	Location of the measures	Implementation Status
NA	NA	5.14	All wastes generated through the operational phase will be managed in accordance with the protocols set out in the WMP Section 5.14.	SHWSTW	Implemented

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