

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Monthly EM&A Report January 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/0265B

Prepared by: Andy K. H. Choi

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
Environmental Team Leader
Fugro Technical Services Limited

Allied Environmental Consultants Limited
Acousticians & Environmental Engineers

19/F., Kwan Chart Tower, 6 Tonnochy Road, Wan Chai, Hong Kong
Tel.: (852) 2815 7028 Fax: (852) 2815 5399 Email: info@aechk.com



沛然環境評估
工程顧問有限公司

Our Ref: 1458/18-0033

5 March 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 (JANUARY 2018)

Reference is made to the submission of Monthly Environmental Monitoring and Audit (EM&A) Report for January 2018 (Report No.: 0041/17/ED/0265B) received from the Environmental Team (ET), Messrs. Fugro Technical Services Ltd., on 2 March 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).

Notwithstanding, please be reminded that the ET shall strictly follow Condition 4.3 of the EP to submit monthly EM&A report within two weeks after the completion of each reporting period and the report shall be certified by the Independent Environmental Checker (IEC) before depositing with the Environmental Protection Department.

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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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 sixth Monthly EM&A Report for the Project which summarizes findings of the EM&A works during the reporting period from 1 January 2018 to 31 January 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, 10, 19, 23 and 29 January 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.

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 5 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. seawater, vegetation and 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). Alternative methods shall be proposed and submitted for EPD's approval. In order to access whether SHWSTW is the major H₂S source to the ASR, additional air quality monitoring will be arranged on the first three weeks of coming month to review the suitability of the current monitoring location.

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, 10, 19, 23 and 29 January 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 January 2018	09:48 – 10:03	19.1	64.0	NE	2.0
10 January 2018	10:03 – 10:18	11.0	46.0	NE	0.7
19 January 2018	10:03 – 10:18	15.6	87.0	E	2.9
23 January 2018	10:48 – 11:03	21.2	63.0	E	2.5
29 January 2018	10:00 – 10:15	26.2	76.6	N	0.7

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 - 10	3.0	1 - 1	11 - 20	15.6

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 5 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW. In the measurements conducted on 29 January 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 measurement on 2, 10, 19 and 23 January 2018, only non-target smell (seawater, vegetation and 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 (11 – 20OU) 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. seawater, vegetation and gasoline) during the measurements conducted in past six months, inadequacy of representative data was result in the past 6 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). Alternative methods shall



be proposed and submitted for EPD's approval. In order to access whether SHWSTW is the major H₂S source to the ASR, additional air quality monitoring will be arranged on the first three weeks of coming month to review the suitability of the current monitoring location.

- 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 In addition to the specific sources of odour (e.g. seawater, vegetation and 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.
- 2.8.9 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 Status of EM&A Programme of Water Quality Monitoring

- 3.1.1 In accordance with Section 5.1 of the EM&A Plan, water quality monitoring should be carried out in the North Western Waters during the first five years of the operational phase of the Project on a bimonthly basis.
- 3.1.2 Since the proposed methodology was different from the requirement specified in the OEM&A plan, methodology for Water Quality Monitoring was prepared and submitted for EPD's review and approval. The commencement of Water Quality Monitoring will be subjected to the approval of EPD. The methodologies and the results of water quality monitoring will be reported in the subsequent Monthly EM&A report. No water quality monitoring work was conducted and no monitoring result was collected during the reporting period.



4. SEDIMENT QUALITY MONITORING AND BENTHIC SURVEY

4.1 Status of EM&A Programme of Sediment Quality Monitoring and Benthic Survey

- 4.1.1 In accordance with Section 6.1 of the EM&A Plan, sediment quality monitoring and benthic survey should be carried out in the North Western Waters during the first five years of the operational phase of the Project on a bimonthly basis.
- 4.1.2 Since the proposed methodology was different from the requirement specified in the OEM&A plan, methodology for Sediment Quality Monitoring and Benthic Survey was prepared and submitted for EPD's review and approval. The commencement of Sediment Quality Monitoring and Benthic Survey will be subjected to the approval of EPD. The methodologies and the results of sediment quality monitoring and benthic survey will be reported in the subsequent Monthly EM&A report. No sediment quality monitoring work and benthic survey was conducted and no monitoring result was collected during 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.



6. ADVICE ON IMPLEMENTATION STATUS OF ENVIRONMENTAL MITIGATION MEASURES

6.1 Implemtation 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 F**.



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 F**.



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, 10, 19, 23 and 29 January 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 6 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). Alternative methods shall be proposed and submitted for EPD's approval. In order to access whether SHWSTW is the major H₂S source to the ASR, additional air quality monitoring will be arranged on the first three weeks of coming month to review the suitability of the current monitoring location.

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 5 measurements) could not be considered as representative data to reflect the odour impact from SHWSTW. In the measurements conducted on 29 January 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 measurement on 2, 10, 19 and 23 January 2018, only non-target smell (seawater, vegetation and 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 (11 – 20OU) 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 6 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). Alternative methods shall be proposed and submitted for EPD's approval. In order to access whether SHWSTW is the major H₂S source to the ASR, additional air quality monitoring will be arranged on the first three weeks of coming month to review the suitability of the current monitoring location.
- 11.1.4 No water quality monitoring, sediment quality monitoring and benthic survey work was conducted during the reporting period. Since the proposed methodology was different from the requirement specified in the OEM&A plan, methodology for water quality monitoring, sediment quality monitoring and benthic survey was prepared and submitted for EPD's review and approval. The commencement of water quality monitoring, sediment quality monitoring and benthic survey will be subjected to the approval of EPD. Water quality monitoring, sediment quality Monitoring and benthic survey will be conducted and reported in the subsequent monthly EM&A reporting.
- 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

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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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. 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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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Figure 1

Monitoring Location of Air Sensitive Receiver

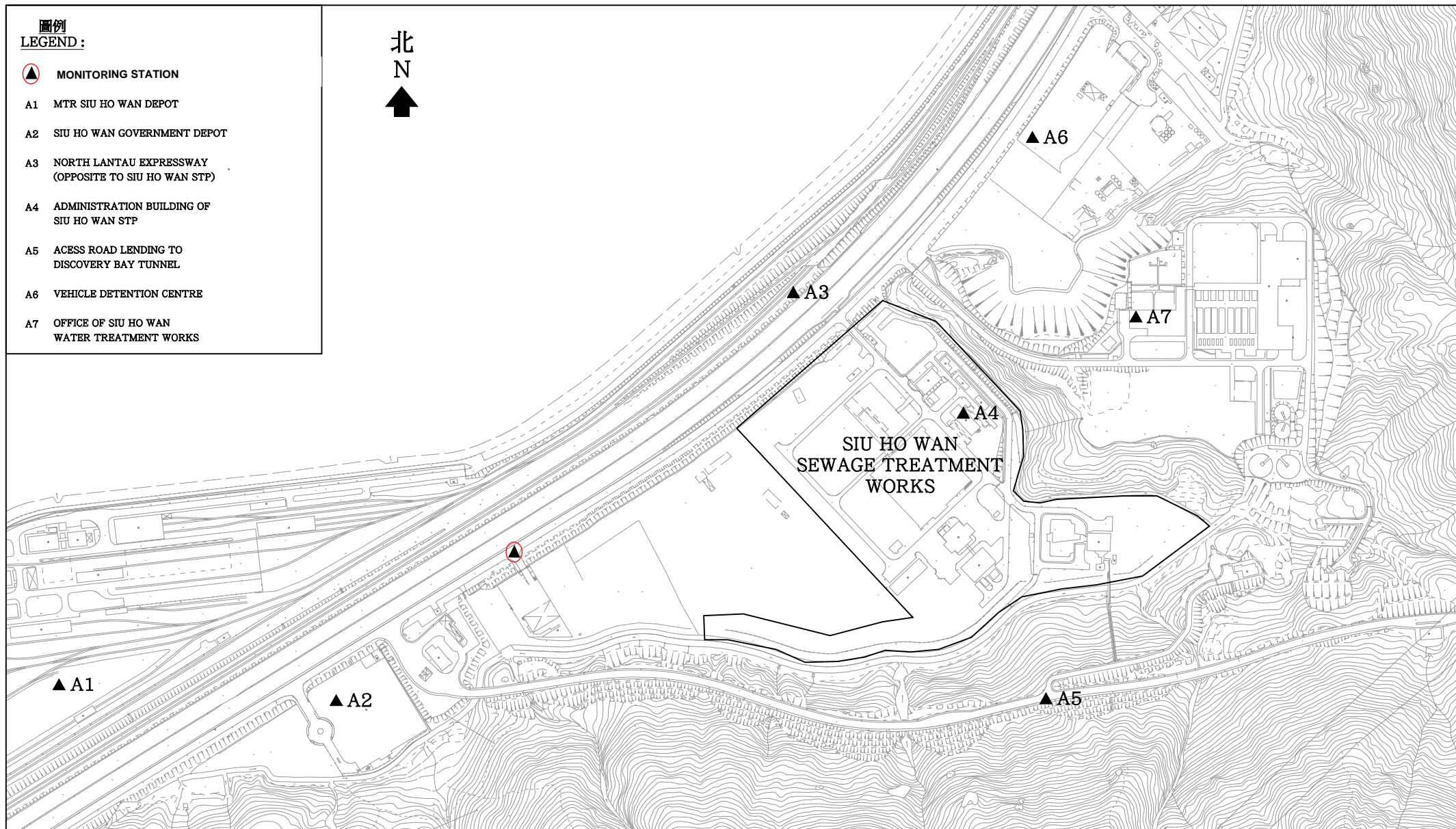
圖例
LEGEND:



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 LEADING TO
DISCOVERY BAY TUNNEL
A6 VEHICLE DETENTION CENTRE
A7 OFFICE OF SIU HO WAN
WATER TREATMENT WORKS

北
N



圖則名稱 drawing title

UPGRADING OF SIU HO WAN SEWAGE TREATMENT PLANT
OPTIONAL ENVIRONMENTAL MONITORING AND AUDIT PLAN
ODOUR PATROL MONITORING STATIONS

繪畫 drawn

C.W. CHAN

日期 date
16-08-2006

核對 checked

C.K. LAM

日期 date
16-08-2006

批核 approved

S.K. WONG

日期 date
16-08-2006

部門 office

顧問工程管理部
CONSULTANTS MANAGEMENT DIVISION

圖則編號 drawing no.

DCM/2006/063

比例 scale

N.T.S.

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香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE
HONG KONG
SPECIAL ADMINISTRATIVE REGION

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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Figure 2

Location of Survey Areas of Chinese White Dolphins

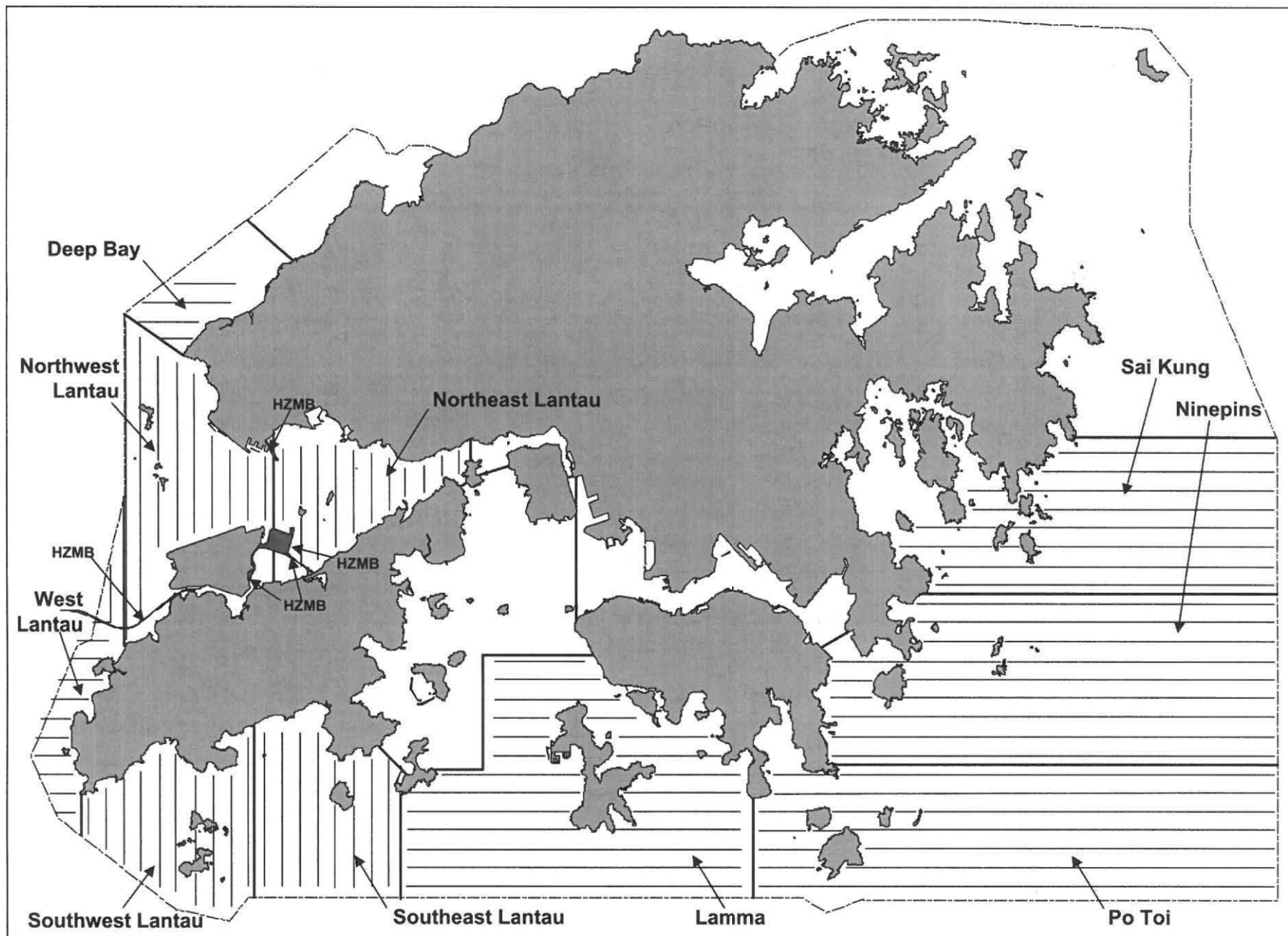


Figure 2 Ten Line-Transect Survey Areas within the Study Area chosen for the Present Monitoring Study (2016-17)

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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Appendix A

Project Organization Chart

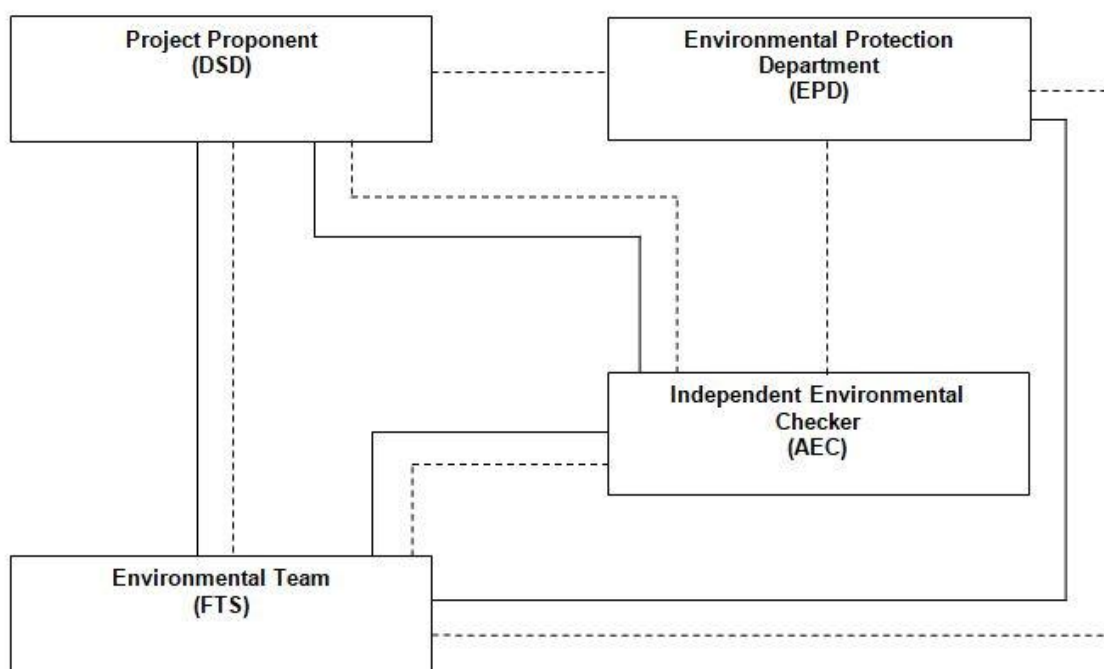
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Fugro Development Centre,
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Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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Legend:
— Line of Reporting
--- Line of Communication

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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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Appendix B

Monitoring Schedule for Present and Next Reporting Period

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Monitoring Schedule for Present Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
	1 January 2018	2 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	3	4	5	6
7	8	9	10 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	11	12	13
14	15	16	17	18	19 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	20
21	22	23 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	24	25	26	27
28	29 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	30	31			

Remarks

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

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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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Monitoring Schedule for Next Reporting Period

Sun	Mon	Tue	Wed	Thur	Fri	Sat
			1	1 February 2018	2	3
4	5 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	6	7	8	9	10
11	12	13	14 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	15	16	17
18	19	20	21	22	23 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	24
25	26 H ₂ S concentration monitoring, odour patrol monitoring and odour sampling	27	28			

Remarks

1. Actual monitoring will be subjected to change due to any safety concern or adverse weather condition.
2. The Commencement of Water Quality Monitoring, Sediment Quality Monitoring and Benthic Survey Works will be subjected to the approved from EPD in case there is any variation in the methodology between the EM&A Plan.

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
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Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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Appendix C

Event and Action Plan for Air Quality Monitoring

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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EVENT	ACTION		
	ET	IEC	*Operator
Action Level			
One complaint received for specific odour event	1. Check Operator's working methods; 2. Discuss with Operator on required remedial actions	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	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	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	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	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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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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Appendix D

Copy of Calibration Certificates of H₂S Analyzer

ARIZONA INSTRUMENT LLC

3375 N. Delaware St., Chandler, AZ 85225
(800) 528-7411 • (602) 470-1414
www.azic.com • customerservice@azic.com



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: _____

Date Approved: 05-Jun-2017

Title: Cheryl Hradek - Quality Control

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.

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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Appendix E

Results and Graphical Presentation of Air Quality Monitoring

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	02 January 2018
Monitoring Location:	ASR
Start Time:	09:48
End Time:	10:03
Temperature (°C)	19.1
Wind Speed (m/s)	2
Wind Direction	NE
Relative Humidity (%)	64

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-01-02	09:48:07	0.006
2018-01-02	09:49:07	0.006
2018-01-02	09:50:07	0.006
2018-01-02	09:51:07	0.006
2018-01-02	09:52:07	0.010
2018-01-02	09:53:07	0.009
2018-01-02	09:54:07	0.006
2018-01-02	09:55:07	0.005
2018-01-02	09:56:07	0.005
2018-01-02	09:57:07	0.005
2018-01-02	09:58:07	0.004
2018-01-02	09:59:07	0.004
2018-01-02	10:00:07	0.006
2018-01-02	10:01:07	0.005
2018-01-02	10:02:07	0.006
Average H2S conc. (ppm)		0.006

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	10 January 2018
Monitoring Location:	ASR
Start Time:	10:03
End Time:	10:18
Temperature (°C)	11.0
Wind Speed (m/s)	0.7
Wind Direction	NE
Relative Humidity (%)	46

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-01-10	10:03:37	0.003
2018-01-10	10:04:37	0.003
2018-01-10	10:05:37	0.002
2018-01-10	10:06:37	0.002
2018-01-10	10:07:37	0.002
2018-01-10	10:08:37	0.003
2018-01-10	10:09:37	0.002
2018-01-10	10:10:37	0.002
2018-01-10	10:11:37	0.003
2018-01-10	10:12:37	0.002
2018-01-10	10:13:37	0.003
2018-01-10	10:14:37	0.002
2018-01-10	10:15:37	0.003
2018-01-10	10:16:37	0.003
2018-01-10	10:17:37	0.002
Average H2S conc. (ppm)		0.002

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	19 January 2018
Monitoring Location:	ASR
Start Time:	10:03
End Time:	10:18
Temperature (°C)	15.6
Wind Speed (m/s)	2.9
Wind Direction	E
Relative Humidity (%)	87

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-01-19	10:03:56	0.004
2018-01-19	10:04:56	0.003
2018-01-19	10:05:56	0.003
2018-01-19	10:06:56	0.002
2018-01-19	10:07:56	0.003
2018-01-19	10:08:56	0.002
2018-01-19	10:09:56	0.002
2018-01-19	10:10:56	0.001
2018-01-19	10:11:56	0.001
2018-01-19	10:12:56	0.001
2018-01-19	10:13:56	0.002
2018-01-19	10:14:56	0.002
2018-01-19	10:15:56	0.002
2018-01-19	10:16:56	0.002
2018-01-19	10:17:56	0.002
Average H2S conc. (ppm)		0.002

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	23 January 2018
Monitoring Location:	ASR
Start Time:	10:48
End Time:	11:03
Temperature (°C)	21.2
Wind Speed (m/s)	2.5
Wind Direction	E
Relative Humidity (%)	63

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-01-23	10:48:22	0.002
2018-01-23	10:49:22	0.001
2018-01-23	10:50:22	0.002
2018-01-23	10:51:22	0.002
2018-01-23	10:52:22	0.003
2018-01-23	10:53:22	0.003
2018-01-23	10:54:22	0.003
2018-01-23	10:55:22	0.004
2018-01-23	10:56:22	0.003
2018-01-23	10:57:22	0.003
2018-01-23	10:58:22	0.003
2018-01-23	10:59:22	0.006
2018-01-23	11:00:22	0.007
2018-01-23	11:01:22	0.005
2018-01-23	11:02:22	0.008
Average H2S conc. (ppm)		0.004

Results and Graphical Presentation of Air Quality Monitoring

Date of Measurement:	29 January 2018
Monitoring Location:	ASR
Start Time:	10:00
End Time:	10:15
Temperature (°C)	10.3
Wind Speed (m/s)	0.7
Wind Direction	N
Relative Humidity (%)	76.6

Date (YYYY-MM-DD)	Time (hh:mm:ss)	H2S conc. (ppm)
2018-01-29	10:00:41	0.002
2018-01-29	10:01:41	0.002
2018-01-29	10:02:41	0.001
2018-01-29	10:03:41	0.001
2018-01-29	10:04:41	0.001
2018-01-29	10:05:41	0.001
2018-01-29	10:06:41	0.001
2018-01-29	10:07:41	0.001
2018-01-29	10:08:41	0.001
2018-01-29	10:09:41	0.001
2018-01-29	10:10:41	<0.001
2018-01-29	10:11:41	0.001
2018-01-29	10:12:41	0.001
2018-01-29	10:13:41	0.001
2018-01-29	10:14:41	<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.



CERTIFICATE OF ANALYSIS

CLIENT:	MateriaLab Consultants Limited	WORK ORDER:	HK1810090/B
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:	0
		DATE RECEIVED:	02 January 2018
		DATE OF ISSUE:	04 January 2018
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	SAMPLE TYPE:	Air
SITE:	Siu Ho Wan	NO OF SAMPLES:	1
PO:	---		

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 02nd January, 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.


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: $\text{OU}_\text{E}/\text{m}^3$. 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 $\text{OU}_\text{E}/\text{m}^3$. 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 $10^1 \text{OU}_\text{E}/\text{m}^3$ to $10^7 \text{OU}_\text{E}/\text{m}^3$.

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**

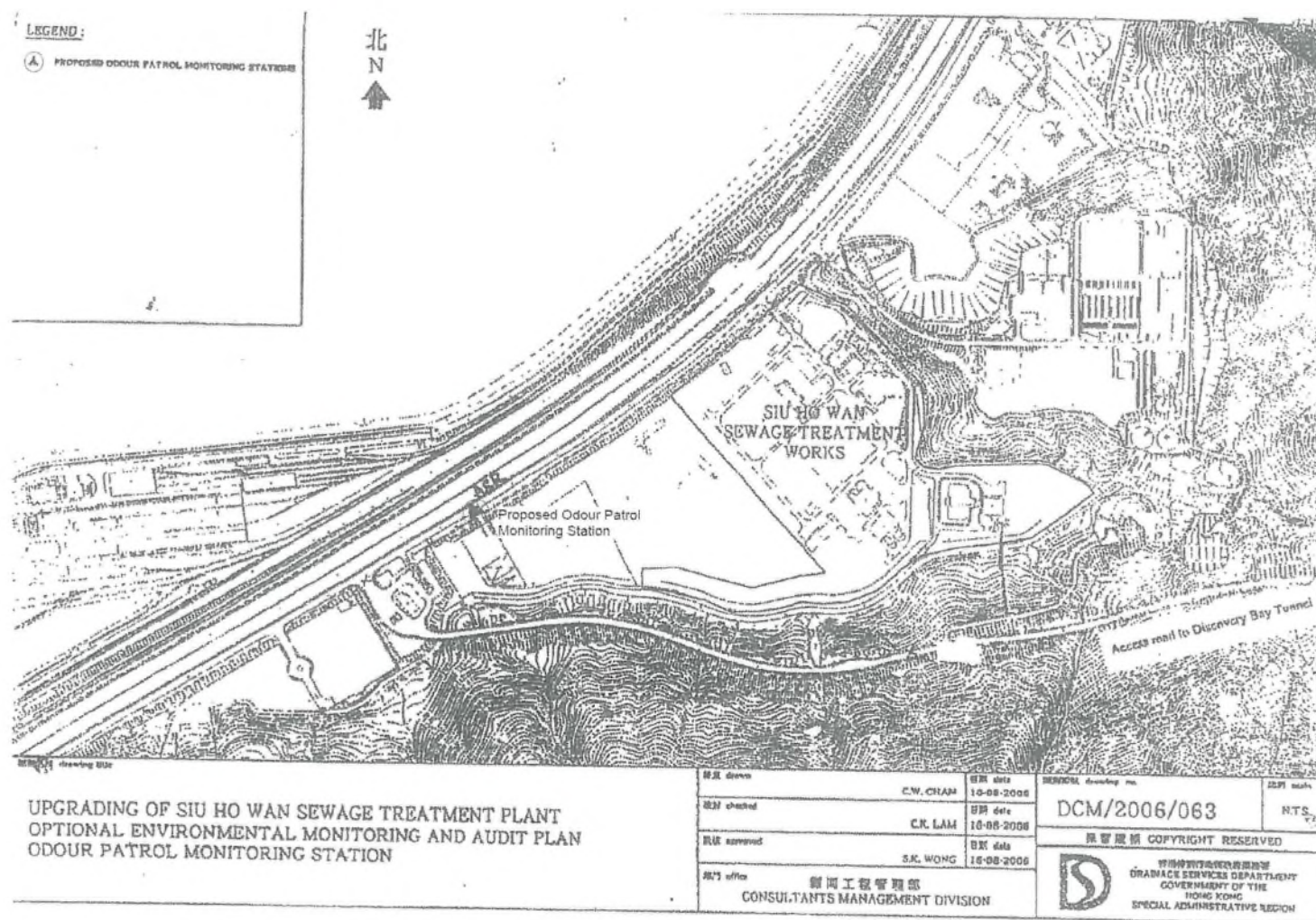
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _ℓ /m ³)	Odour Concentration (OU _ℓ /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1810090/B001	Siu Ho Wan - ASR	Air	02 January 2018	09:48	5	20	19.1	64	2.0	NE

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





CERTIFICATE OF ANALYSIS

CLIENT:	MaterialLab Consultants Limited	WORK ORDER:	HK1811810/B
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:	0
		DATE RECEIVED:	10 January 2018
		DATE OF ISSUE:	23 January 2018
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	SAMPLE TYPE:	Air
SITE:	Siu Ho Wan	NO OF SAMPLES:	1
PO:	---		

COMMENTS


Air sample(s) were collected by ALS Technichem (HK) staff on 10th January, 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.


Richard Fung
General Manager - Hong Kong

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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: $\text{OU}_\text{E}/\text{m}^3$. 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 $\text{OU}_\text{E}/\text{m}^3$. 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 $10^1 \text{OU}_\text{E}/\text{m}^3$ to $10^7 \text{OU}_\text{E}/\text{m}^3$.

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**

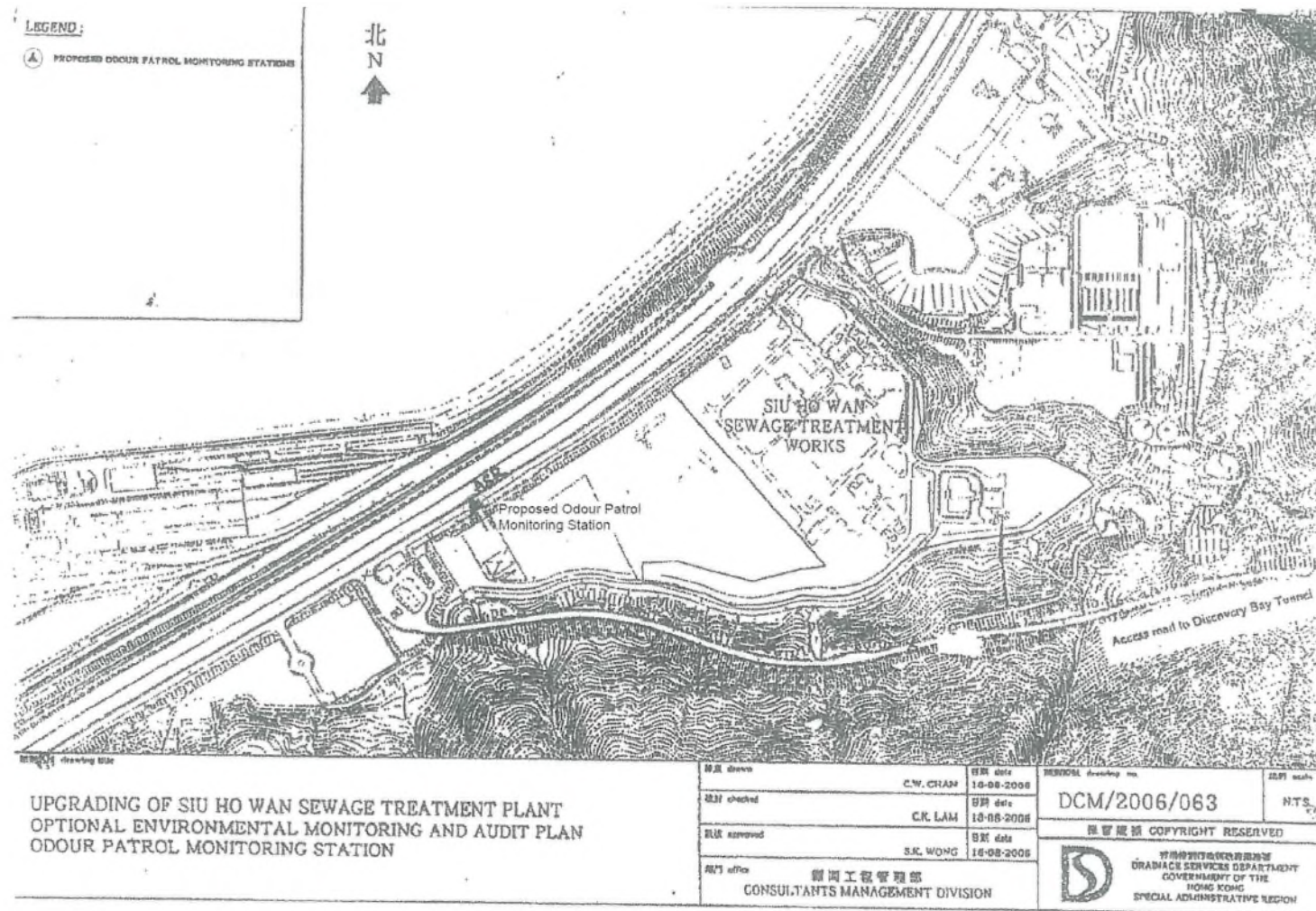
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1811810/B001	Siu Ho Wan - ASR	Air	10 January 2018	10:03	5	11	11	46	0.7	NE

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





CERTIFICATE OF ANALYSIS

CLIENT:	MaterialLab Consultants Limited	WORK ORDER:	HK1814371/B
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:	0
		DATE RECEIVED:	19 January 2018
		DATE OF ISSUE:	7 February 2018
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	SAMPLE TYPE:	Air
SITE:	Siu Ho Wan	NO OF SAMPLES:	1
PO:	---		

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 19th January, 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.


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: $\text{OU}_\text{E}/\text{m}^3$. 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 $\text{OU}_\text{E}/\text{m}^3$. 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 $10^1 \text{OU}_\text{E}/\text{m}^3$ to $10^7 \text{OU}_\text{E}/\text{m}^3$.

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**

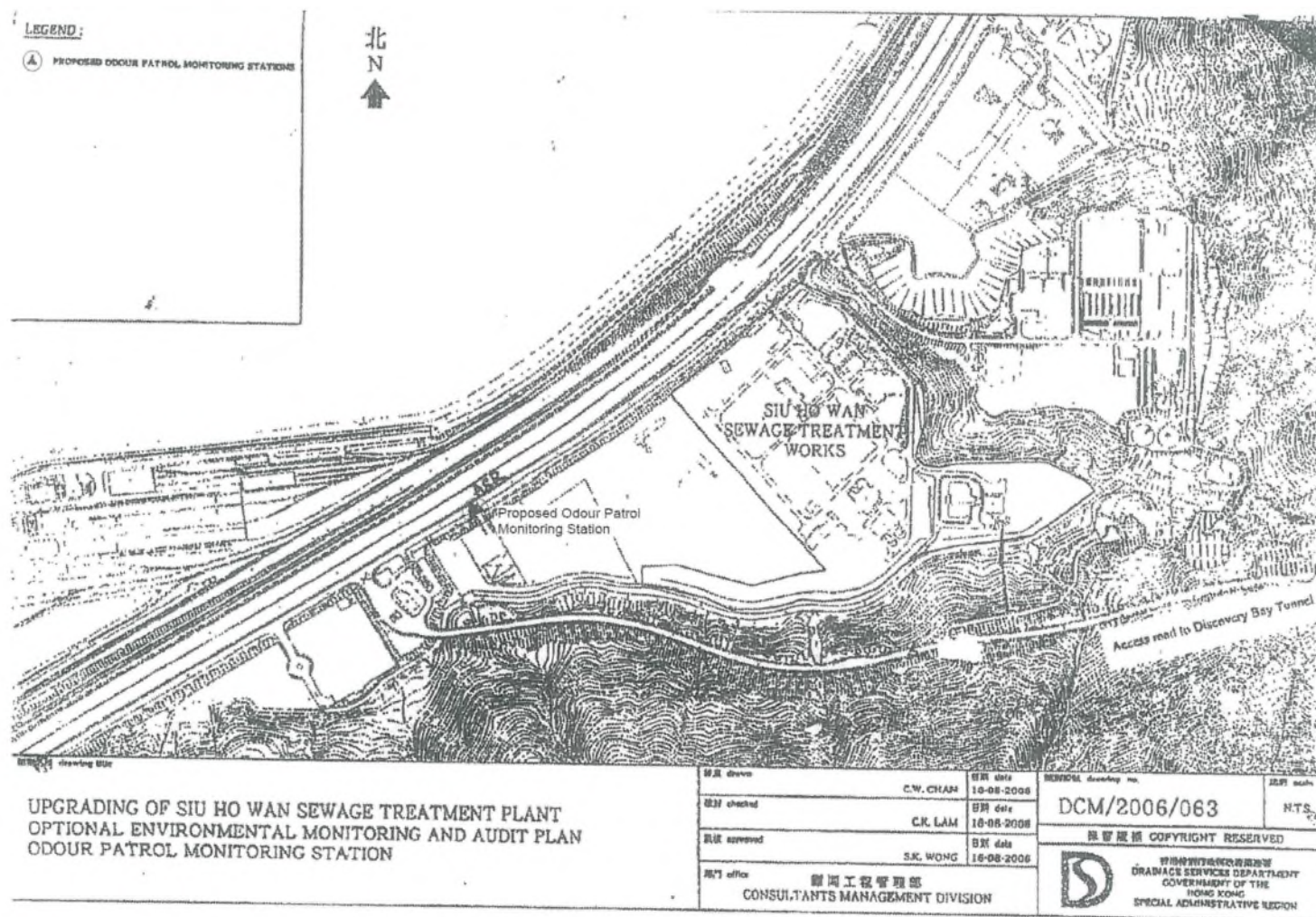
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1814371/B001	Siu Ho Wan - ASR	Air	19 January 2018	10:03	5	16	15.6	87	2.9	E

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





ALS Technichem (HK) Pty Ltd
11/F, Chung Shun Knitting Centre
1-3 Wing Yip Street
Kwai Chung, N.T., Hong Kong
T +852 2610 1044 F +852 2610 2021

CERTIFICATE OF ANALYSIS

CLIENT:	MaterialLab Consultants Limited	WORK ORDER:	HK1814373/B
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:	0
		DATE RECEIVED:	23 January 2018
		DATE OF ISSUE:	07 February 2018
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	SAMPLE TYPE:	Air
SITE:	Siu Ho Wan	NO OF SAMPLES:	1
PO:	---		

COMMENTS

Air sample(s) were collected by ALS Technichem (HK) staff on 23rd January, 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.


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.

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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.

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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**

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 (Degree)
HK1814373/B001	Siu Ho Wan - ASR	Air	23 January 2018	10:48	5	20	21.2	63	2.5	E

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.



ALS Technichem (HK) Pty Ltd
11/F, Chung Shun Knitting Centre
1-3 Wing Yip Street
Kwai Chung, N.T., Hong Kong
T +852 2610 1044 F +852 2610 2021

CERTIFICATE OF ANALYSIS

CLIENT:	MaterialLab Consultants Limited	WORK ORDER:	HK1815137/B
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:	0
		DATE RECEIVED:	29 January 2018
		DATE OF ISSUE:	07 February 2018
PROJECT:	Odour Survey for Siu Ho Wan Sewage Treatment Plant	SAMPLE TYPE:	Air
SITE:	Siu Ho Wan	NO OF SAMPLES:	1
PO:	---		

COMMENTS


Air sample(s) were collected by ALS Technichem (HK) staff on 29th January, 2018 at Siu Ho Wan.

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

NOTES

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


Richard Fung
General Manager - Hong Kong

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METHOD STATEMENT

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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**

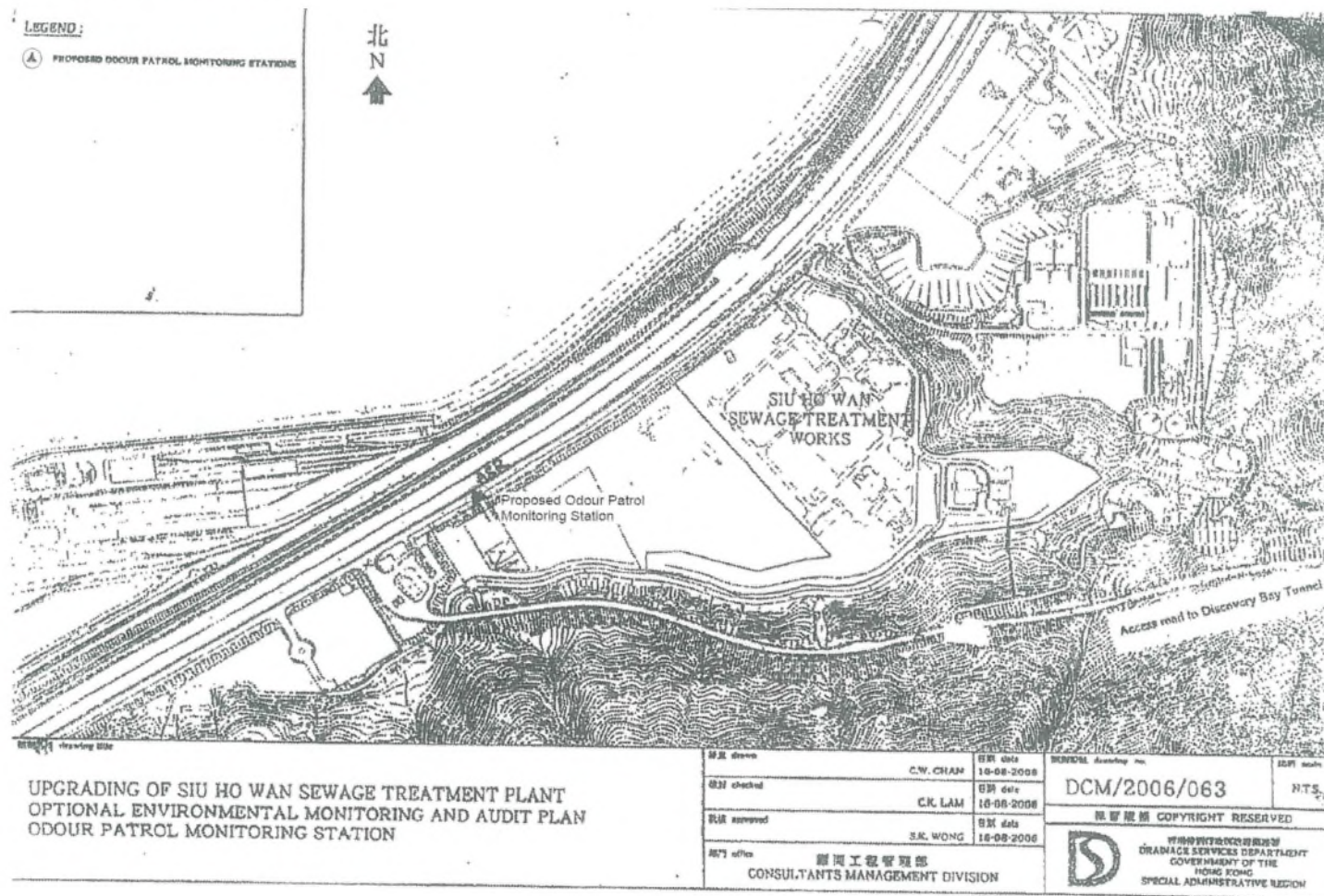
Sample ID	Location	Sample Type	Sampling Date	Sampling Time	LOR (OU _E /m ³)	Odour Concentration (OU _E /m ³)	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (Degree)
HK1815137/B001	Siu Ho Wan - ASR	Air	29 January 2018	10:00	5	11	10.3	76.6	0.7	N

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



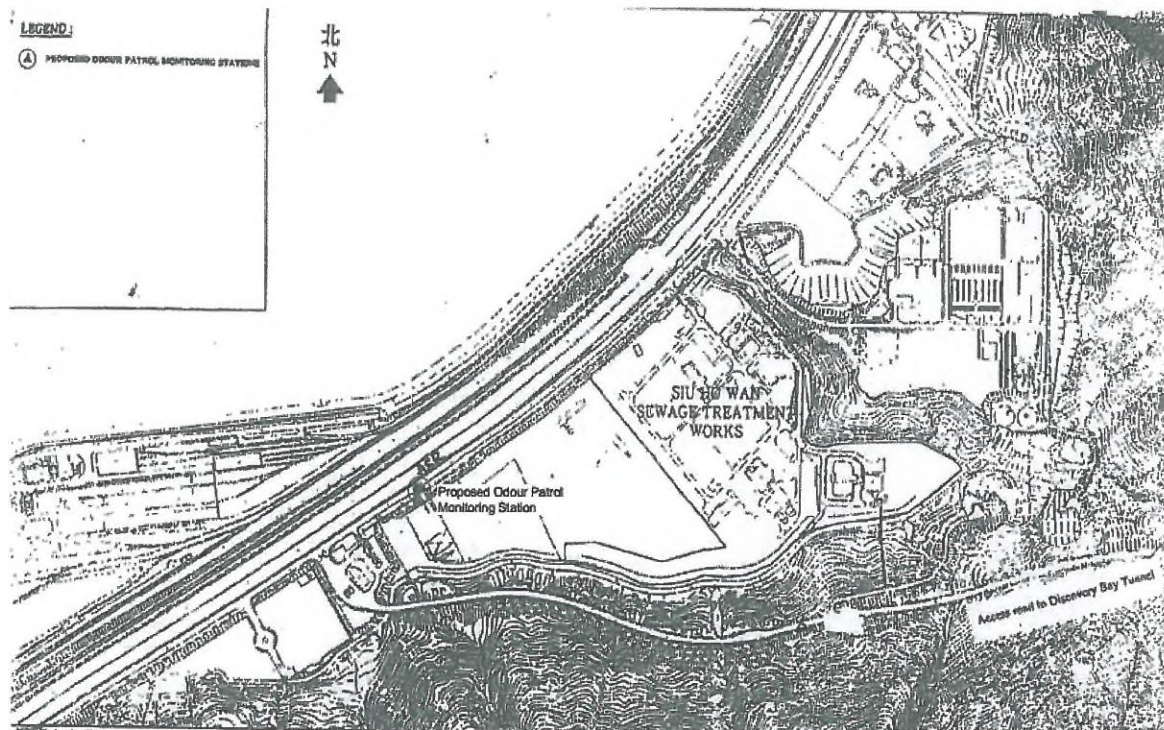
FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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: 2-1-2017

Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	19.1°C	Start Time:	09:49	End Time:	10:03
Wind Speed:	2.0 m/s		Wind Direction:	NE	
Nature of Odour:	vegetation				
*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: Sam
Name: Chen Ho Cheung
Date: 2-1-2017

Checked by: P
Name: Loi Chun Yip
Date: 2-1-2017

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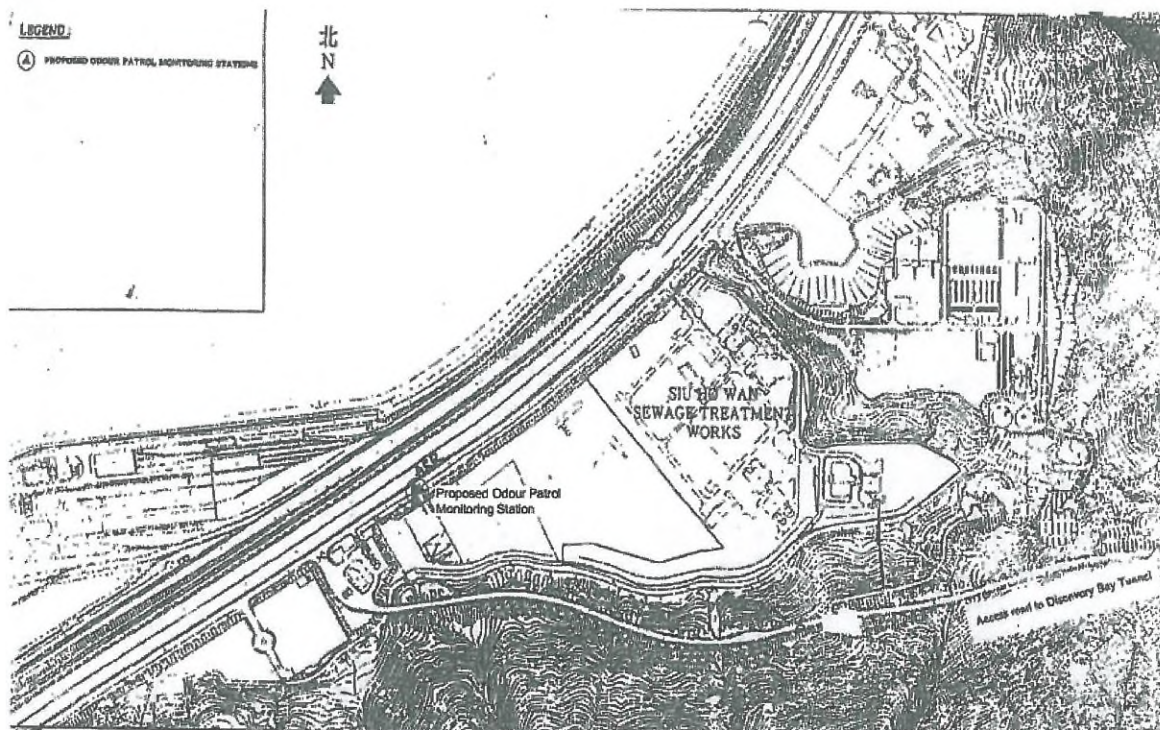
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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
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Website : www.fugro.com



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: 10-1-2017

Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	11°C	Start Time:	10:03	End Time:	10:19
Wind Speed:	0.7 m/s		Wind Direction:	NE	
Nature of Odour:	seawater				
*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: Jimmy
Name: Loi Kwok Leung
Date: 10-1-2017

Checked by: [Signature]
Name: Jan Chun Yip
Date: 10-1-2017

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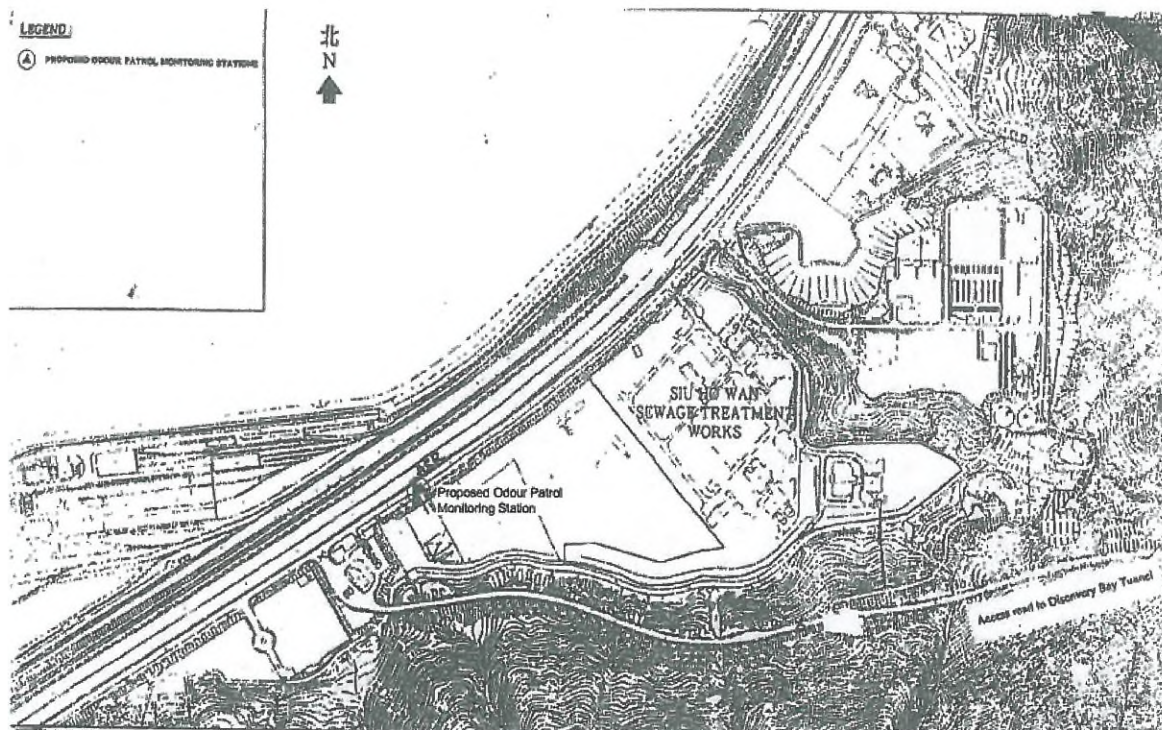
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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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: 19-1-2018

Weather: Cloudy

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	15.6°C	Start Time:	10:03	End Time:	10:18
Wind Speed:	2.9 m/s		Wind Direction:	E	
Nature of Odour:	vegetation				
*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: Lai Kwok Leng
Date: 19-1-2018

Checked by: [Signature]
Name: Lai Chun Yip
Date: 19-1-2018

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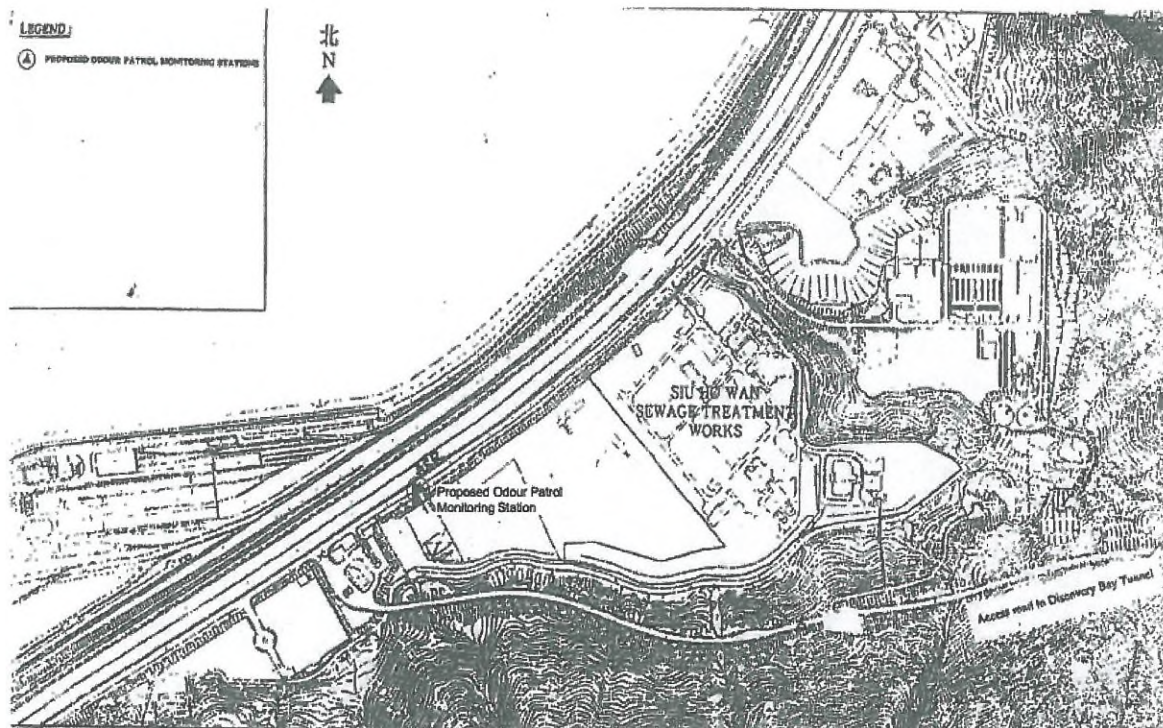
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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
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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: 23-1-2018

Weather: Fine

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	21.2°C	Start Time:	10:48	End Time:	11:03
Wind Speed:	2.5 m/s		Wind Direction:	E	
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: Joby
Name: Wan Ka Ho
Date: 23-1-2018

Checked by: [Signature]
Name: Lai Chun Yip
Date: 23-1-2018

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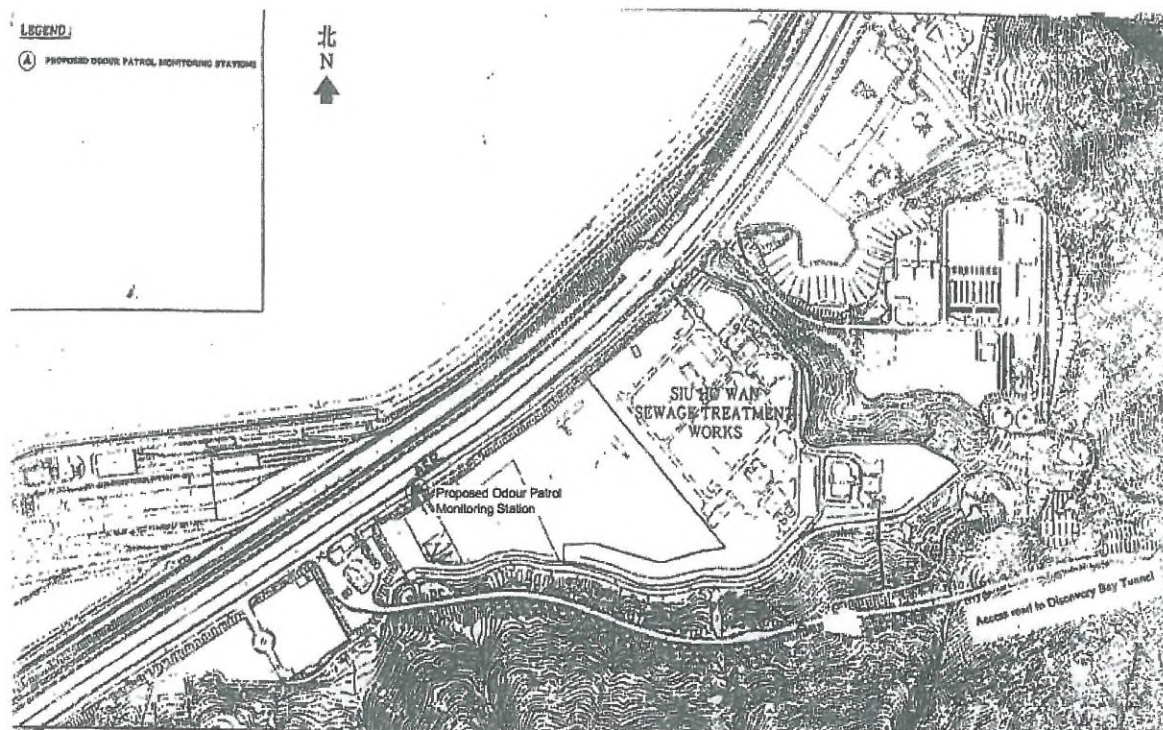
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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
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Hong Kong.

Tel : +852 2450 8233
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E-mail : matlab@fugro.com
Website : www.fugro.com



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: 29-1-2018

Weather: Cloudy

Location:	ASR – Cheung Tung Road near the Bus Depot at the west of treatment plant				
Temperature:	10.3°C	Start Time:	10:00	End Time:	10:15
Wind Speed:	0.7m/s		Wind Direction:	N	
Nature of Odour:	seawater				
*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:

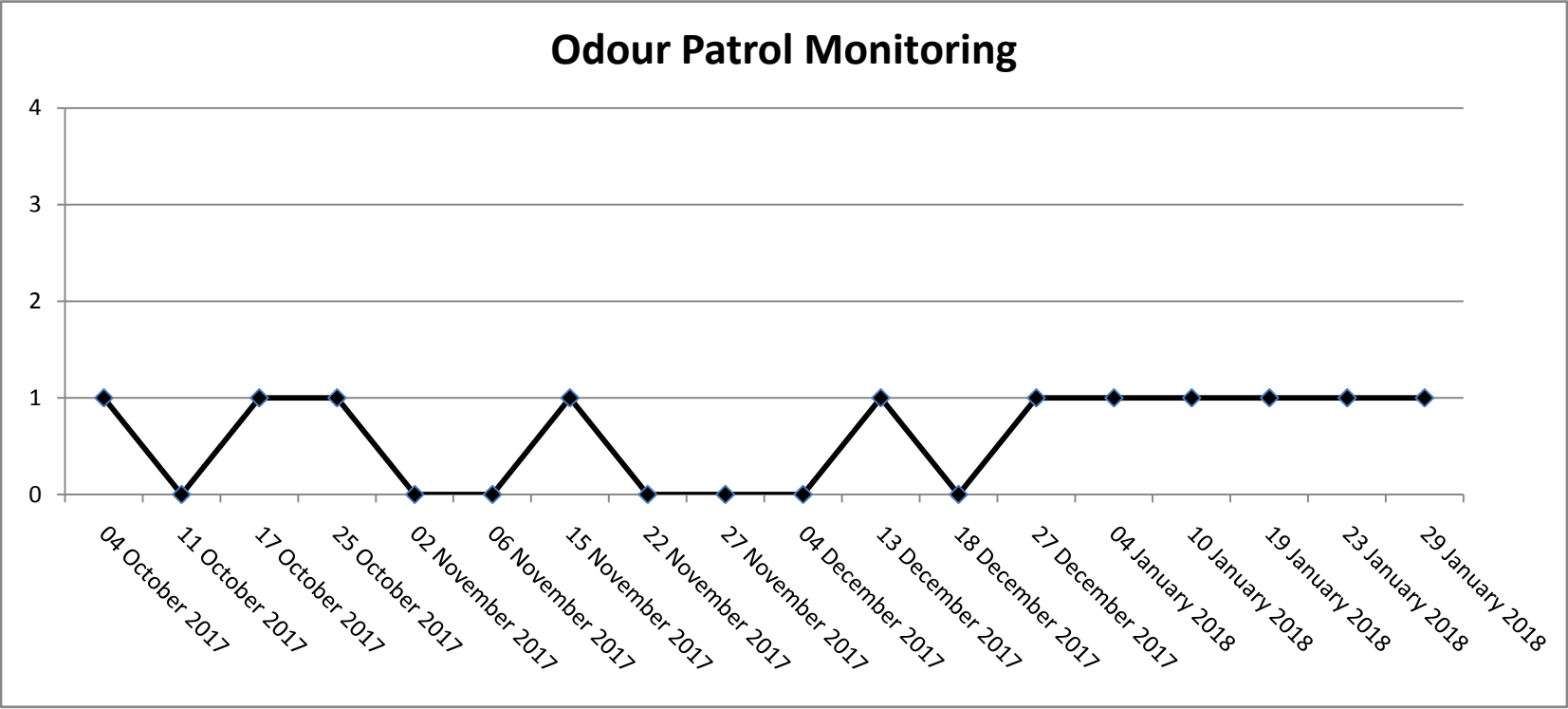
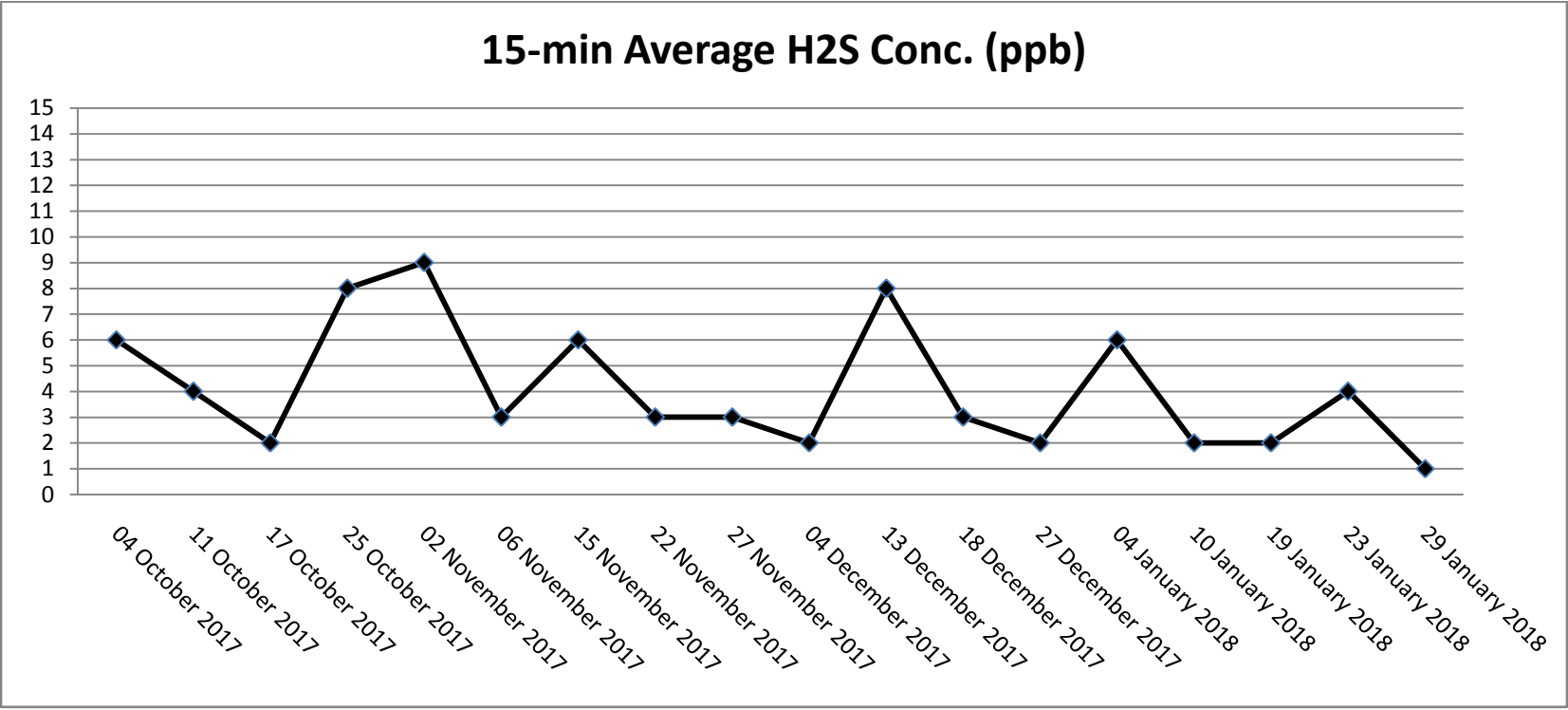
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Slight : Identifiable odour, barely noticeable
Noticeable : Identifiable odour, noticeable
Strong : Identifiable odour, strong
Extreme : Severe odour

Recorded by: Sunn
Name: Chan Ho Cheung
Date: 29-1-2018

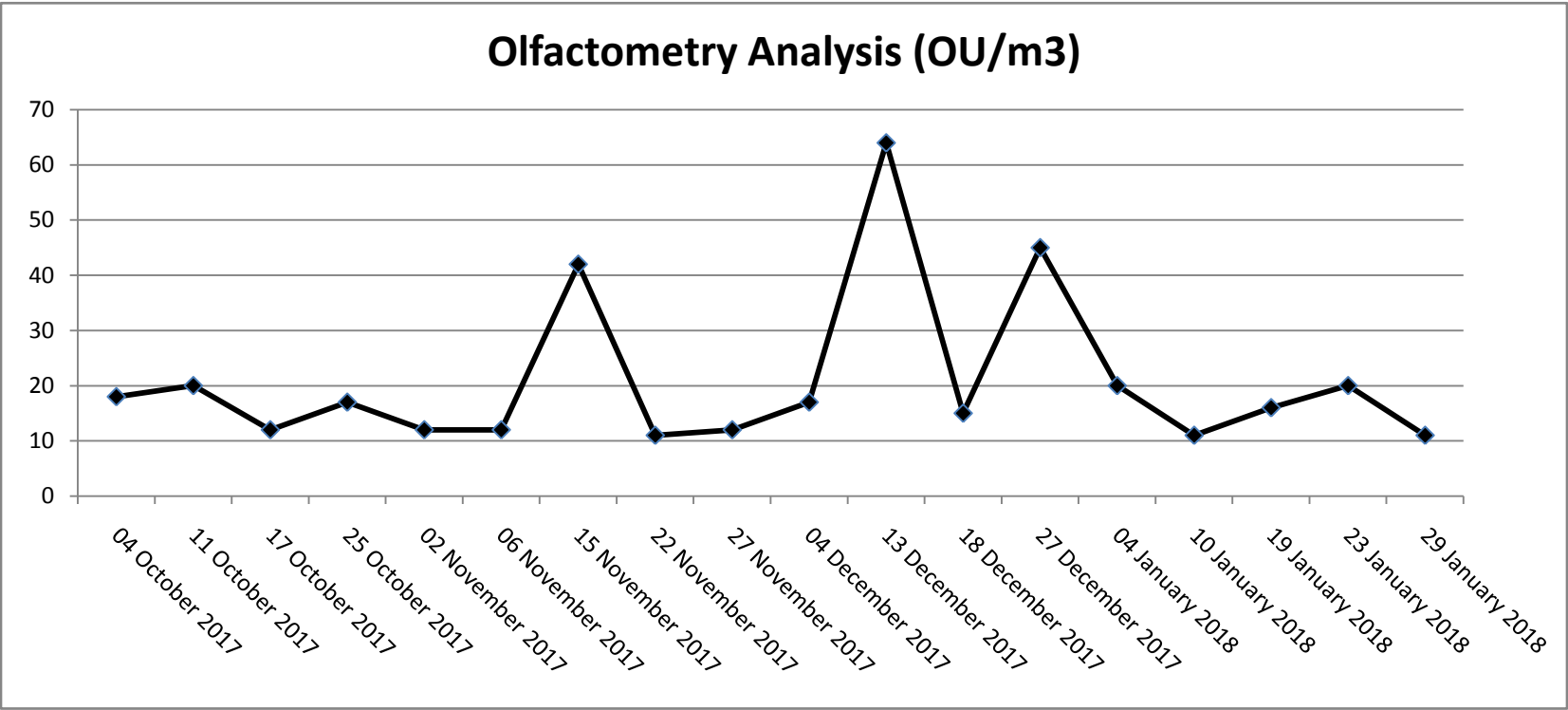
Checked by: l
Name: Lo Chun Yip
Date: 29-1-2018

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



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Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

Appendix F

Environmental Mitigation Implementation Schedule (EMIS)

FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



Report No.: 0041/17/ED/0265B

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 aareas should be identify and provided for the temporary storage of general	SHWSTW	Implemented

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Tel : +852 2450 8233
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Website : www.fugro.com



Report No.: 0041/17/ED/0265B

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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FUGRO TECHNICAL SERVICES LIMITED

Fugro Development Centre,
5 Lok Yi Street, Tai Lam,
Tuen Mun, N.T.,
Hong Kong.

Tel : +852 2450 8233
Fax : +852 2450 6138
E-mail : matlab@fugro.com
Website : www.fugro.com



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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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