




**Odour Monitoring Report for Harbour Area
Treatment Scheme Stage 2A
(Operational Phase) (January 2023)**

Report No.: OT_2023001

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1. Introduction

1.1. Background

- 1.1.1. Bestwise – Sun Fook Kong Joint Venture (the Contractors) appointed 3NV Technology Limited (3NV) to undertake the Odour Monitoring for the Operational Phase of the Harbour Area Treatment Scheme Stage 2A (hereafter referred to as “the Project”).
- 1.1.2. The Project is reference to Environmental Permit No. EP-322/2008/G issued on 9th May 2014 by the Environmental Protection Department (hereinafter called EPD) to the Drainage Services Department (hereinafter called the DSD) as the Permit Holder and the EM&A Manual for the HATS Stage 2A.
- 1.1.3. The odour measurement and odour patrol shall be conducted in the first five years upon commissioning of the expanded SCISTW. For the 1st year, odour monitoring had been conducted every three months. For the 2nd year, the monitoring frequency are remained unchanged. For the 3rd to 5th year, if the monitoring results from the 2nd year comply with the requirements stated in Section 2.38 and Section 2.41 of EM&A Manual, the frequency of the monitoring could be reduced to once every 6 months subject to EPD’s approval.

1.2. Objectives of the monitoring

- 1.2.1. The objective of odour patrol and odour measurement is to compare the result obtained from the operational phase with the baseline data at the designated points in order to determine the impact from the operation.

1.3. Objectives of the Report

- 1.3.1. The purpose of the odour monitoring report for the operational phase is to provide analysis and graphical presentation to determine if there are any changes of odour impacts with respect to the implementation of HATS Stage 2A.

2. Odour Patrol

2.1. Monitoring Requirement

- 2.1.1. An odour patrollist with at least 3 independent trained personnel / competent persons, will be provided to conduct the odour patrol work at 23 designated odour monitoring locations and at the site boundary of 8 PTW and the SCISTW. The patrollist will be “calibrated” with reference to European Standard Method:

BS EN13725 to ensure the patrollist odour sensitivity within 20-80 ppb/V. The Odour Certificates are shown in **Appendix B**.

2.1.2. The monitoring shall not be conducted on rainy days. Meteorological conditions including ambient temperature, relative humidity, wind speed and wind direction will be recorded with photo showing the sampling locations during each monitoring.

2.1.3. The independent trained personnel / competent persons shall:

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

2.2. Monitoring Frequency

2.2.1. Odour Patrol shall be conducted every three months for the operation for 8 PTWs and expended SCISTW. The first odour monitoring shall be conducted within one month, after the operation of the upgraded PTWs and expended SCISTW. Subsequent odour monitoring shall be conducted at the 4th, 7th and 10th month.

2.3. Monitoring Location

2.3.1. According to section 2.23 of the EM&A Manual, odour patrol monitoring will be conducted at the odour monitoring locations listed in **Table 2.1** and at the site boundary of 8 PTWs and SCISTW.

2.3.2. The layout of odour patrol monitoring locations is shown in **Appendix A**.

Table 2.1 Odour Patrol Monitoring Locations

| ASR ID in EIA Report | Monitoring Station ID | Location |
|----------------------|-----------------------|--|
| NP3 | OM_NP1 | King's Road Playground & Skating Area |
| NP4 | OM_NP2 | Customs HQ Tower (planned) |
| NP5 | OM_NP3 | K. Wah Centre |
| WC3 | OM_WC1 | Society for the Prevention of Cruelty to Animals |
| WC4 | OM_WC2 | Rest Garden near Wan Chai Interchange |
| C1 | OM_C1 | Sheung Wan Fire Station |
| C2 | OM_C2 | Water Front Divisional Police Station |
| C3 | OM_C3 | Sheung Wan Gala Point |
| FM2 | OM_FM1 | Western Wholesale Food Market |
| SB1 | OM_SB1 | University of Hong Kong Stanley Ho Sports Centre Pitch |
| SB2 | OM_SB2 | Home for the Elderly |
| SB3 | OM_SB3 | Maclehose Medical Rehabilitation Centre |
| SB4 | OM_SB4 | The Duchess of Kent Children's Hospital |
| CB1 | OM_CB1 | Cyber Centre |
| CB2 | OM_CB2 | Le Meridien Cyberport |
| WF2 | OM_WF1 | Wah Ming House, Wah Fu Estate |
| AB4 | OM_AB1 | Dairy Farm Ice and Cold Storage |

| | | |
|------|---------|--|
| ALC3 | OM_ALC1 | Shell Ap Lei Chau Depot |
| SCI1 | OM_SCI1 | Government Dockyard Offices |
| SCI3 | OM_SCI2 | COSCO Hit Terminal |
| SCI4 | OM_SCI3 | KMB Depot Office |
| SCI5 | OM_SCI4 | Planned FSD Diving Rescue and Diving Training Centre |
| SCI6 | OM_SCI5 | Club House |

2.4. Monitoring Parameters

2.4.1. During the patrolling, the meteorological and surrounding information are recorded:

- the prevailing weather condition;
- the wind direction;
- the wind speed;
- location where odour is spotted;
- source of odour;
- perceived intensity of the odour;
- duration of odour; and
- characteristics of the odour detected
- some relevant meteorological data such as daily average temperature, and daily average humidity, on the day of odour patrol should be obtained from the nearest Hong Kong Observatory station for reference.

2.4.2. The perceived intensity is to be divided into 5 levels which are ranked in a descending order as shown in **Table 2.2**.

Table 2.2 Description of Odour Intensity Levels

| Odour Level | Odour Intensity | Classification Criteria |
|-------------|-----------------|--|
| 0 | Not detected | No odour perceives or an odour so weak that it cannot be easily characterised or described |
| 1 | Slight | Slight identifiable odour, and slight chance to have odour nuisance |
| 2 | Moderate | Moderate identifiable odour, and moderate chance to have odour nuisance |
| 3 | Strong | Strong identifiable, likely to have odour nuisance |
| 4 | Extreme | Extreme severe odour, and unacceptable odour level |

3. Odour Patrol Monitoring Result

3.1. Odour Intensity

3.1.1. The odour patrol monitoring result on 11th January 2023 is summarized in **Table 3.1**. The field record and photo record at the ASRs during the patrols are attached in **Appendix C**.

Table 3.1 Summary of the Odour Patrol Results

| Monitoring Location | Odour Patrol Member | | |
|----------------------------|--------------------------|-----|-----|
| | O-1 | O-2 | O-3 |
| | Odour Intensity (0 to 4) | | |
| OM_NP1 | 0 | 0 | 0 |
| OM_NP2 | 0 | 0 | 0 |
| OM_NP3 | 0 | 0 | 0 |
| North Point PTW Boundary | 0 | 0 | 0 |
| OM_WC1 | 0 | 0 | 0 |
| OM_WC2 | 0 | 0 | 0 |
| Wan Chai East PTW Boundary | 0 | 0 | 0 |

| | | | |
|--------------------------------|---|---|---|
| OM_C1 | 0 | 0 | 0 |
| OM_C2 | 0 | 0 | 0 |
| OM_C3 | 0 | 0 | 0 |
| Central PTW Boundary | 0 | 0 | 0 |
| OM_FM1 | 0 | 0 | 0 |
| OM_SB1 | 0 | 0 | 0 |
| OM_SB2 | 0 | 0 | 0 |
| OM_SB3 | 0 | 0 | 0 |
| OM_SB4 | 0 | 0 | 0 |
| Sandy Bay PTW Boundary | 0 | 0 | 0 |
| OM_CB1 | 0 | 0 | 0 |
| OM_CB2 | 0 | 0 | 0 |
| Cyberport PTW Boundary | 0 | 0 | 0 |
| OM_WF1 | 0 | 0 | 0 |
| Wah Fu PTW Boundary | 0 | 0 | 0 |
| OM_AB1 | 0 | 0 | 0 |
| Aberdeen PTW Boundary | 0 | 0 | 0 |
| OM_ALC1 | 0 | 0 | 0 |
| Ap Lei Chau PTW Boundary | 0 | 0 | 0 |
| OM_SCI1 | 0 | 0 | 0 |
| OM_SCI2 | 0 | 0 | 0 |
| OM_SCI3 | 0 | 0 | 0 |
| OM_SCI4 | 0 | 0 | 0 |
| OM_SCI5 | 0 | 0 | 0 |
| SCISTW Boundary Location A | 1 | 1 | 1 |
| SCISTW Boundary Location A1 | 1 | 1 | 1 |
| SCISTW Boundary | 0 | 0 | 0 |

| | | | |
|-------------------------------|---|---|---|
| Location B | | | |
| SCISTW Boundary Location C | 0 | 0 | 0 |
| SCISTW Boundary Location D | 0 | 0 | 0 |

3.2. Meteorological Conditions

3.2.1. The meteorological conditions (including temperature, wind speed, wind direction, relative humidity) from the nearest Hong Kong Observatory's Weather Stations for each of the odour patrols were provided for reference in **Appendix D**.

3.3. Odour Patrol Result Discussion

3.3.1. Generally, the odour intensities detected around the SCISTW and PTWs were found to be ranging from level 0 up to level 1. With reference to the Action / Limit Level as shown in **Table 3.2**, no exceedance was found.

Table 3.2 Action / Limit Levels of the Odour Patrol

| Parameter | Action | Limit |
|----------------|--|---|
| Odour Nuisance | Odour Intensity of 2 is measured from odour patrol | Odour Intensity of 3 or above is measured from odour patrol |

3.3.2. By comparing our impact monitoring data with the baseline monitoring data, generally, there are no significant difference between two sets of data. A summary table are shown in **Table 3.3**.

Table 3.3 Comparison between Baseline Data and Impact Data of Odour Patrol

| Monitoring Location | Operational Phase Baseline* | Operational Phase Impact [#] |
|---------------------|--------------------------------|--|
| | Odour Intensity (0 to 4) | |
| OM_NP1 | 0 | 0 |
| OM_NP2 | 0 | 0 |
| OM_NP3 | 0 | 0 |

| | | |
|-------------------------------|---|---|
| North Point PTW Boundary | 0 | 0 |
| OM_WC1 | 0 | 0 |
| OM_WC2 | 0 | 0 |
| Wan Chai East PTW Boundary | 0 | 0 |
| OM_C1 | 0 | 0 |
| OM_C2 | 0 | 0 |
| OM_C3 | 0 | 0 |
| Central PTW Boundary | 0 | 0 |
| OM_FM1 | 0 | 0 |
| OM_SB1 | 0 | 0 |
| OM_SB2 | 0 | 0 |
| OM_SB3 | 0 | 0 |
| OM_SB4 | 0 | 0 |
| Sandy Bay PTW Boundary | 0 | 0 |
| OM_CB1 | 0 | 0 |
| OM_CB2 | 0 | 0 |
| Cyberport PTW Boundary | 0 | 0 |
| OM_WF1 | 0 | 0 |
| Wah Fu PTW Boundary | 0 | 0 |
| OM_AB1 | 0 | 0 |
| Aberdeen PTW Boundary | 0 | 0 |
| OM_ALC1 | 0 | 0 |
| Ap Lei Chau PTW Boundary | 0 | 0 |
| OM_SCI1 | 0 | 0 |
| OM_SCI2 | 0 | 0 |
| OM_SCI3 | 1 | 0 |
| OM_SCI4 | 0 | 0 |
| OM_SCI5 | 0 | 0 |
| SCISTW Boundary | 1 | 1 |

| | | |
|--------------------------------|---|---|
| Location A | | |
| SCISTW Boundary Location A1 | 1 | 1 |
| SCISTW Boundary Location B | 2 | 0 |
| SCISTW Boundary Location C | 3 | 0 |
| SCISTW Boundary Location D | 1 | 0 |

Remark(s):

1. * The Largest Data throughout the baseline period are extracted.
2. # The Largest Data among the three Odour Patrol Member are extracted.

4. Summary of Odour Patrol Result

4.1. Conclusion

4.1.1. In general, the odour patrol result is similar to the baseline data. There was no exceedance recorded.

4.2. Recommendations

4.2.1. With the odour patrol result, it is recommended to keep maintaining the plants and deodorization units in good condition.

4.3. Exceedance

4.3.1. There was no exceedance recorded. **Table 4.1** shown the Event/Action Plan for Operation Air Quality Monitoring.

Table 4.1 Event/Action Plan for Operation Air Quality Monitoring

| Event | Action | |
|----------------------------|---|---|
| | Person-in-charge of Odour Monitoring | DSD |
| Action Level | | |
| Exceedance of action level | 1. Identify source/reason of exceedance; 2. Repeat odour patrol to confirm finding; 3. Repeat odour | 1. Carry out investigation to identify the source/reason of exceedance. |

| | | |
|---------------------------|---|--|
| | <p>measurement at exhaust stacks of deodorization system of SCISTW (if exceedance at SCISTW) to confirm finding</p> | <p>2. Investigation shall be completed within 2 week; 3. Implement more mitigation measures if necessary.</p> |
| Limit Level | | |
| Exceedance of Limit level | <p>1. Identify source / reason of exceedance; 2. Repeat odour patrol to confirm finding; 3. Repeat odour measurement at exhaust stacks of deodorization system of SCISTW (if exceedance at SCISTW) to confirm finding 4. Increase monitoring frequency to monthly; 5. If exceedance stops, cease additional monitoring.</p> | <p>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 week; 2. Rectify any unacceptable practice; 3. Formulate remedial actions; 4. Ensure amended working methods and remedial actions properly implemented; 5. If exceedance continues, consider what mitigation measures shall be implemented.</p> |

4. Odour Measurement

4.1. Monitoring Requirement

4.1.1. Air samples will be collected by passive sampling technique at the odour monitoring station. A Nalophan™ sampling bag will be placed inside an air-tight sampler and then drawn to vacuum for sampling. Approximately 60 litres of the gas sample is collected into the sampling bag for testing. A diagram of the passive sampling equipment that will be used for the sampling is shown below:



Figure 1: Passive Sampler

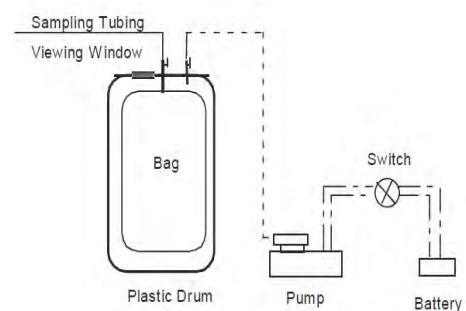


Figure 2: A Schematic Diagram of Sampling Device

- 4.1.2. Air samples in Nalophane bags shall be kept in cool condition not under direct sunlight exposure during the collection. If any condensate is observed on the inner surface of the sampled bag, the sample shall be discarded.
- 4.1.3. All samples collected during the sampling day shall be returned to laboratory at the same day. All olfactometry testing shall be conducted and finished within 24 hours after sampling.
- 4.1.4. The selected laboratory is the local laboratory for the measurement of odour concentration following the European Standard Method BS EN13725:2003 (by dynamic olfactometry). The Reporting Limit for the Olfactometry Analysis is 11 OUE/m³.
- Odour concentration of the sample is determined by Forced-choice Dynamic Olfactometer in accordance to European Standard Method: BS EN13725:2003.
 - Testing should be performed by five qualified panellists who have been trained and complied with the requirement of the European Standard Method: BS EN13725:2003 in the range of 20 to 80 ppb/v and a standard deviation of $R < 2.3$.

- Testing shall be started immediately after sample receipt and all testing to be completed with 24 hours after sampling.
- 4.1.5. 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 OUE/m³. The odour concentration is then expressed in terms of multiples of the detection threshold.



Figure 3: Olfactory Laboratory with Scentroid™ SS600 Olfactometer

- 4.1.6. During each odour sampling day, one blank sample should be collected for quality control. The sample will be taken by purging pure nitrogen gas into the odour bag directly on site as a blank sample.
- 4.1.7. All equipment for odour measurement and analysis are maintained and calibrated in according to the requirement of the European Standard Method EN13725.
- 4.2. Monitoring Frequency**
- 4.2.1. Odour measurement shall be conducted every three months for the operation for the expanded SCISTW. The first odour measurement shall be conducted within one month after operation of the expanded SCISTW. Subsequent odour measurement shall be conducted at the 4th, 7th and 10th month.
- 4.3. Monitoring Location**
- 4.3.1. According to section 2.36 of the EM&A Manual, odour measurement will be conducted at 15 exhaust stacks of the deodorization system at SCISTW. The odour measurement locations are listed in **Table 5.1**. As suggested by the contractor, the location ID is renamed to better identify the deodorization unit

which is different from that on the detailed reporting requirement of odour monitoring report.

- 4.3.2. The layout of odour monitoring locations for odour measurement is shown in **Appendix E**.

Table 5.1 Odour Monitoring Locations for Odour Measurement

| Location Point |
|-------------------------|
| DOU 1-R ⁽¹⁾ |
| DOU 1-PS ⁽²⁾ |
| DOU 1B-1 |
| DOU 1B-2 |
| DOU 2-PS ⁽³⁾ |
| DOU 3 |
| DOU 4-PS ⁽⁴⁾ |
| DOU 5-PS ⁽⁵⁾ |
| DOU 6 |
| DOU 6A |
| DOU 6B |
| DOU 8-1 |
| DOU 8-2 |
| DOU 9-1 |
| DOU 9-2 |

Notes:

- (1) Replace DOU 4-2 stated in Detailed Reporting Requirement of Odour Monitoring Report (Renaming to distinguish the source of odour is different from that of DOU4)
- (2) Replace DOU 1 stated in Detailed Reporting Requirement of Odour Monitoring Report (A polishing stage (PS) is added after the treatment of DOU 1 to enhance odour treatment performance)
- (3) Replace DOU 2 stated in Detailed Reporting Requirement of Odour Monitoring Report (A polishing stage (PS) is added after the treatment of DOU 2 to enhance odour treatment performance)
- (4) Replace DOU 4 stated in Detailed Reporting Requirement (A polishing stage (PS) is added after the treatment of DOU 4 to enhance odour treatment performance)
- (5) Replace DOU 5 stated in Detailed Reporting Requirement (A polishing stage (PS) is added after the treatment of DOU 5 to enhance odour treatment performance)

4.4. Monitoring Parameter

- 4.4.1. During sampling, following items will be recorded:

- ambient temperature;
- relative humidity;
- wind speed; and
- wind direction

- photo showing the sampling locations relative to existing land features

5. Odour Measurement Result

5.1. Odour Concentration and Odour Emission Rate

- 5.1.1. The odour measurement was conducted on 11th January 2023. The detail of location photo is shown in **Appendix E**.
- 5.1.2. The odour emission rate is listed in **Table 6.1**. The total odour emission rate is calculated to be 10,049 ou/s. **Appendix F** shown the detail monitoring results for each monitoring location.

Table 6.1 Summary of Odour Emission Rate

| Location ID | Odour Emission Rate (ou/s) |
|-------------|----------------------------|
| DOU 1-R | 163 |
| DOU 1-PS | 12 |
| DOU 1B-1 | 254 |
| DOU 1B-2 | 2,724 |
| DOU 2-PS | <103 |
| DOU 3 | 1,751 |
| DOU 4-PS | 260 |
| DOU 5-PS | 1,181 |
| DOU 6 | 2,336 |
| DOU 6A | <101 |
| DOU 6B | 711 |
| DOU 8-1 | <8 |
| DOU 8-2 | <8 |
| DOU 9-1 | 255 |
| DOU 9-2 | 182 |

5.2. Odour Measurement Result Discussion

- 5.2.1. The total odour emission rate presented in EIA Report Table 3.14 are given in **Appendix G**, the design total mitigated odour emission rate is 11,506.21 ou/s for Option 2 – Decentralized Design.

5.2.2. Comparison between impact monitoring data and data obtained from EIA is shown in **Table 6.2**.

Table 6.2 Comparison between Impact Monitoring Data and Data Obtained from EIA

| Total Odour Emission Rate (ou/s) | |
|----------------------------------|-----------|
| Operation Phase Impact | EIA |
| 10,049 | 11,506.21 |

5.2.3. According to Table 2.3 of EM&A Manual, the Action / Limit Level is shown in **Table 6.3**.

Table 6.3 Action / Limit Levels of the Odour Measurement

| Parameter | Action | Limit |
|----------------|--|--|
| Odour Nuisance | <ul style="list-style-type: none"> - When two documented complaints are received; or - Measured total odour emission rate from exhaust stacks of deodorization system at SCSITW $\geq 0.9 \times$ Total mitigated odour emission rate presented in EIA Report | <ul style="list-style-type: none"> - Five or more consecutive genuine documented complaints within a week; or - Measured total odour emission rate from exhaust stacks of deodorization system at SCISTW \geq Total mitigated odour emission rate presented in EIA Report |

6. Summary of Odour Measurement

6.1. Conclusion

6.1.1. The impact total odour emission rate is smaller than the 90% of total mitigated odour emission rate presented in the EIA report (10355.59 ou/s). The odour

measurement is acceptable and no exceedance is recorded.

6.2. Recommendation

6.2.1. Since the odour measurement was close to the exceedance limit. The operator is reminded to check the performance of the plants and deodorization units and to keep a close monitoring on the in-house H₂S sensors to ensure that no odour nuisance is induced by SCSITW.

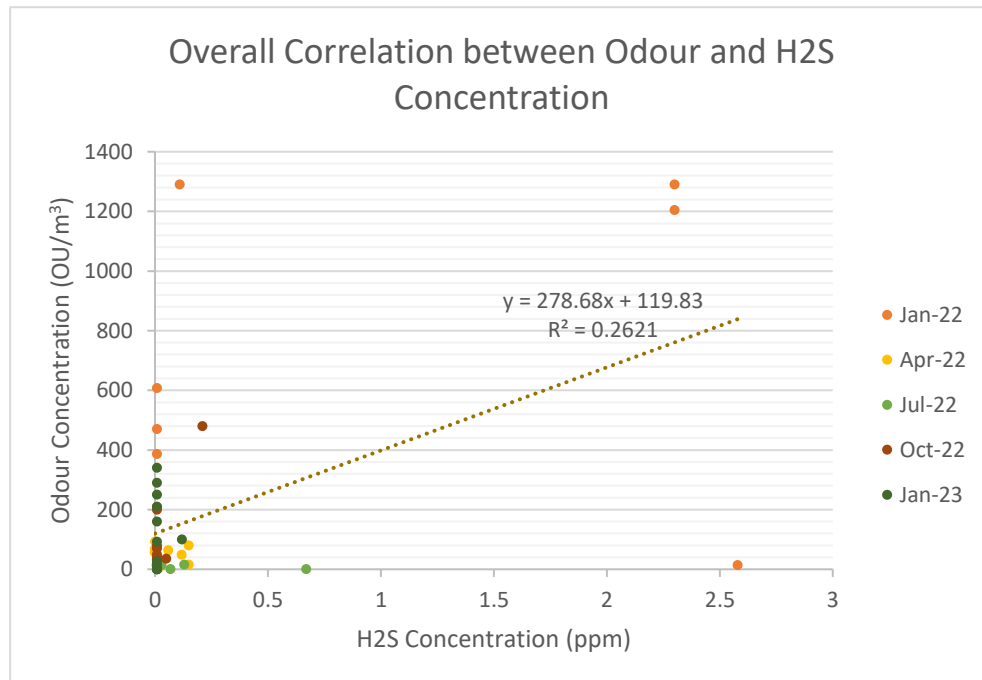
6.3. Correlation between Odour and H₂S Concentration

6.3.1. To further understand the gas composition, the overall correlation between H₂S concentrations and odour units of available DOUs was plotted in **Graph 1**. In-house H₂S concentration from sensors and odour concentration from odour measurement for January 2023 was listed in **Table 7.1**.

Table 7.1 In-house H₂S Concentration from Sensors and Odour Concentration from Odour Measurement for January 2023

| Location ID | In-house H ₂ S Concentration (ppm) | Odour Concentration (OU/m ³) |
|-------------|---|--|
| DOU 1-R | <0.01 | 210 |
| DOU 1-PS | <0.01 | 15 |
| DOU 1B-1 | <0.01 | 290 |
| DOU 1B-2 | <0.01 | 250 |
| DOU 2-PS | <0.01 | <11 |
| DOU 3 | <0.01 | 160 |
| DOU 4-PS | <0.01 | 27 |
| DOU 5-PS | 0.12 | 100 |
| DOU 6 | <0.01 | 340 |
| DOU 6A | <0.01 | <11 |
| DOU 6B | <0.01 | 93 |
| DOU 8-1 | <0.01 | <11 |
| DOU 8-2 | <0.01 | <11 |
| DOU 9-1 | N/A | 170 |
| DOU 9-2 | N/A | 130 |

Graph 1 Overall Correlation between Odour and H₂S Concentration



Remark:

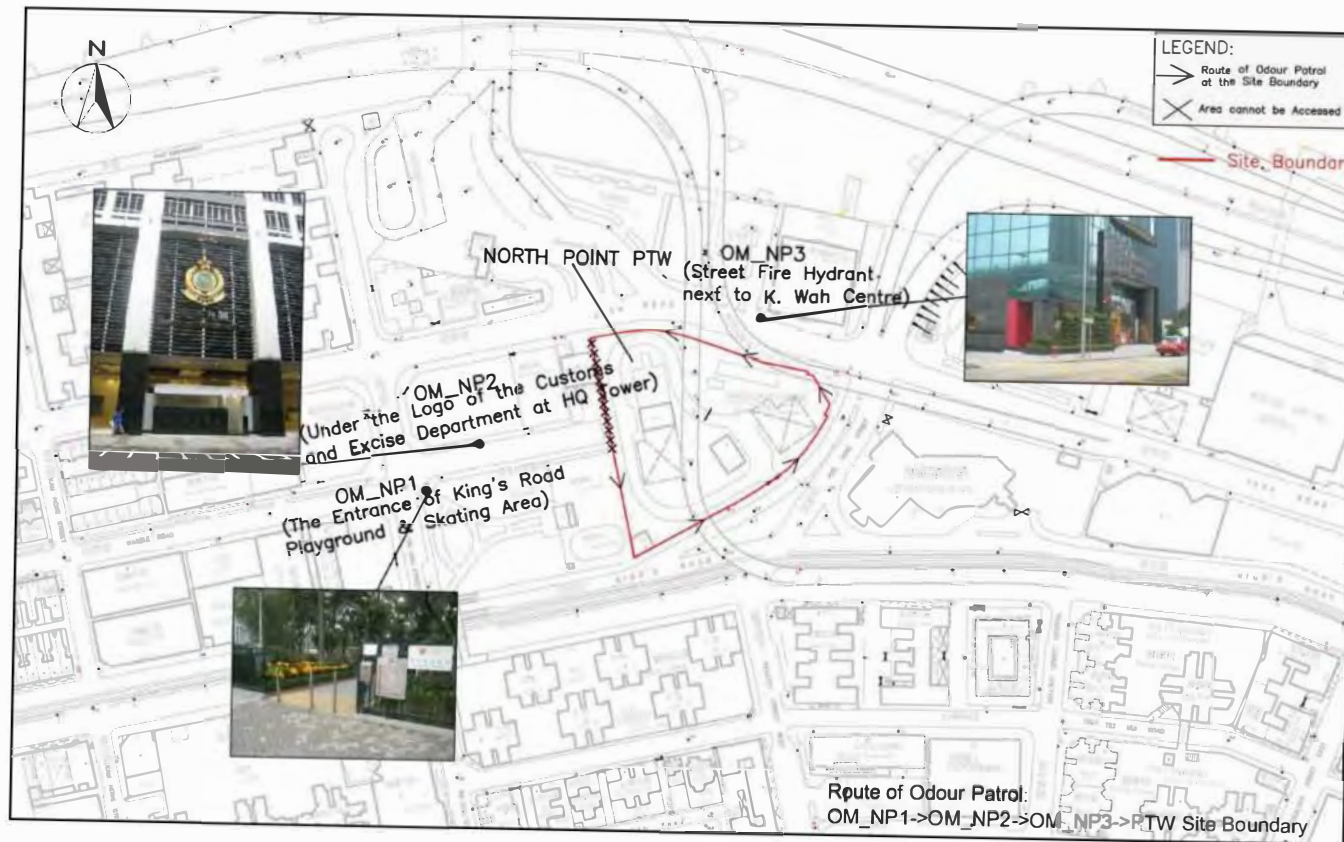
1. Data smaller than detection limit would be plotted as zero for graph presentation

- 6.3.2. According to **Graph 1**, no correlation can be established generally. With the above-mentioned observation, the monitoring results in April 2022, July 2022 and October 2022 were similar. It is believed that the fine-tuned operating mode including change of quantities of chemical used at the wet chemical scrubbers and replacement of activated carbon at the activated carbon filters after odour measurement exceedance in January 2022 can effectively minimize the odour nuisance. However, the odour concentration and in-house H2S concentration from sensors shown a slightly difference in January 2023. The operators are recommended to check if the plants, deodorization units and H2S sensors are operated in good condition.
- 6.3.3. To conclude, the operators are reminded to maintain the equipment and plants in good condition and have a close monitoring on the performance of the deodorization units.

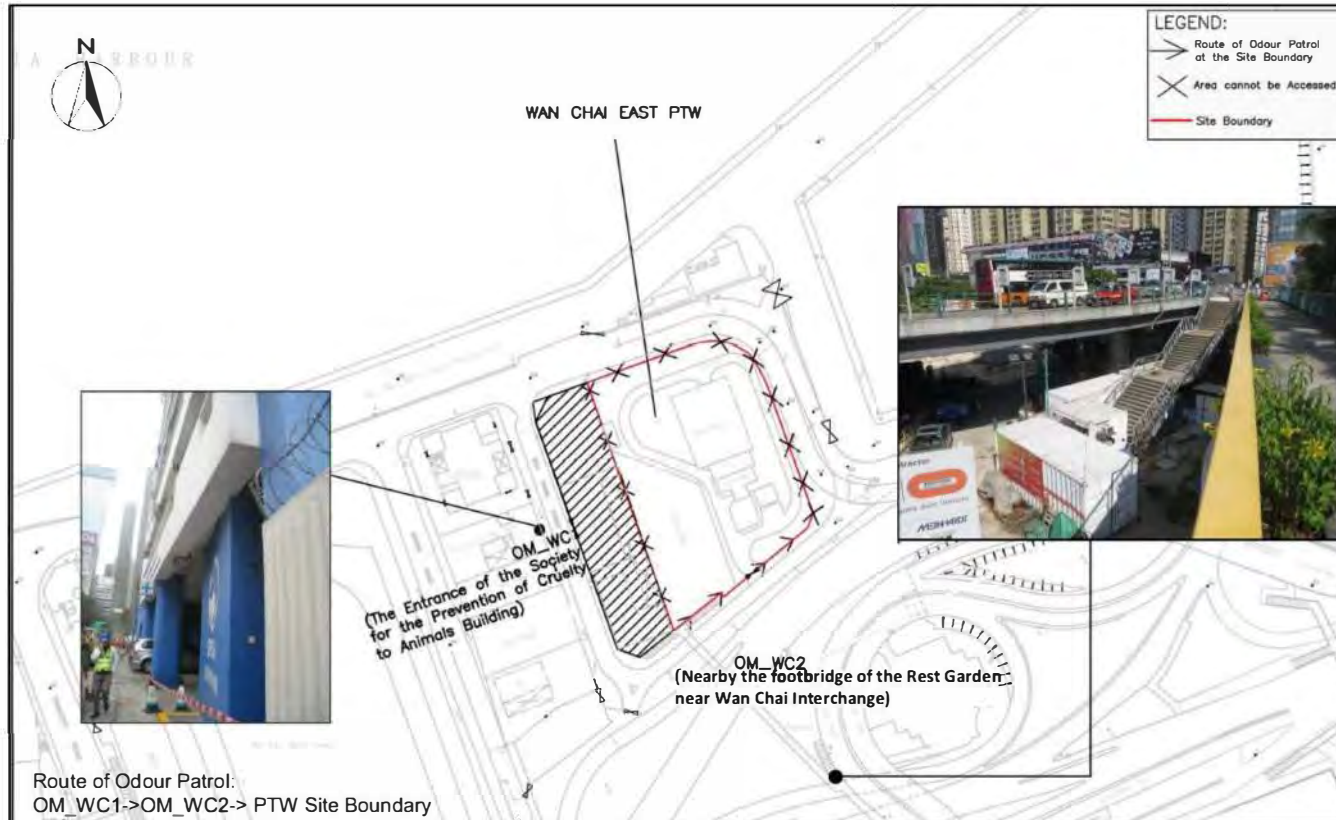
- End of Report -

Appendix A

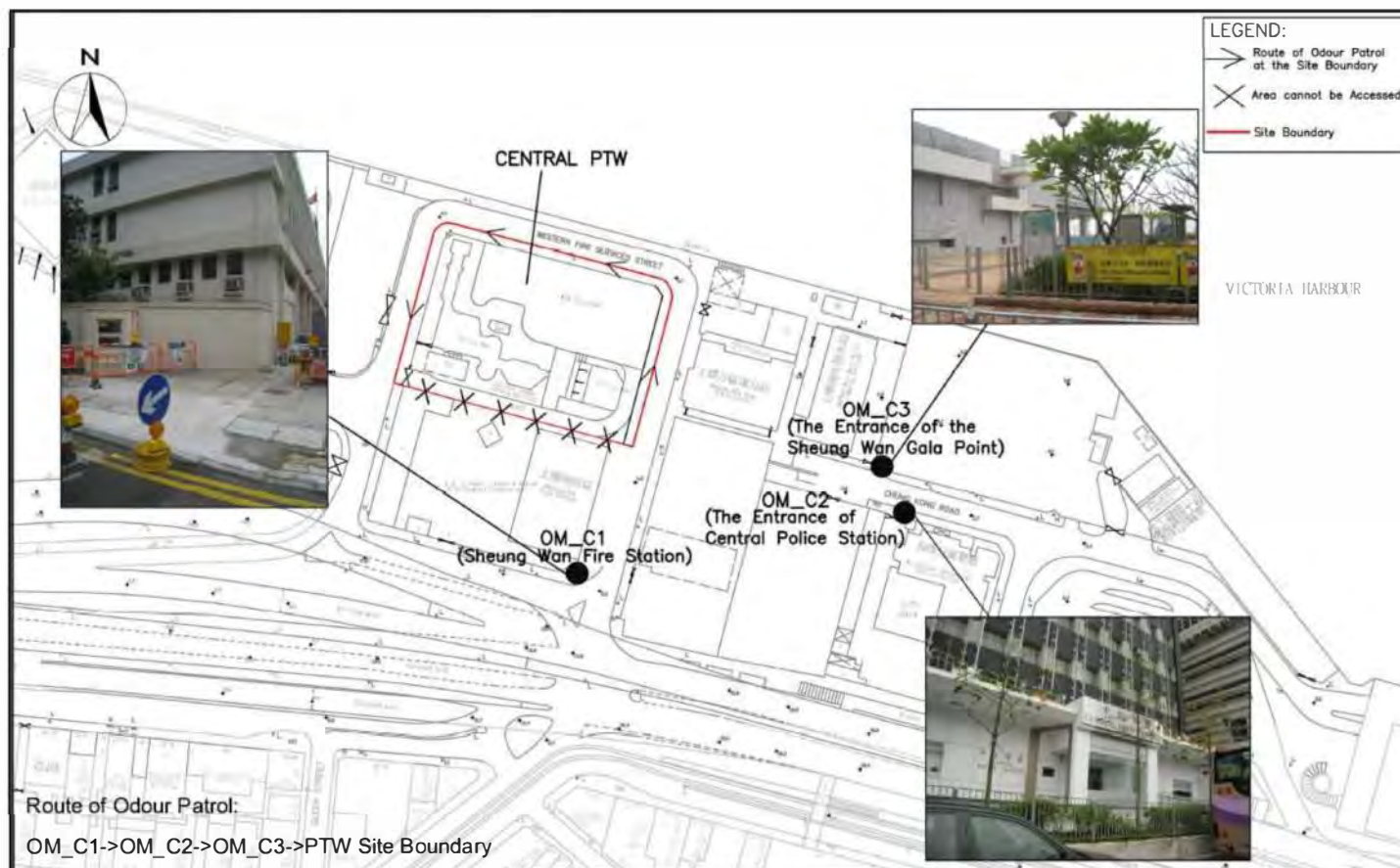
Odour Patrol Monitoring Locations



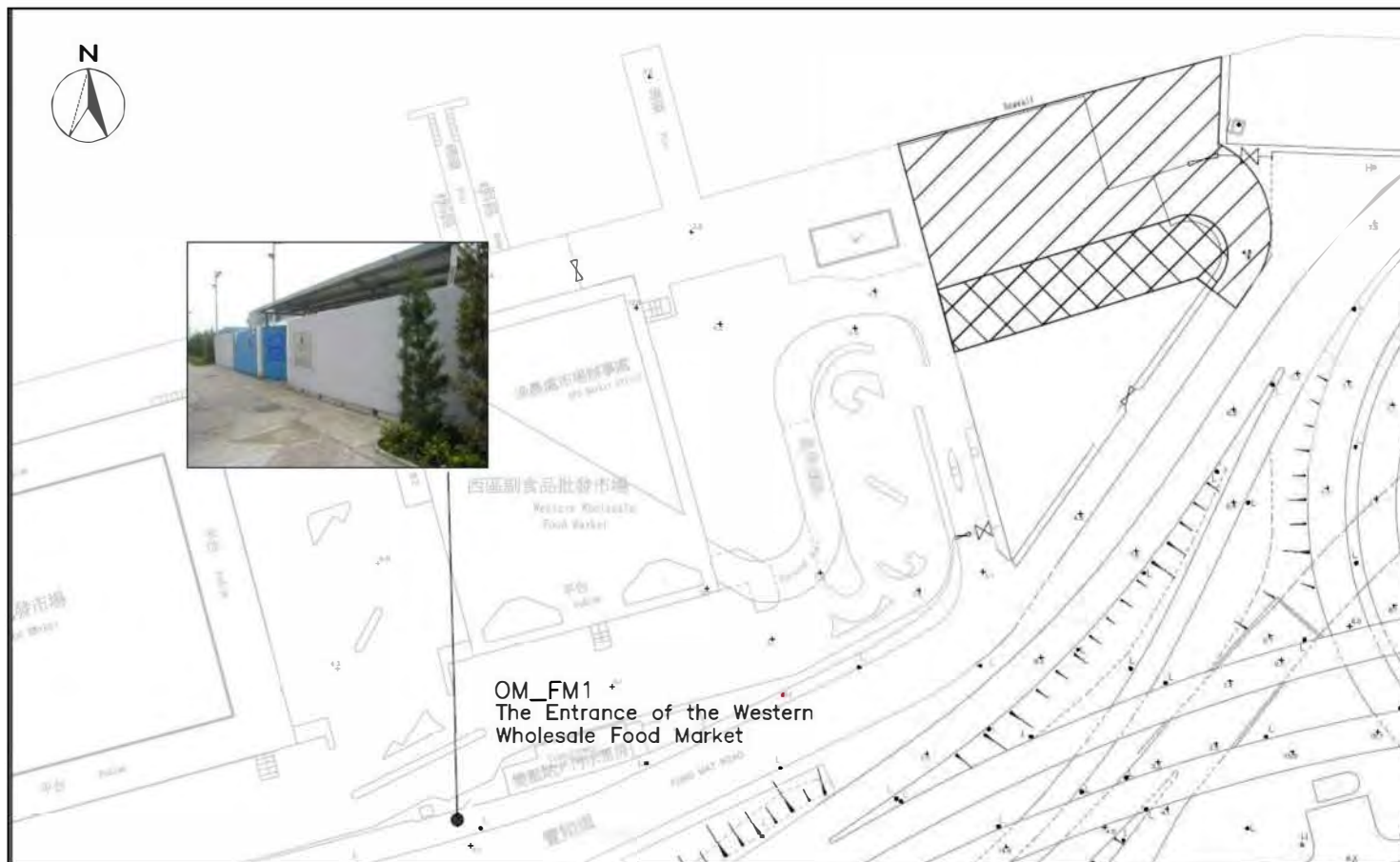
North Point PTW



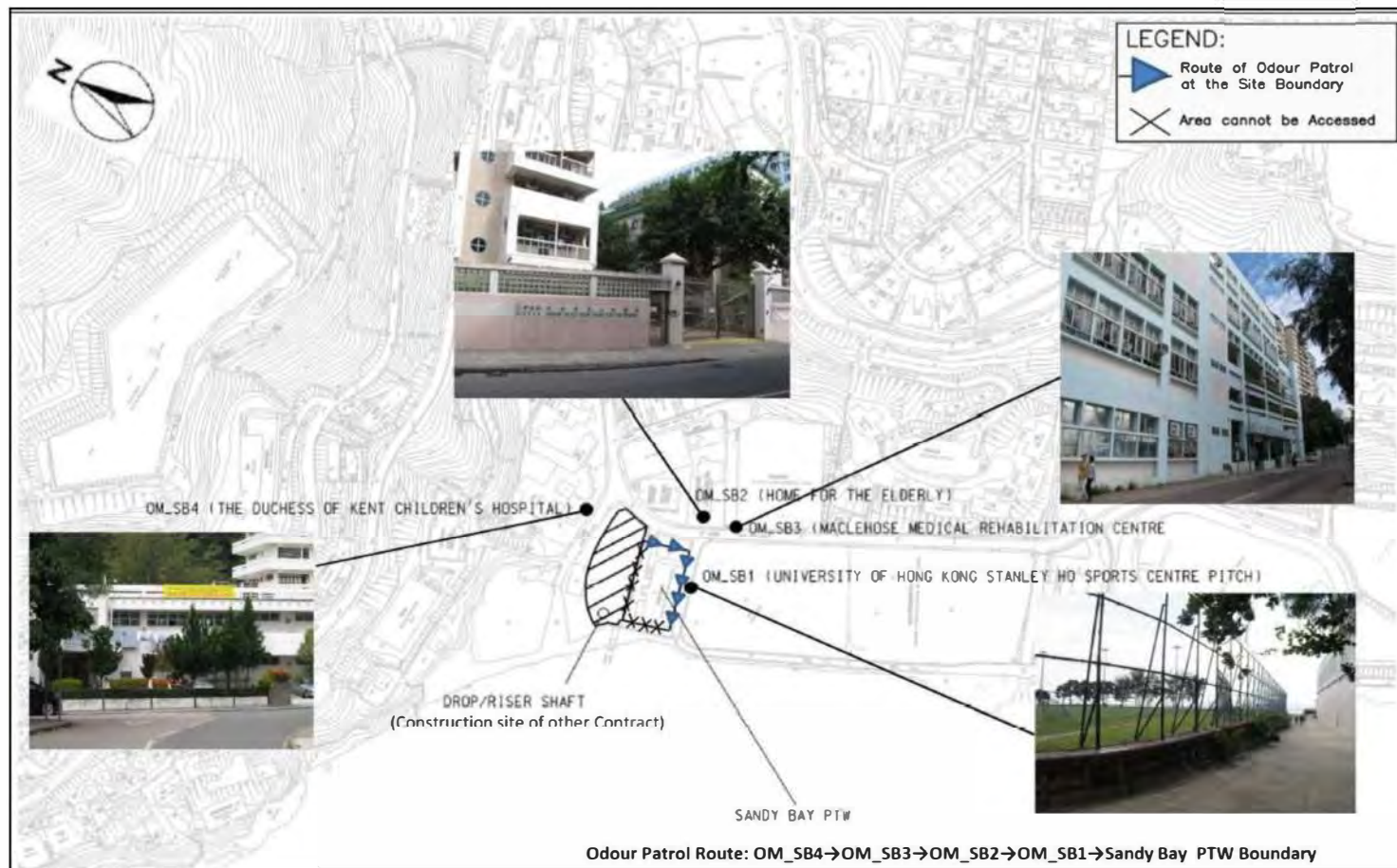
Wan Chai East PTW



Central PTW



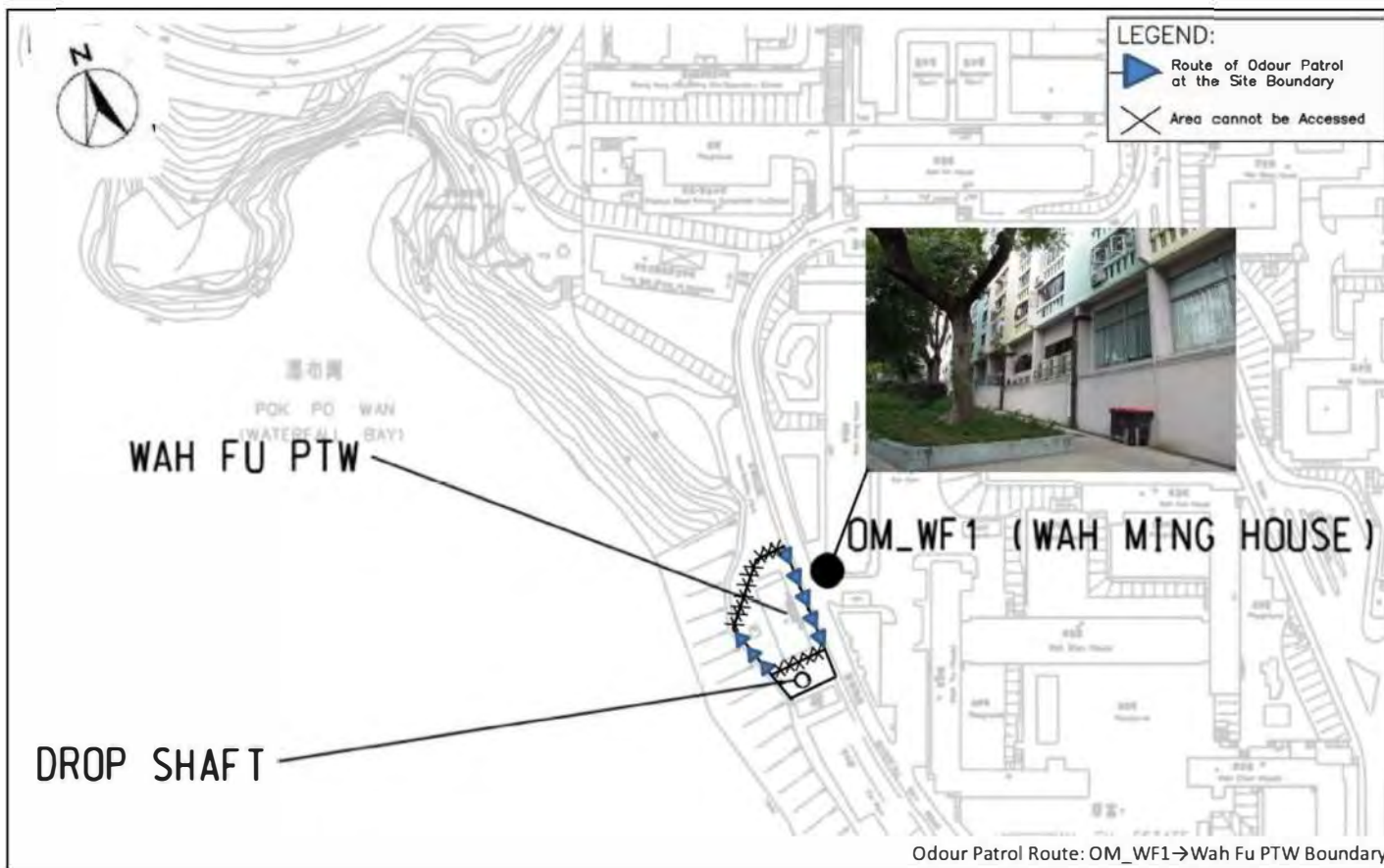
Western Wholesale Food Market



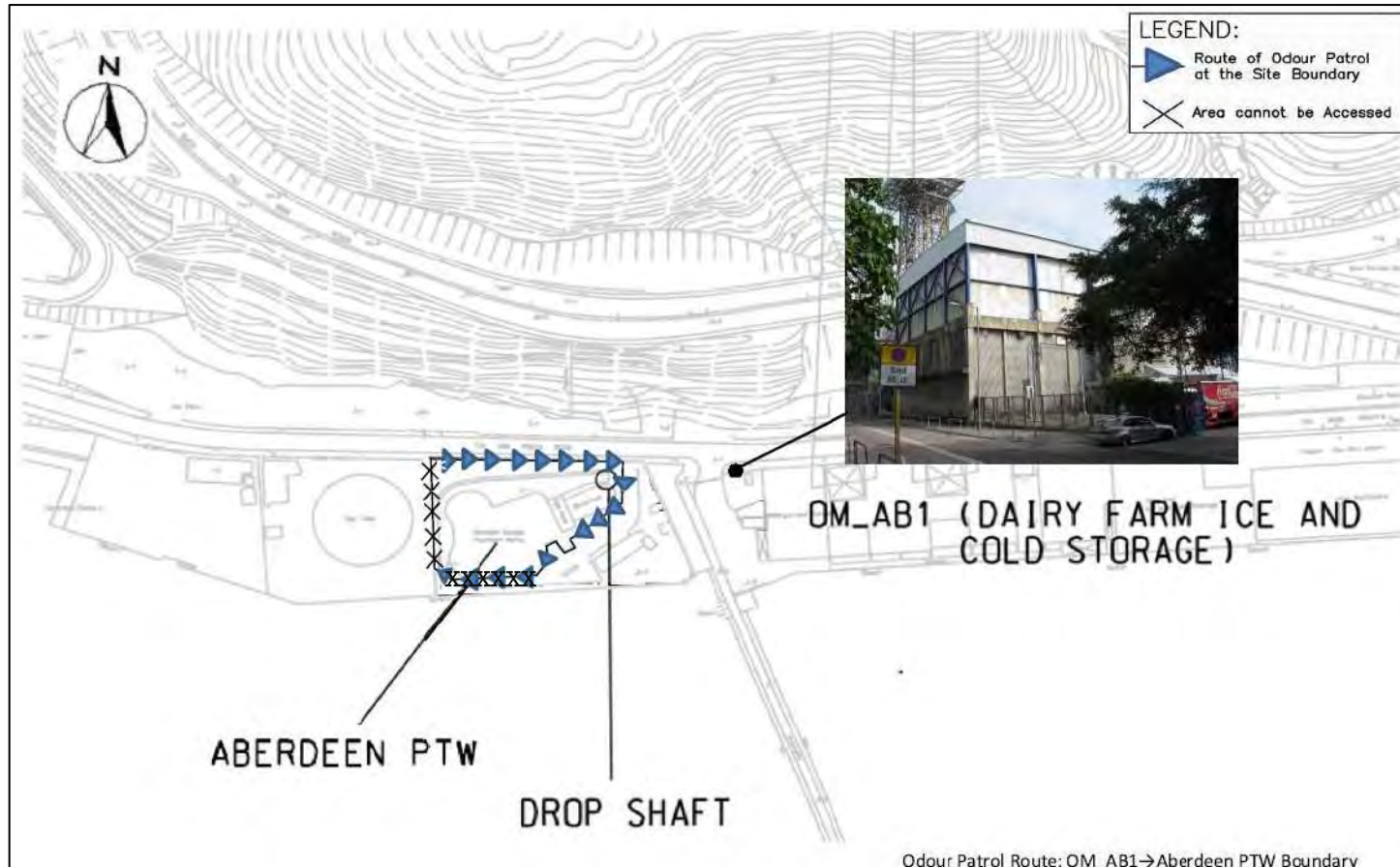
Sandy Bay PTW



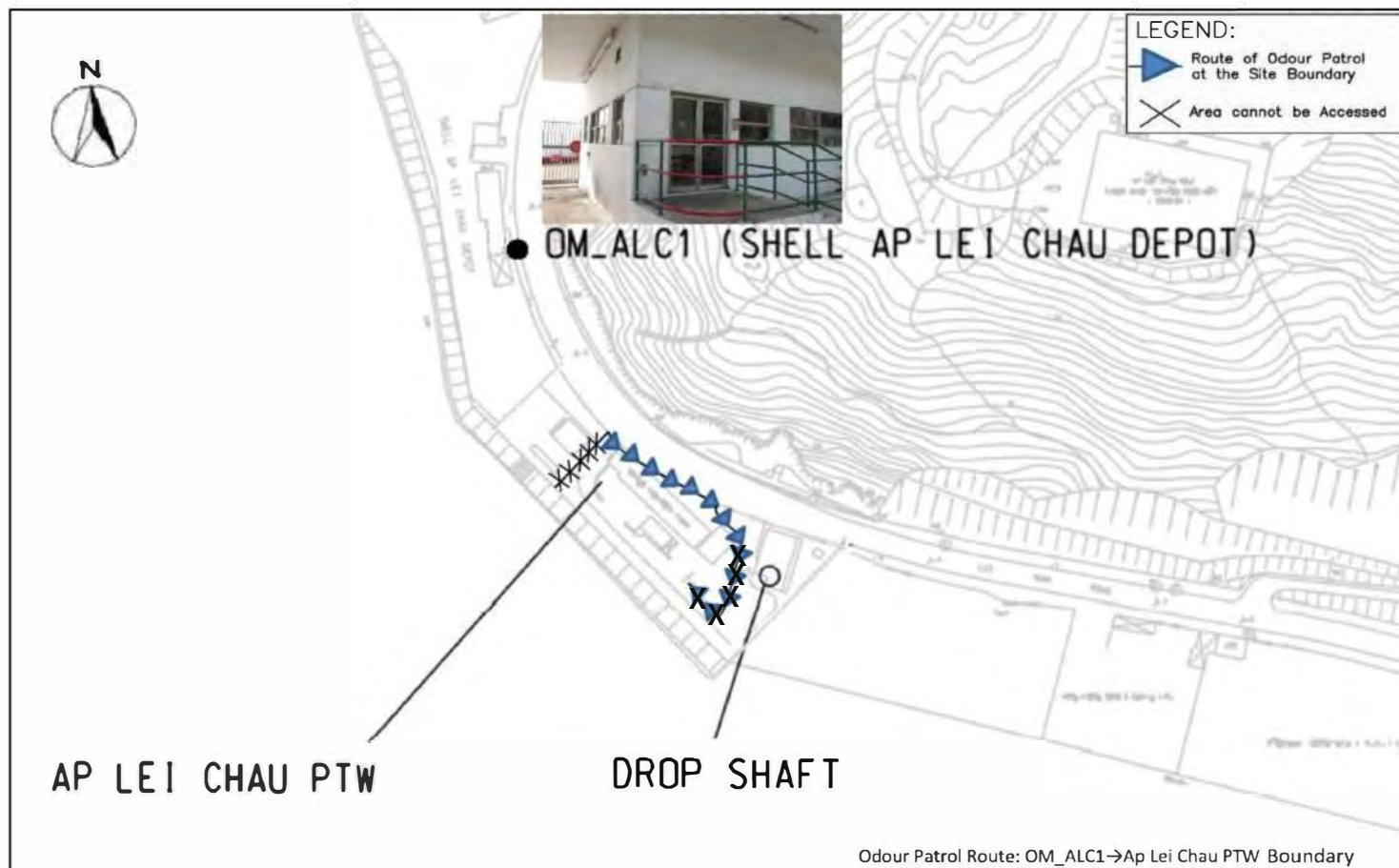
Cyberport PTW



Wah Fu PTW

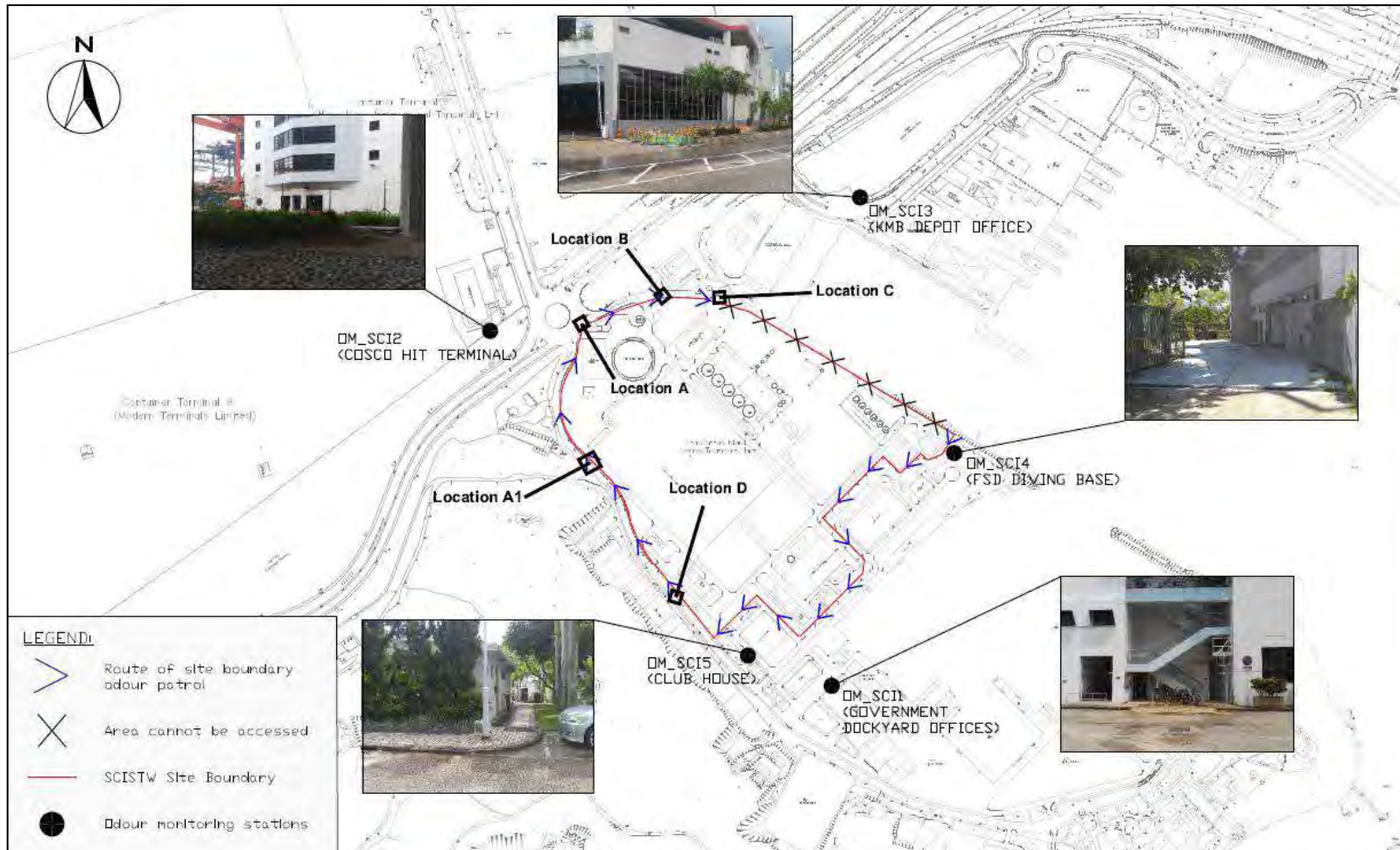


Aberdeen PTW



Ap Lei Chau PTW

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



SCISTW

Appendix B

Odour Certificates



Certificate for a Qualified Odour Panellist

This is to certify that

LO TING YI

has participated in Ten (10) sets of individual N-Butanol Screening Test
during 18 March 2022 – 24 March 2022

with Individual Threshold: 36 ppb/v

and

fulfill the Requirement of the European Standard Method of Air Quality –
Determination of Odour Concentration by Dynamic Olfactometry (EN13725:2003) –

The Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80 ppb/v
with at least 10 sets of individual threshold estimates and standard deviation less than 2.3

24 March 2022
Issue Date

24 March 2023
Valid Until


Fung Lim Chee, Richard



Certificate for a Qualified Odour Panel Member

Serial No. : P-047

Odour Panel Member : Andrew Yuen

Date of Screening Test : 08 Aug 2022
10 Aug 2022
12 Aug 2022

Valid Until : 11 Feb 2023

This is to certify that Mr. Andrew Yuen participated in a set of n-butanol screening tests in our laboratory between 08 Aug 2022 and 12 Aug 2022.

The odour threshold test results of n-butanol in nitrogen gas was found to be in the range of 20 – 80 ppb/v and a standard deviation of $R < 2.3$, which comply with the requirement of the European Standard Method of Air Quality – Determination of Odour Concentration by Dynamic Olfactometry (EN 13725).

The participant is Approved and Authorized as Qualified Odour Panel Member for odour patrol and olfactometry analysis.

Signed for and on behalf of
CMA Industrial Development Foundation Limited

A handwritten signature in black ink, appearing to be 'Wu Chun Fai', written over a horizontal line.

Wu Chun Fai
Assistant Manager – Environmental Division

Date: 12 Aug 2022



Certificate for a Qualified Odour Panel Member

Serial No. : P-054

Odour Panel Member : Michael Lee

Date of Screening Test : 08 Aug 2022
10 Aug 2022
12 Aug 2022

Valid Until : 11 Feb 2023

This is to certify that Mr. Michael Lee participated in a set of n-butanol screening tests in our laboratory between 08 Aug 2022 and 12 Aug 2022.

The odour threshold test results of n-butanol in nitrogen gas was found to be in the range of 20 – 80 ppb/v and a standard deviation of $R < 2.3$, which comply with the requirement of the European Standard Method of Air Quality – Determination of Odour Concentration by Dynamic Olfactometry (EN 13725).

The participant is Approved and Authorized as Qualified Odour Panel Member for odour patrol and olfactometry analysis.

Signed for and on behalf of
CMA Industrial Development Foundation Limited

A handwritten signature in black ink, appearing to be 'Wu Chun Fai', written over a horizontal line.

Wu Chun Fai
Assistant Manager – Environmental Division

Date: 12 Aug 2022

Appendix C

Field Record and Photo Record

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



| Location ID | Panellist | Weather | Time | Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Odour Intensity | Duration of Odour | Direction from Source | On-Site Observation | |
|----------------|-----------|---------|------|------------------|-----------------------|------------------|----------------|-----------------|-------------------|-----------------------|-----------------------|------------------------|
| | | | | | | | | | | | Odour Characteristics | Potential Odour Source |
| OM_NP1 | 1 | Cloudy | 1131 | 17.8 | 87 | 0.8 | NE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_NP2 | 1 | Cloudy | 1130 | 17.8 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_NP3 | 1 | Cloudy | 1125 | 17.9 | 87 | 0.9 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_NP Boundary | 1 | Cloudy | 1134 | 17.9 | 87 | 0.9 | SE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_WC1 | 1 | Cloudy | 1443 | 18.1 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_WC2 | 1 | Cloudy | 1440 | 18.1 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_WC Boundary | 1 | Cloudy | 1438 | 17.8 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_C1 | 1 | Cloudy | 1419 | 17.9 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



| Location ID | Panellist | Weather | Time | Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Odour Intensity | Duration of Odour | Direction from Source | On-Site Observation | |
|------------------|-----------|---------|------|------------------|-----------------------|------------------|----------------|-----------------|-------------------|-----------------------|-----------------------|------------------------|
| | | | | | | | | | | | Odour Characteristics | Potential Odour Source |
| OM_C2 | 1 | Cloudy | 1417 | 17.9 | 87 | 2.2 | E | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_C3 | 1 | Cloudy | 1416 | 17.9 | 87 | 1.7 | NE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_C Boundary | 1 | Cloudy | 1412 | 17.8 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_FM | 1 | Cloudy | 1402 | 18.1 | 87 | 1.1 | E | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SB1 | 1 | Cloudy | 1348 | 17.7 | 87 | 0.7 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SB2 | 1 | Cloudy | 1344 | 17.7 | 87 | 0.3 | SE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SB3 | 1 | Cloudy | 1343 | 17.8 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SB4 | 1 | Cloudy | 1345 | 17.8 | 87 | 0.9 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



| Location ID | Panellist | Weather | Time | Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Odour Intensity | Duration of Odour | Direction from Source | On-Site Observation | |
|----------------|-----------|---------|------|------------------|-----------------------|------------------|----------------|-----------------|-------------------|-----------------------|-----------------------|------------------------|
| | | | | | | | | | | | Odour Characteristics | Potential Odour Source |
| OM_SB Boundary | 1 | Cloudy | 1347 | 17.7 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_CB1 | 1 | Cloudy | 1337 | 17.7 | 87 | 0.4 | NW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_CB2 | 1 | Cloudy | 1338 | 17.8 | 87 | 0.8 | NW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_CB Boundary | 1 | Cloudy | 1334 | 17.8 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_WF Boundary | 1 | Cloudy | 1319 | 18.5 | 87 | 0.3 | NW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_WF1 | 1 | Cloudy | 1320 | 18.5 | 87 | 0.7 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



| Location ID | Panellist | Weather | Time | Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Odour Intensity | Duration of Odour | Direction from Source | On-Site Observation | |
|-----------------|-----------|---------|------|------------------|-----------------------|------------------|----------------|-----------------|-------------------|-----------------------|-----------------------|------------------------|
| | | | | | | | | | | | Odour Characteristics | Potential Odour Source |
| OM_AB1 | 1 | Cloudy | 1309 | 18.4 | 87 | 1.2 | E | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_AB Boundary | 1 | Cloudy | 1310 | 18.5 | 87 | 0.4 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_ALC1 | 1 | Cloudy | 1203 | 18.2 | 87 | 1.6 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_ALC Boundary | 1 | Cloudy | 1201 | 18.2 | 87 | 0.8 | S | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SCI1 | 1 | Cloudy | 1009 | 17.1 | 87 | 0.8 | N | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SCI2 | 1 | Cloudy | 1039 | 17.4 | 87 | 2.0 | NE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SCI3 | 1 | Cloudy | 1041 | 17.5 | 87 | 0.8 | SW | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |

Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2023)



| Location ID | Panellist | Weather | Time | Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Odour Intensity | Duration of Odour | Direction from Source | On-Site Observation | |
|--------------------|-----------|---------|------|------------------|-----------------------|------------------|----------------|-----------------|-------------------|-----------------------|-----------------------|----------------------------|
| | | | | | | | | | | | Odour Characteristics | Potential Odour Source |
| OM_SCI4 | 1 | Cloudy | 1014 | 17.1 | 87 | 0.6 | NE | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| OM_SCI5 | 1 | Cloudy | 1020 | 17.3 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| SCISTW-Location A | 1 | Cloudy | 1032 | 17.3 | 87 | 0.6 | NW | 1 | Continuous | Side Wind | Garbage | Refuse Collection Vehicles |
| | 2 | | | | | | | 1 | | | | |
| | 3 | | | | | | | 1 | | | | |
| SCISTW-Location A1 | 1 | Cloudy | 1028 | 17.2 | 87 | 0.0 | NA | 1 | Continuous | NA | Garbage | Refuse Collection Vehicles |
| | 2 | | | | | | | 1 | | | | |
| | 3 | | | | | | | 1 | | | | |
| SCISTW-Location B | 1 | Cloudy | 1033 | 17.2 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| SCISTW-Location C | 1 | Cloudy | 1035 | 17.3 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |
| SCISTW-Location D | 1 | Cloudy | 1025 | 17.2 | 87 | 0.0 | NA | 0 | NA | NA | NA | NA |
| | 2 | | | | | | | 0 | | | | |
| | 3 | | | | | | | 0 | | | | |



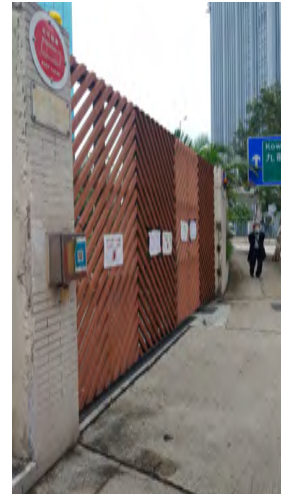
OM_NP1



OM_NP2



OM_NP3



North Point PTW Boundary



OM_WC1



OM_WC2



Wan Chai East PTW Boundary



OM_C1



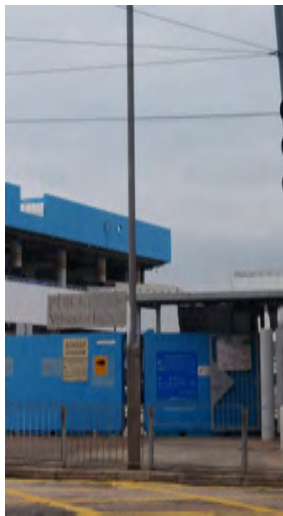
OM_C2





OM_C3



Central PTW Boundary



OM_FM1

| | |
|---|--|
|  |  |
| <p>OM_SB1</p> | <p>OM_SB2</p> |
|  |  |
| <p>OM_SB3</p> | <p>OM_SB4</p> |
|  |  |
| <p>Sandy Bay PTW Boundary</p> | <p>OM_CB1</p> |

| | |
|---|--|
|  |  |
| <p>OM_CB2</p> | <p>Cyberport PTW Boundary</p> |
|  |  |
| <p>OM_WF1</p> | <p>Wah Fu PTW Boundary</p> |
|  |  |
| <p>OM_AB1</p> | <p>Aberdeen PTW Boundary</p> |



OM_ALC1



OM_ALC1



OM_SCI1





OM_SCI2



OM_SCI3



OM_SCI4

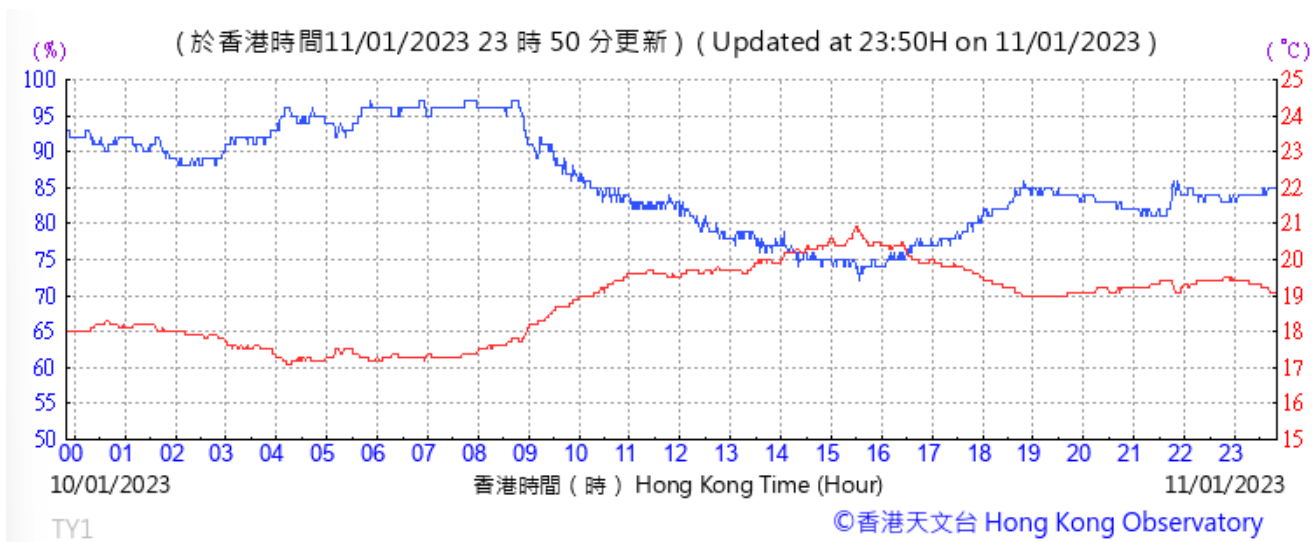
| | |
|---|--|
|  |  |
| <p>OM_SC15</p> | <p>Location A</p> |
|  |  |
| <p>Location A1</p> | <p>Location B</p> |
|  |  |
| <p>Location C</p> | <p>Location D</p> |

Appendix D

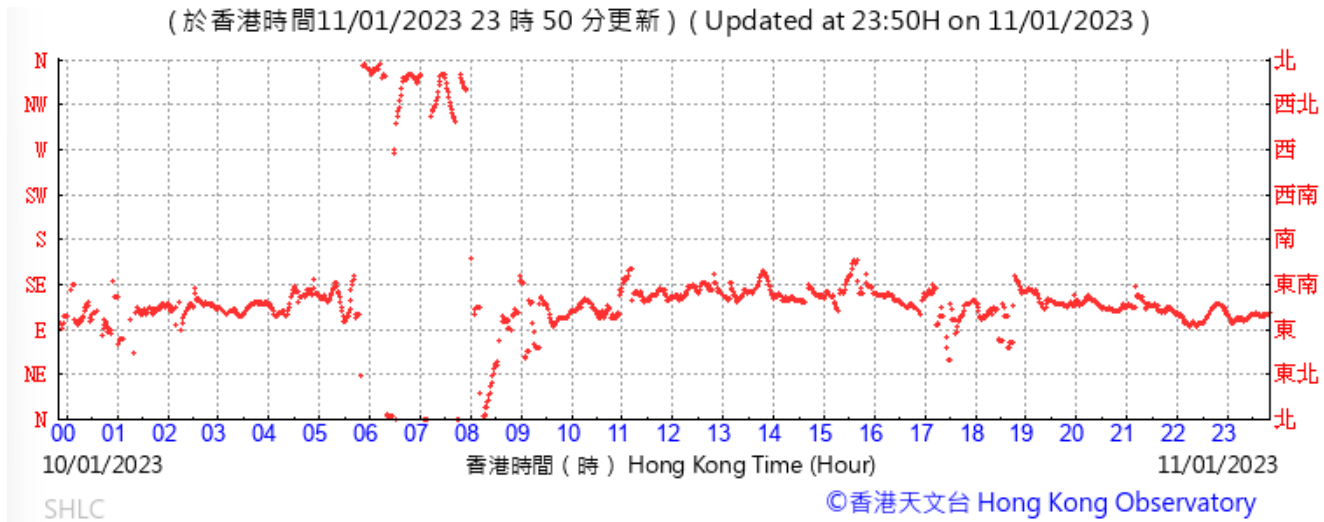
Meteorological Information from the Hong Kong Observatory Station

Meteorological Information from the Hong Kong Observatory Station

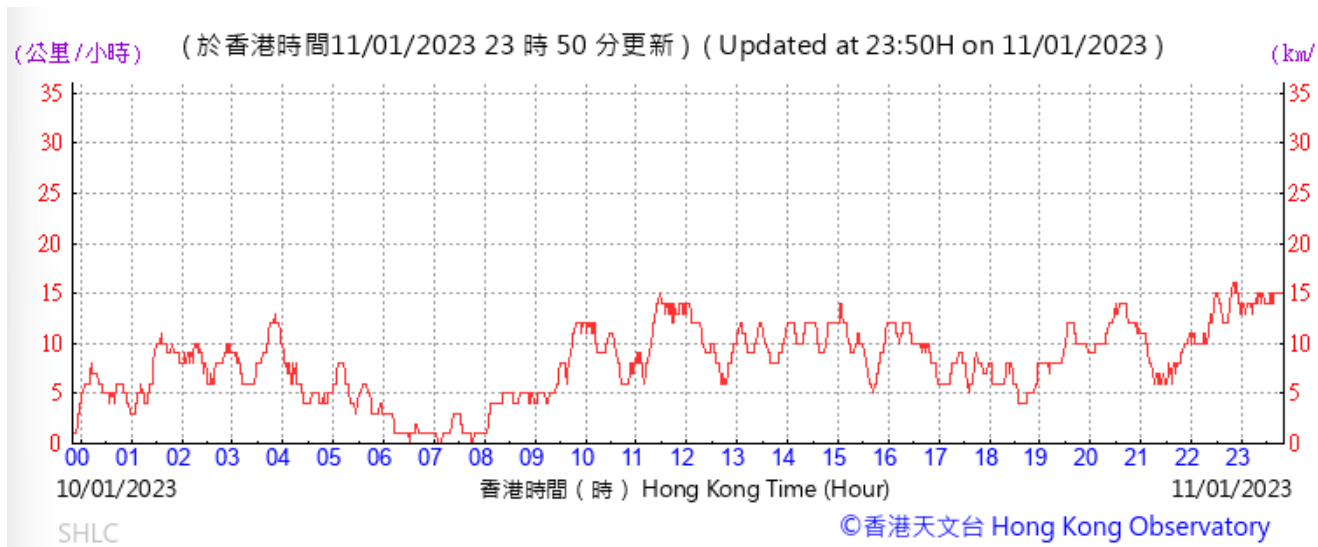
Temperature/Humidity:



Wind Direction:

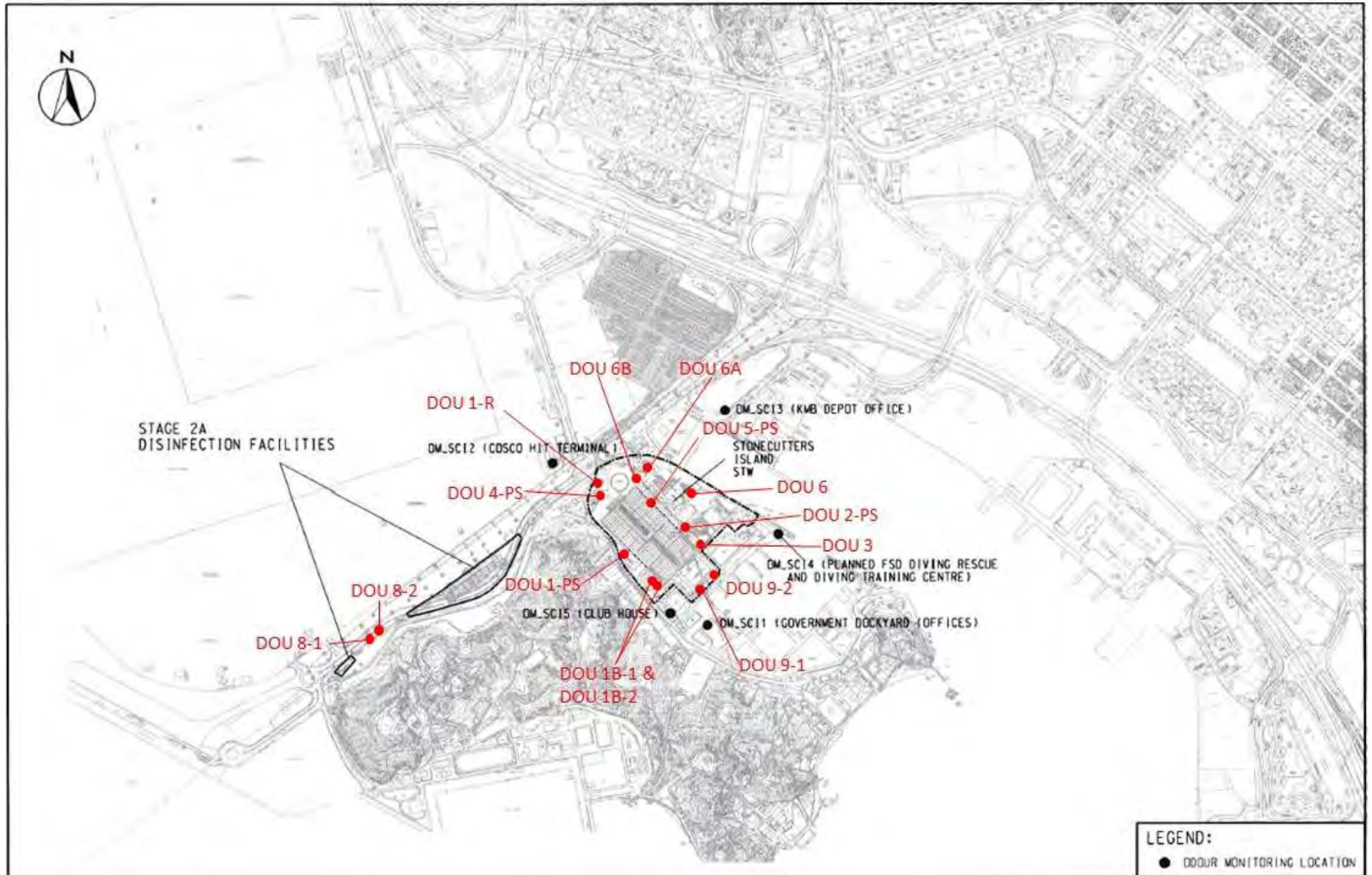


Wind Speed:



Appendix E

Layout of Odour Monitoring Locations for Odour Measurement



Sampling Locations Photos



DOU 1B-1



DOU 1B-2



DOU 1-PS



DOU 1-R



DOU 2-PS



DOU 3



DOU 4-PS



DOU 5-PS

Sampling Location Photos



DOU 6



DOU 6A



DOU 6B



DOU 8-1



DOU 8-2



DOU 9-1



DOU 9-2

Appendix F

Odour Measurement Result

Odour Monitoring Report for Harbour Area Treatment
Scheme Stage 2A (Operational Phase) (January 2023)



| Sample ID | Location ID | Sampling Date | Sampling Time | Analysis Date | Analysis Time | LOR ^[Note 1] (ou _E /m ³) | Odour Concentration (ou _E /m ³) | Duct Volumetric Flow Rate ^[Note 2] (m ³ /hr) | Odour Emission Rate (ou _E /s) |
|--|-------------|---------------|---------------|---------------|---------------|---|--|--|--|
| LB030646-3 | DOU 1B-1 | 11-Jan-23 | 10:40 | 11-Jan-23 | 16:30-17:30 | <11 | 290 | 2,826 | 228 |
| LB030646-4 | DOU 1B-2 | 11-Jan-23 | 11:00 | 11-Jan-23 | | <11 | 250 | 2,796 | 194 |
| LB030646-2 | DOU 1-PS | 11-Jan-23 | 10:20 | 11-Jan-23 | | <11 | 15 | 39,226 | 163 |
| LB030646-15 | DOU 1-R | 11-Jan-23 | 14:00 | 11-Jan-23 | | <11 | 210 | 3,151 | 184 |
| LB030646-8 | DOU 2-PS | 11-Jan-23 | 12:20 | 11-Jan-23 | | <11 | <11 | 33,670 | <103 |
| LB030646-7 | DOU 3 | 11-Jan-23 | 12:00 | 11-Jan-23 | | <11 | 160 | 38,191 | 1,697 |
| LB030646-1 | DOU 4-PS | 11-Jan-23 | 10:00 | 11-Jan-23 | | <11 | 27 | 34,651 | 260 |
| LB030646-12 | DOU 5-PS | 11-Jan-23 | 14:20 | 11-Jan-23 | | <11 | 100 | 42,530 | 1,181 |
| LB030646-9 | DOU 6 | 11-Jan-23 | 12:40 | 11-Jan-23 | | <11 | 340 | 24,731 | 2,336 |
| LB030646-10 | DOU 6A | 11-Jan-23 | 13:00 | 11-Jan-23 | | <11 | <11 | 32,939 | <101 |
| LB030646-11 | DOU 6B | 11-Jan-23 | 13:20 | 11-Jan-23 | | <11 | 93 | 27,540 | 711 |
| LB030646-13 | DOU 8-1 | 11-Jan-23 | 14:40 | 11-Jan-23 | | <11 | <11 | 2,645 | <8 |
| LB030646-14 | DOU 8-2 | 11-Jan-23 | 15:00 | 11-Jan-23 | | <11 | <11 | 2,645 | <8 |
| LB030646-5 | DOU 9-1 | 11-Jan-23 | 11:20 | 11-Jan-23 | | <11 | 170 | 5,400 | 255 |
| LB030646-6 | DOU 9-2 | 11-Jan-23 | 11:40 | 11-Jan-23 | | <11 | 130 | 5,040 | 182 |
| Blank | BLANK | - | - | - | - | - | <11 | | |
| Total Emissions ^[Note 3] | | | | | | | | | 7,612 |

Note:

1. LOR denotes limit of reporting.
2. The volumetric flow rate data were provided by th client.
3. If calculated odour emission rate are lower than a certain value, integer will be used for calculating the total emission.
4. All the collected sample volume of the gas bags was sufficient for olfactometry analysis.
5. Field Blank containing pure and odourous nitrogen gas was filled by CMA staff.

Odour Monitoring Report for Harbour Area Treatment
Scheme Stage 2A (Operational Phase) (January 2023)



| Sample ID | Location ID | Sampling Date | Measured Time | Weather Condition | Ambient Temperature (°C) | Relative Humidity (%) | Wind Speed (m/s) | Wind Direction | Barometric Pressure (hPa) |
|-------------|-------------|---------------|---------------|-------------------|--------------------------|-----------------------|------------------|----------------|---------------------------|
| LB030646-3 | DOU 1B-1 | 11-Jan-23 | 10:40 | Cloudy | 22.3 | 89 | - | S | 1017 |
| LB030646-4 | DOU 1B-2 | 11-Jan-23 | 11:00 | Cloudy | 23.3 | 86 | - | S | 1017 |
| LB030646-2 | DOU 1-PS | 11-Jan-23 | 10:20 | Cloudy | 21.2 | 91 | - | S | 1017 |
| LB030646-15 | DOU 1-R | 11-Jan-23 | 14:00 | Cloudy | 22.1 | 91 | - | W | 1017 |
| LB030646-8 | DOU 2-PS | 11-Jan-23 | 12:20 | Cloudy | 20.4 | 93 | - | E | 1017 |
| LB030646-7 | DOU 3 | 11-Jan-23 | 12:00 | Cloudy | 22.3 | 78 | - | NE | 1017 |
| LB030646-1 | DOU 4-PS | 11-Jan-23 | 10:00 | Cloudy | 20.3 | 91 | - | SW | 1017 |
| LB030646-12 | DOU 5-PS | 11-Jan-23 | 14:20 | Cloudy | 21.5 | 87 | - | NW | 1017 |
| LB030646-9 | DOU 6 | 11-Jan-23 | 12:40 | Cloudy | 20.3 | 88 | - | SE | 1017 |
| LB030646-10 | DOU 6A | 11-Jan-23 | 13:00 | Cloudy | 21.0 | 83 | - | SW | 1017 |
| LB030646-11 | DOU 6B | 11-Jan-23 | 13:20 | Cloudy | 21.5 | 78 | - | E | 1017 |
| LB030646-13 | DOU 8-1 | 11-Jan-23 | 14:40 | Cloudy | 21.8 | 86 | - | N | 1017 |
| LB030646-14 | DOU 8-2 | 11-Jan-23 | 15:00 | Cloudy | 21.8 | 86 | - | N | 1017 |
| LB030646-5 | DOU 9-1 | 11-Jan-23 | 11:20 | Cloudy | 23.0 | 83 | 3.0 | SW | 1017 |
| LB030646-6 | DOU 9-2 | 11-Jan-23 | 11:40 | Cloudy | 22.8 | 83 | 2.8 | SW | 1017 |

Appendix G

Total Odour Emission Rate Extracted from EIA report

Odour Monitoring Report for Harbour Area Treatment Scheme
Stage 2A (Operational Phase) (January 2023)



| Option 2 - Decentralized Design | | | | | | | |
|--|-----------|----------|-----|------|-------|---|---------|
| CEPT Facilities (Odd No. Units) & Flow Distribution Channel) | 146162.21 | S-O2-DO1 | 12 | 1.86 | 20 | 1 | 4384.87 |
| CEPT Facilities (Even No. Units) & NWKPS + NWKPS O/F chamber | 136086.21 | S-O2-DO2 | 12 | 1.86 | 20 | 1 | 4082.59 |
| Sludge Treatment Facilities (include Sludge Storage Tanks, Sludge Dewatering Building 1 & 2, Existing and New Sludge Cake Silos) | 19057.82 | S-O2-DO3 | 6 | 2.40 | 12.58 | 3 | 571.73 |
| Stage 1 MPS & Riser Shaft | 6518.89 | S-O2-DO4 | 18 | 1.13 | 12.28 | 4 | 195.57 |
| Stage 2A MPS & Riser Shaft | 6518.89 | S-O2-DO5 | 18 | 1.13 | 12.28 | 4 | 195.57 |
| NWKPTW | 19963.88 | S-O2-DO6 | 13 | 2.26 | 12.28 | 8 | 598.92 |
| Flow Distribution Chambers | 2688.01 | S-O2-DO7 | 4.5 | 0.32 | 10.48 | 2 | 80.64 |
| New Flow Distribution Chamber | | | | | | | |
| Chlorination Contact Tank | 37776.64 | S-C-DO1 | 11 | 1.13 | 7.2 | 4 | 1133.30 |
| Drop Shaft and Chamber 15A | 2630.22 | S-C-DO2 | 4 | 0.57 | 8.84 | 2 | 263.02 |

Total: 11,506.21

Note: (1) CEPT facilities include Influent upflow structure, distribution channel, flocculation tanks, sedimentation tanks & effluent weirs, drop shafts, scum pit and rapid mixing tank of sedimentation tanks
(2) MPS is Main Pumping Station
(3) NWKPTW, NWKPS & NWKO/F chambers are North West Kowloon PTW, NWKPTW Pumping Station & NWKPTW Overflow Chamber, respectively
(4) The emission rate included a 1.31 ambient temperature correction factor.