Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (April 2022)

Report No.: OT_2022006

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Reviewed by: _____

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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 shall be conducted every three months. For the 2nd to 5th year, if the monitoring results from the 1st 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 first year of 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 29th April 2022 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	1	1	1

OM_C1	0	0	0
OM_C2	0	0	0
OM_C3	0	0	0
Central PTW Boundary	2	1	2
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	1	1	1
OM_WF1	0	0	0
Wah Fu PTW Boundary	1	1	1
OM_AB1	1	1	1
Aberdeen PTW Boundary	1	1	1
OM_ALC1	1	1	1
Ap Lei Chau PTW Boundary	1	1	1
OM_SCI1	0	0	0
OM_SCI2	0	0	0
OM_SCI3	2	2	2
OM_SCI4	1	1	1
OM_SCI5	0	0	0
SCISTW Boundary Location A	0	0	0
SCISTW Boundary Location A1	0	0	0
SCISTW Boundary	0	0	0

Location B			
SCISTW Boundary Location C	2	2	2
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 2. Level 2 was recorded at three monitoring locations. With reference to the Action / Limit Level as shown in **Table 3.2**, these three locations met the action level. However, at OM_SCI3 and Location C of SCISTW, garbage odour was recorded, and the nearby refuse transfer station was considered as the potential odour source. Hence, the exceedance at these two monitoring stations is concluded not related to the project. For Central PTW Boundary (near the gate), odour was recorded continuously under downwind near the gate. The odour is concentrated near the gate (entrance of the Central PTW) while the boundary other than the gate is odourless. Two panelists out of three considered the odour intensity was 2 while the left considered as 1. As the results were not unified, to confirm if the odour nuisance from Central PTW is significant or not, odour patrol at this point is proposed to be conducted to confirm the finding and determine if it is an occasional case.

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	1
OM_C1	0	0
OM_C2	0	0
OM_C3	0	0
Central PTW Boundary	0	2
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	1
OM_WF1	0	0
Wah Fu PTW Boundary	0	1

OM_AB1	0	1
Aberdeen PTW Boundary	0	1
OM_ALC1	0	1
Ap Lei Chau PTW Boundary	0	1
OM_SCI1	0	0
OM_SCI2	0	0
OM_SCI3	1	2
OM_SCI4	0	1
OM_SCI5	0	0
SCISTW Boundary Location A	1	0
SCISTW Boundary Location A1	1	0
SCISTW Boundary Location B	2	0
SCISTW Boundary Location C	3	2
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 were three action level exceedances recorded but the two exceedances at SCISTW is found to be related to nearby refuse transfer stations while the exceedance from Central PTW is not unified by all three panelists and thus it is hard to confirm if the nuisance is significant or not.

4.2. Recommendations

4.2.1. With the odour patrol result, it is recommended to take more attention on Central PTW and additional odour patrol should be conducted at least once to

confirm the exceedance is an occasional case.

4.3. Exceedance

4.3.1. There were three action level exceedances recorded at Central PTW Boundary (near the gate), OM_SCI3 and SCISTW Boundary Location C.

4.3.2. **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 measurement at exhaust stacks of deodorization system of SCISTW (if exceedance at SCISTW) to confirm finding	1. Carry out investigation to identify the source/reason of exceedance. 2. Investigation shall be completed within 2 week; 3. Implement more mitigation measures if necessary.
Limit Level		
Exceedance of Limit level	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	1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 week;

	exceedance at SCISTW) to confirm finding 4. Increase monitoring frequency to monthly; 5. If exceedance stops, cease additional monitoring.	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.

4.3.3. According to the event and action plan, the reason/ source should be first identified. With reference to on-site observation, the odour characteristics and potential odour source of Central PTW Boundary, SCISTW Boundary Location B and SCISTW Boundary Location C are listed in **Table 4.2**.

Table 4.2 On-site Observation

Location ID	On-Site Observation	
	Odour Characteristics	**Potential Odour Source**
Central PTW Boundary	Sewage	Central PTW
OM_SCI3	Garbage	Refuse Transfer Station
SCISTW Boundary Location C	Garbage	Refuse Station / Refuse Vehicles

4.3.4. OM_SCI3 and SCISTW Boundary Location C are located near the West Kowloon Refuse Transfer Station. The potential odour source is mainly related to the station and the refuse collection vehicles. The action level exceedance at OM_SCI3 and SCISTW Boundary Location C are non-project related. For Central PTW Boundary (near the gate), odour was recorded continuously under downwind near the gate. The odour is concentrated near the gate (entrance of the Central PTW) while the boundary other than the gate is odourless. Two

panelists out of three considered the odour intensity was 2 while the left considered as 1. As the results were not unified, to confirm if the odour nuisance from Central PTW is significant or not, odour patrol at this point is proposed to be conducted to confirm the finding and determine if it is an occasional case.

4.3.5. To confirm the findings and conclusion, additional odour patrol at Central PTW Boundary was conducted on 18th May 2022. The field record and photo record during the patrols are attached in **Appendix H**.

4.3.6. On 18th May 2022, the odour intensity was considered to be 1 for all three panelists. The odour level was acceptable and thus the exceedance recorded on 29th April 2022 was considered as an occasional case. 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.

5. Odour Measurement

5.1. Monitoring Requirement

5.1.1. Air samples will be collected by passive sampling technique at the odour monitoring station. A NalophanTM 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

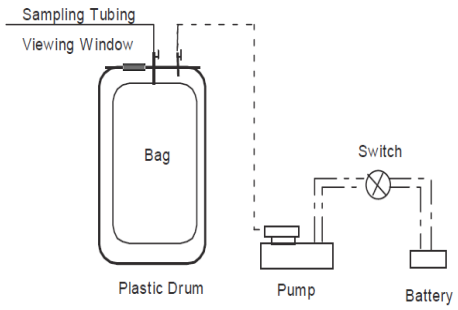


Figure 2: A Schematic Diagram of Sampling Device

5.1.2. 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.

5.1.3. 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.

5.1.4. 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/m^3.

- 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.

5.1.5. 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/m^3. The odour concentration is then expressed in terms of multiples of the detection threshold.

Figure 3: Olfactory Laboratory with Scentroid™ SS600 Olfactometer

5.1.6. 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.

5.1.7. All equipment for odour measurement and analysis are maintained and calibrated in according to the requirement of the European Standard Method EN13725.

5.2. Monitoring Frequency

5.2.1. Odour measurement shall be conducted every three months for the first year of 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.

5.3. Monitoring Location

5.3.1. 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.

5.3.2. 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)

5.4. Monitoring Parameter

5.4.1. 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

6. Odour Measurement Result

6.1. Odour Concentration and Odour Emission Rate

6.1.1. The odour measurement was conducted on 29th April 2022. The detail of location photo is shown in **Appendix E**.

6.1.2. The odour emission rate is listed in **Table 6.1**. The total odour emission rate is calculated to be 2,008 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	<8
DOU 1-PS	<40
DOU 1B-1	25
DOU 1B-2	33
DOU 2-PS	<35
DOU 3	250

DOU 4-PS	51
DOU 5-PS	3
DOU 6	67
DOU 6A	830
DOU 6B	490
DOU 8-1	67
DOU 8-2	79
DOU 9-1	<15
DOU 9-2	<15

6.2. Odour Measurement Result Discussion

6.2.1. 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.

6.2.2. 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**
2,008	11,506.21

6.2.3. 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	- When two documented complaints are received; or - Measured total odour emission rate from exhaust stacks of deodorization system at SCSITW ≧ 0.9 x Total mitigated odour emission rate presented in EIA Report	- Five or more consecutive genuine documented complaints within a week; or - Measured total odour emission rate from exhaust stacks of deodorization system at SCISTW ≧ Total mitigated odour emission rate presented in EIA Report

7. Summary of Odour Measurement

7.1. Conclusion

7.1.1. 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.

7.2. Recommendation

7.2.1. The operator is reminded to maintain the plants and deodorization units are in good condition and to keep a close monitoring on the in-house H2S sensors to ensure that no odour nuisance is induced by SCSITW.

7.3. Follow-up Action for Exceedance Recorded in January 2022

7.3.1. As mentioned in Section 7.3.3. of Odour Monitoring Report for Harbour Area Treatment Scheme Stage 2A (Operational Phase) (January 2022), it is recommended to counter check the H2S reading of the in-house sensors and portable equipment in the next monitoring.

7.3.2. The on-site H2S measurement of portable equipment was conducted on 29th

April 2022. **Table 7.1** summarized the model used and the limit of detection. Copy of calibration certificate is attached in **Appendix I**. The H2S readings is summarized in **Table 7.2**.

Table 7.1 Information of the Portable H2S Meter

Product Name	Model Number	Limit of Detection
POLI	MP400P	0.1 ppm

Table 7.2 Summary of H2S Readings of Portable Equipment and In-house H2S Sensors

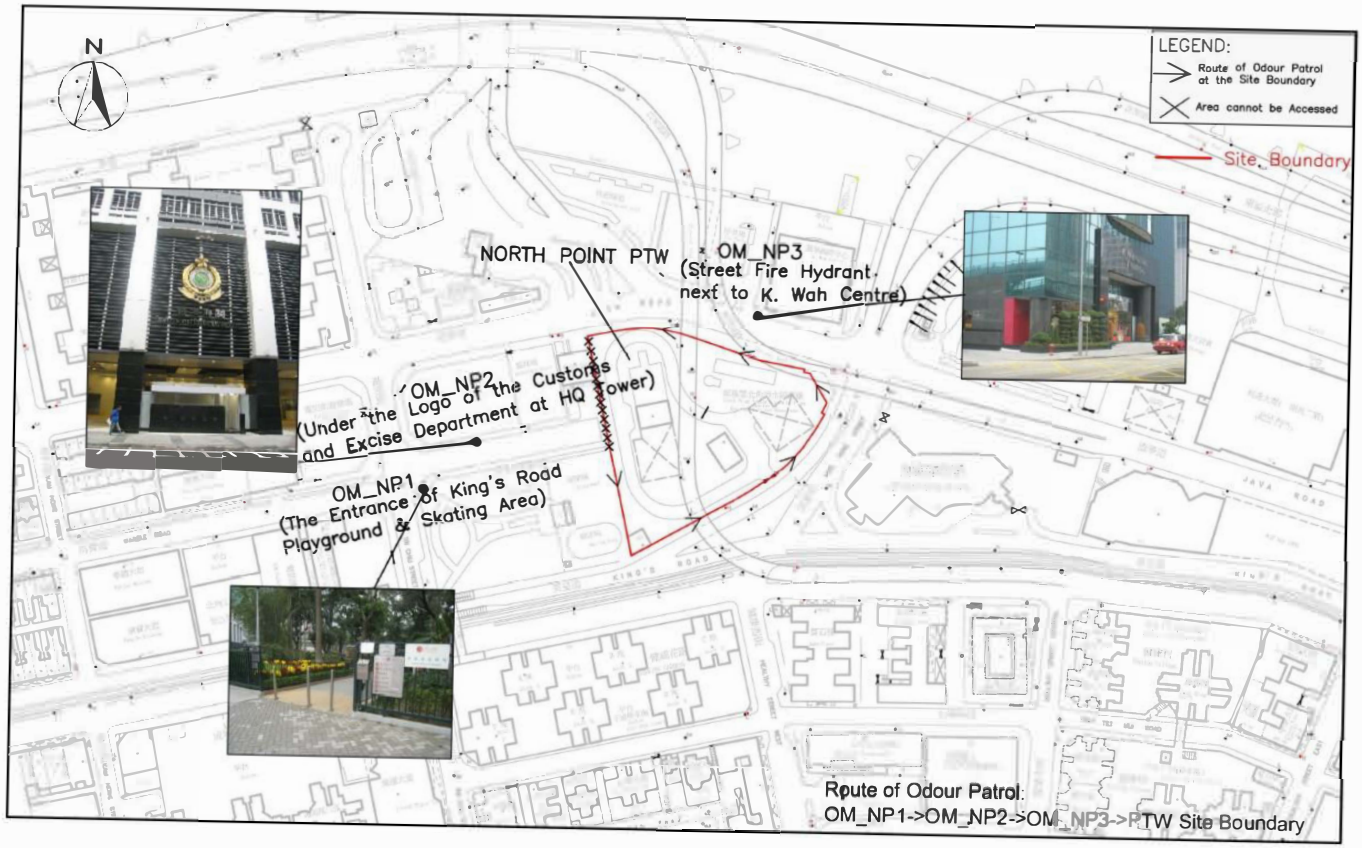
Location ID	Portable Equipment H2S Reading (ppm)	In-house H2S Sensors H2S Reading (ppm)
DOU 1-R	<0.1	0.014
DOU 1-PS	<0.1	N/A
DOU 1B-1	<0.1	N/A
DOU 1B–2	<0.1	N/A
DOU 2-PS	<0.1	0.011
DOU 3	<0.1	0.15
DOU 4-PS	<0.1	0.002
DOU 5-PS	<0.1	0.008
DOU 6	<0.1	<0.01
DOU 6A	<0.1	0.15
DOU 6B	<0.1	0.12
DOU 8-1	<0.1	<0.01
DOU 8-2	<0.1	0.06
DOU 9-1	<0.1	N/A
DOU 9-2	<0.1	N/A

7.3.3. To conclude, the odour emission rate from the odour measurement and the H2S readings from portable equipment shown that the odour emitted from SCISTW is under an acceptable range. Therefore, from the results obtained from 29th April 2022, the performance of deodorization device is considered to be in normal operation.

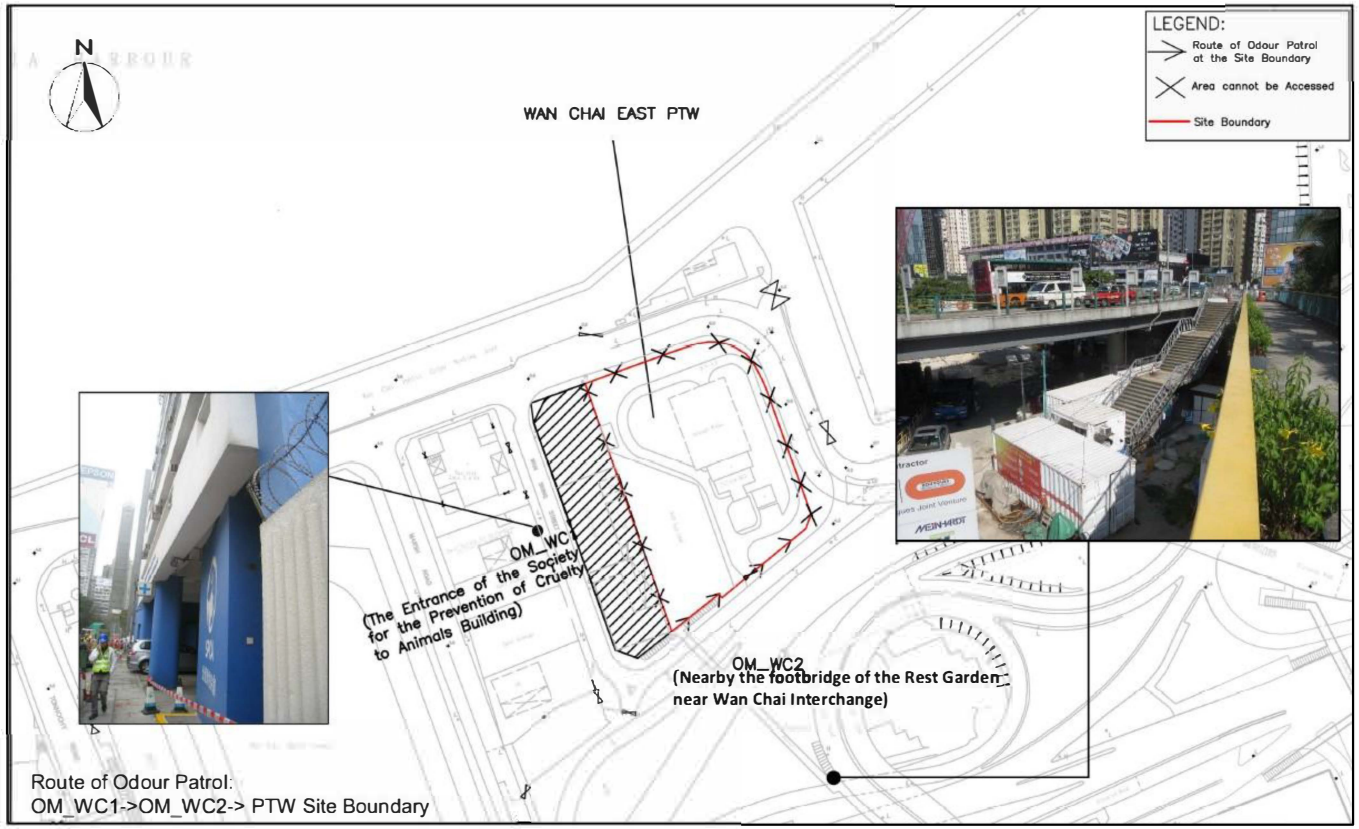
- End of Report -

Appendix A

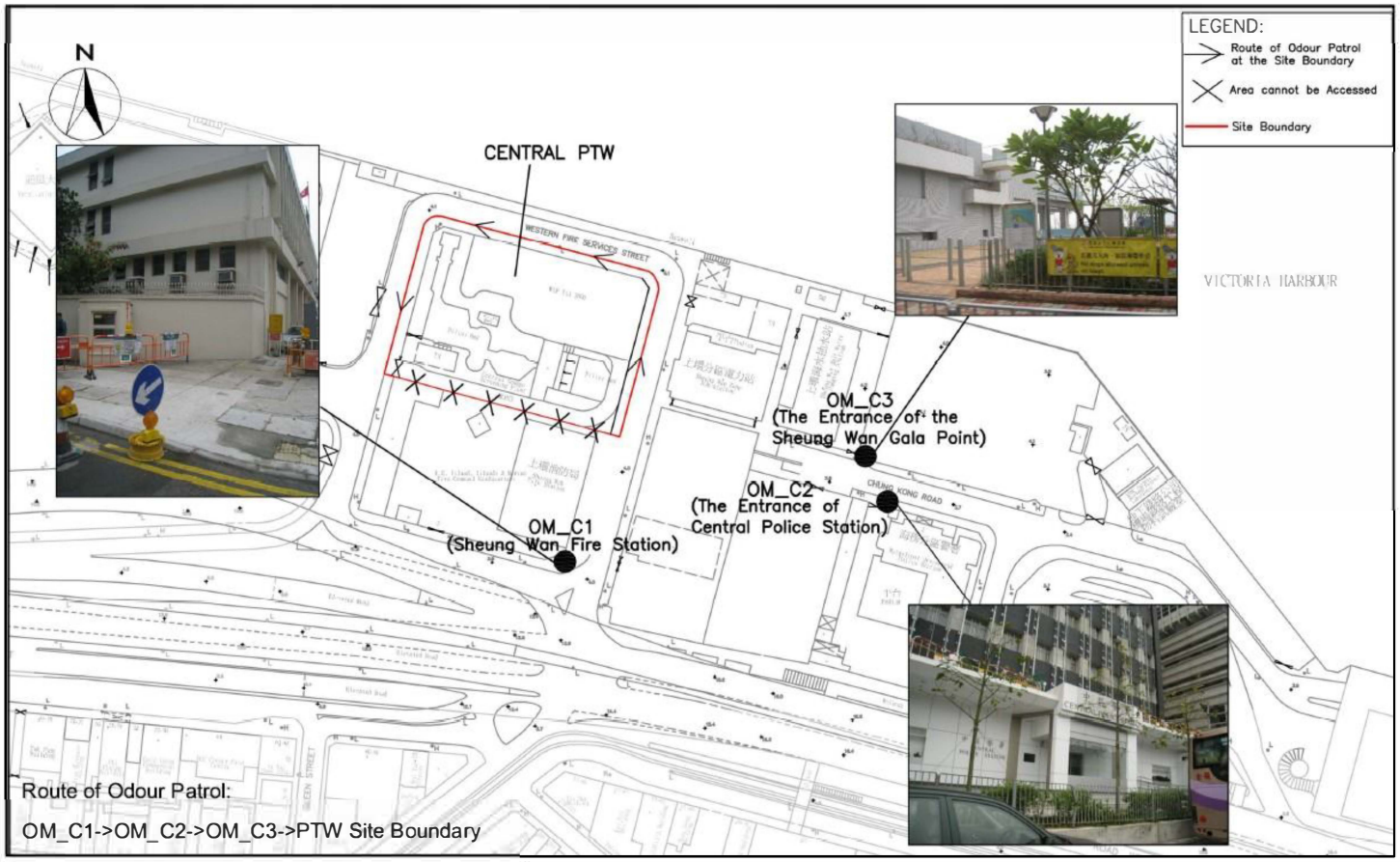
Odour Patrol Monitoring Locations



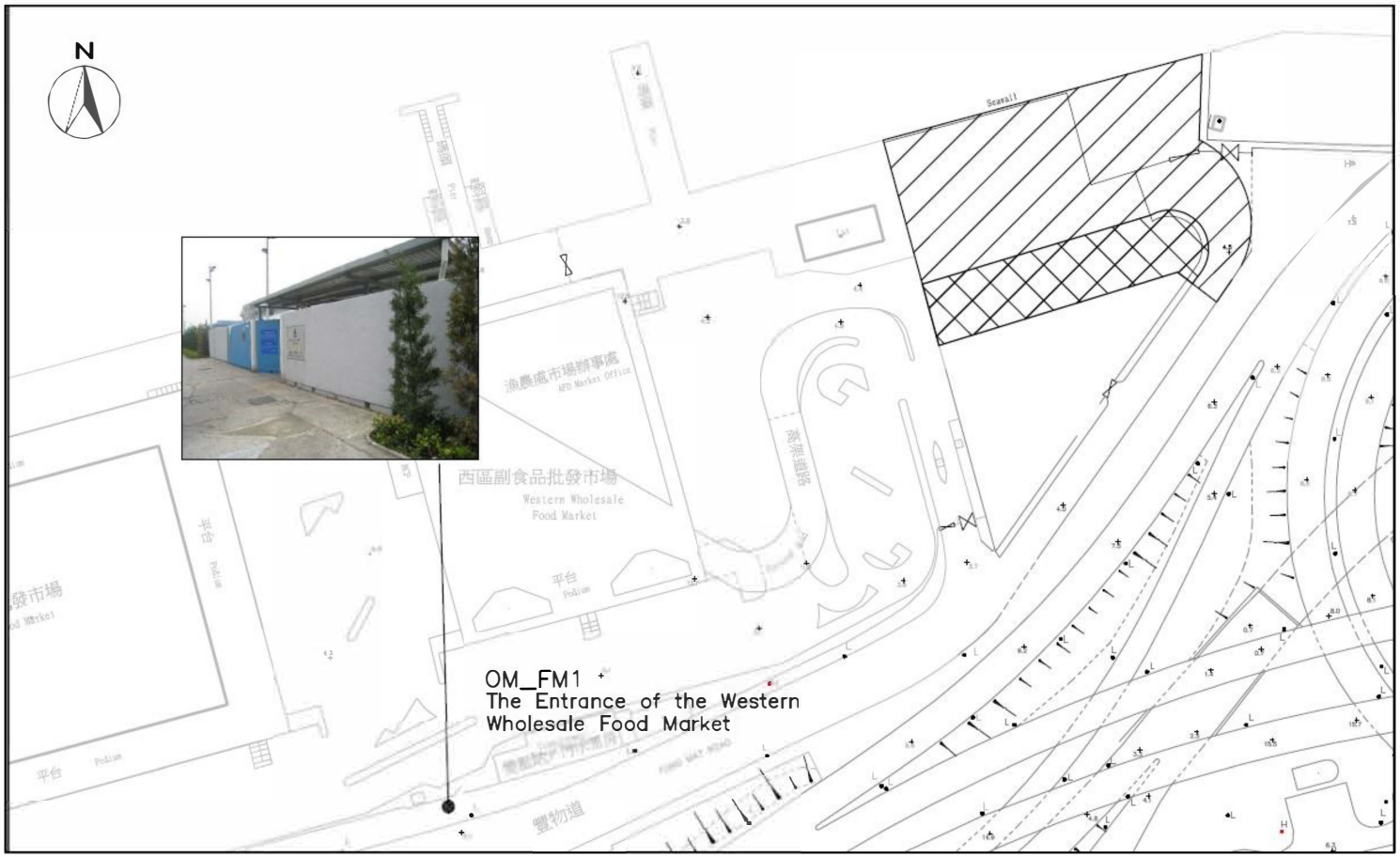
North Point PTW



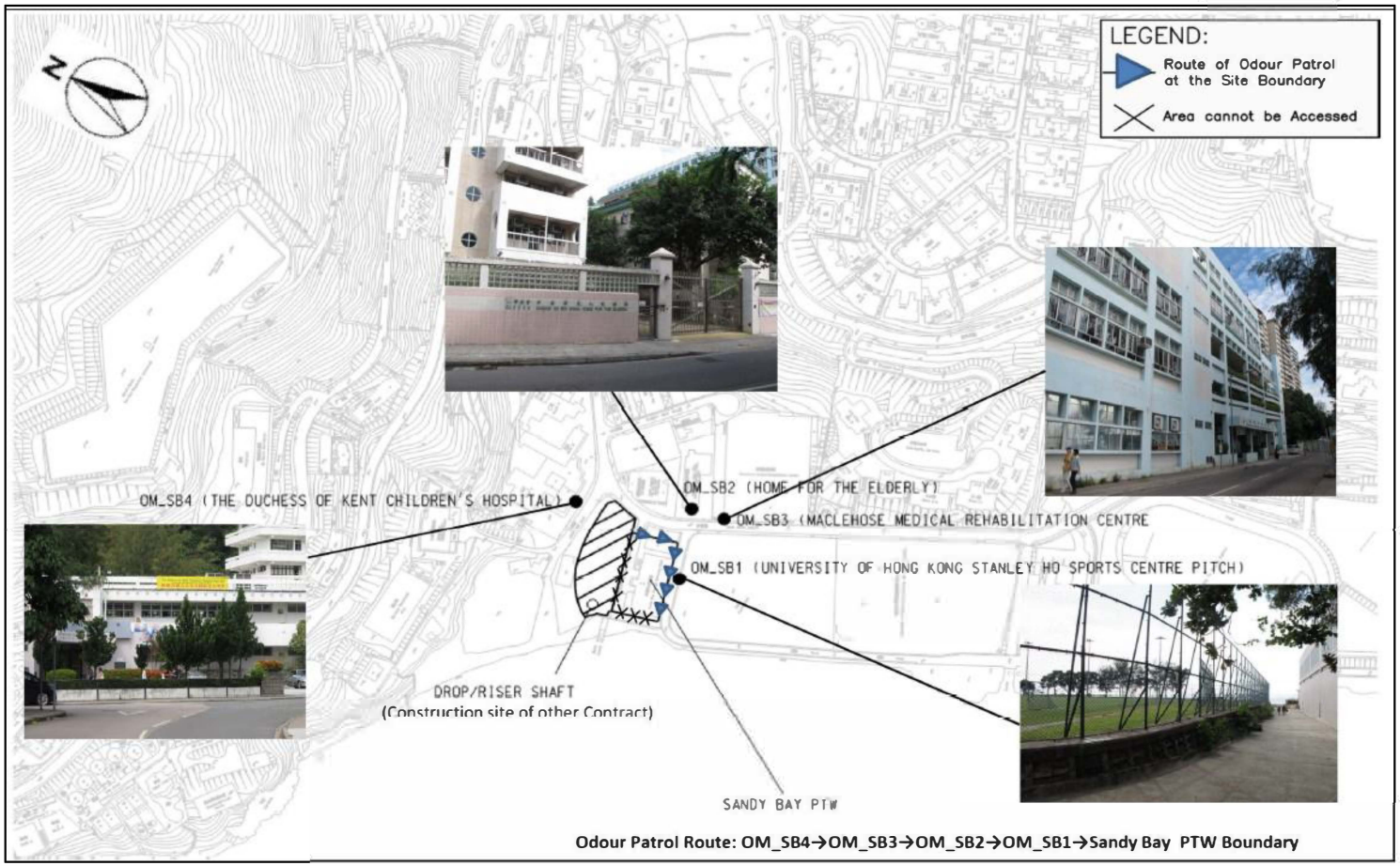
Wan Chai East PTW


N
LEGEND:
Route of Odour Patrol at the Site Boundary
Area cannot be Accessed
Site Boundary
CENTRAL PTW
WESTERN FIRE SERVICES STREET
VICTORIA HARBOUR
OM_C3
(The Entrance of the Sheung Wan Gala Point)
OM_C2
(The Entrance of Central Police Station)
OM_C1
(Sheung Wan Fire Station)
Route of Odour Patrol:
OM_C1->OM_C2->OM_C3->PTW Site Boundary

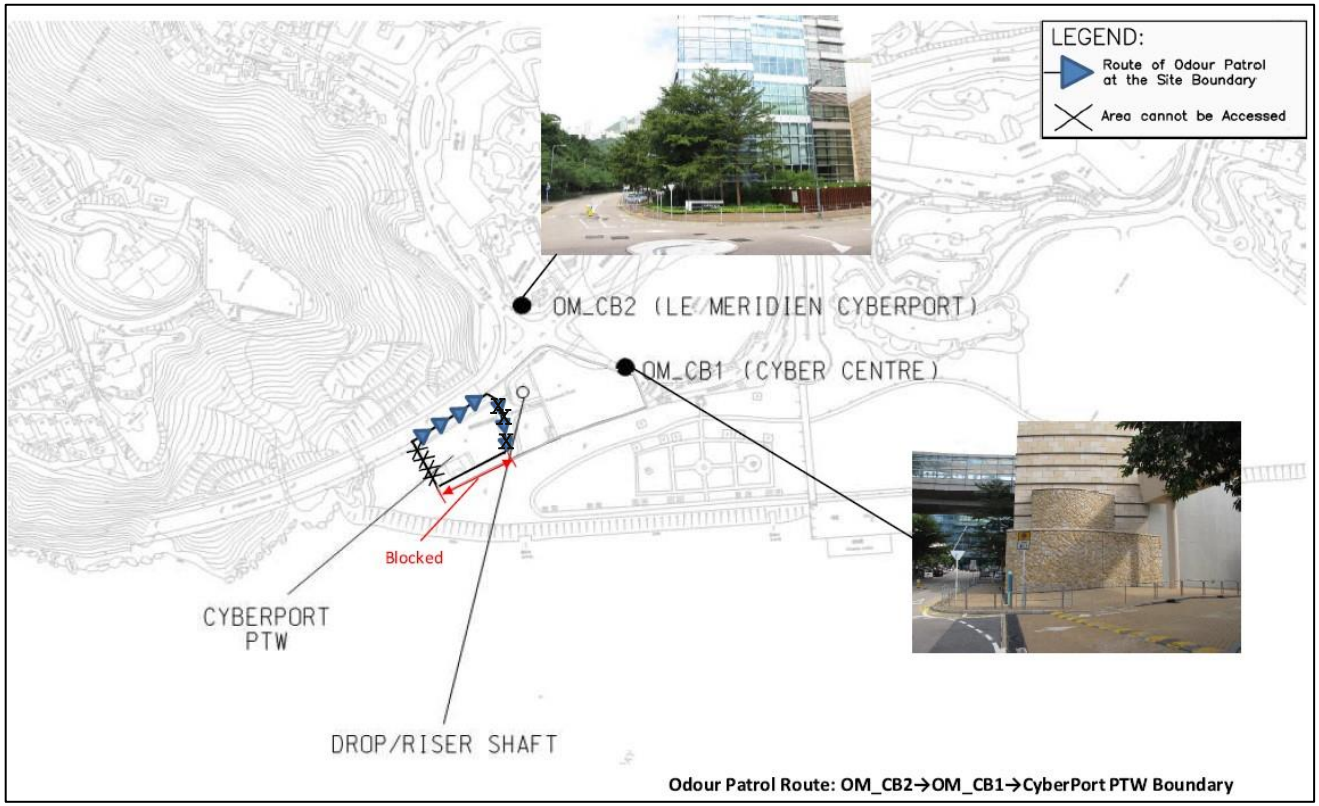
Central PTW



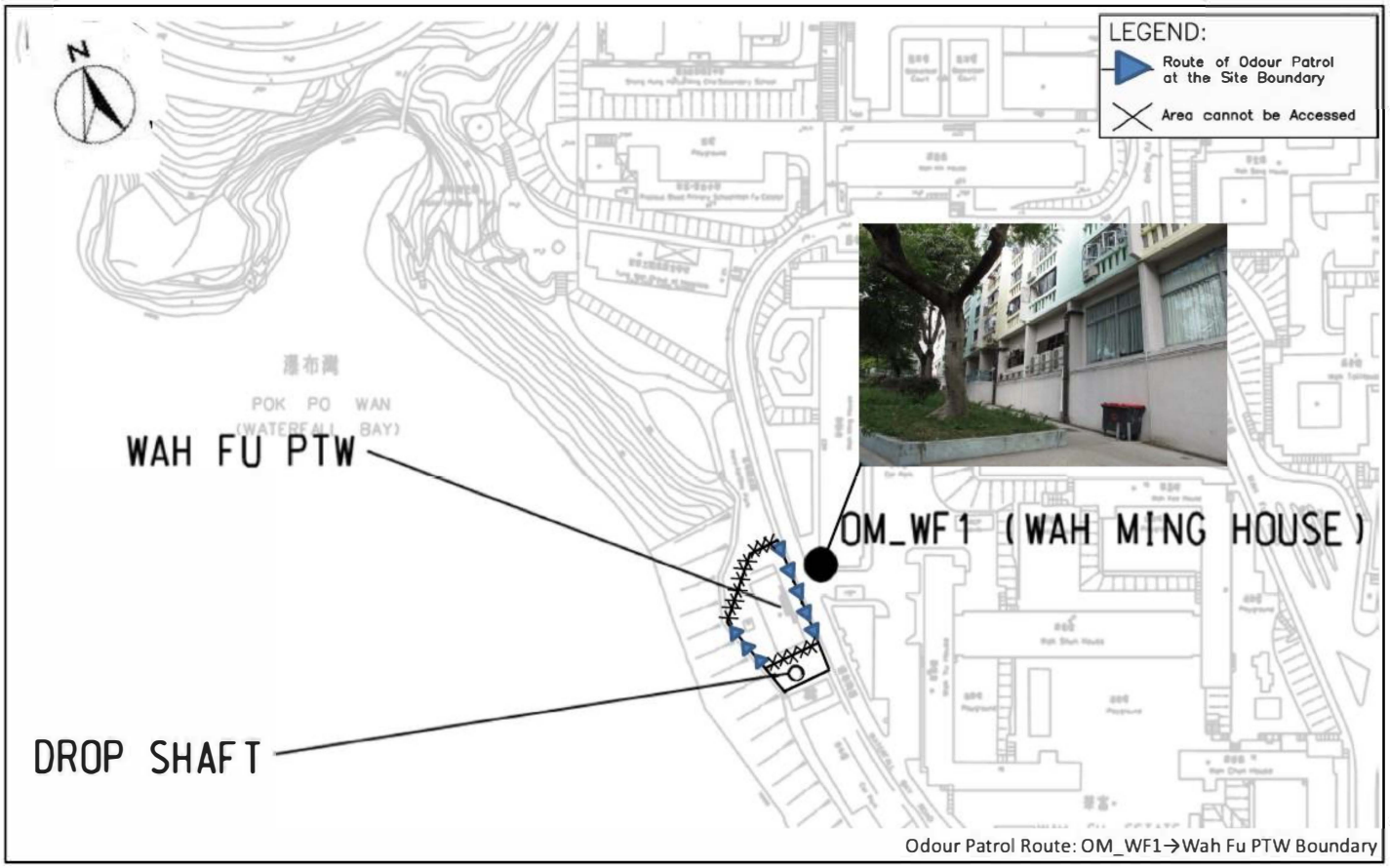
Western Wholesale Food Market



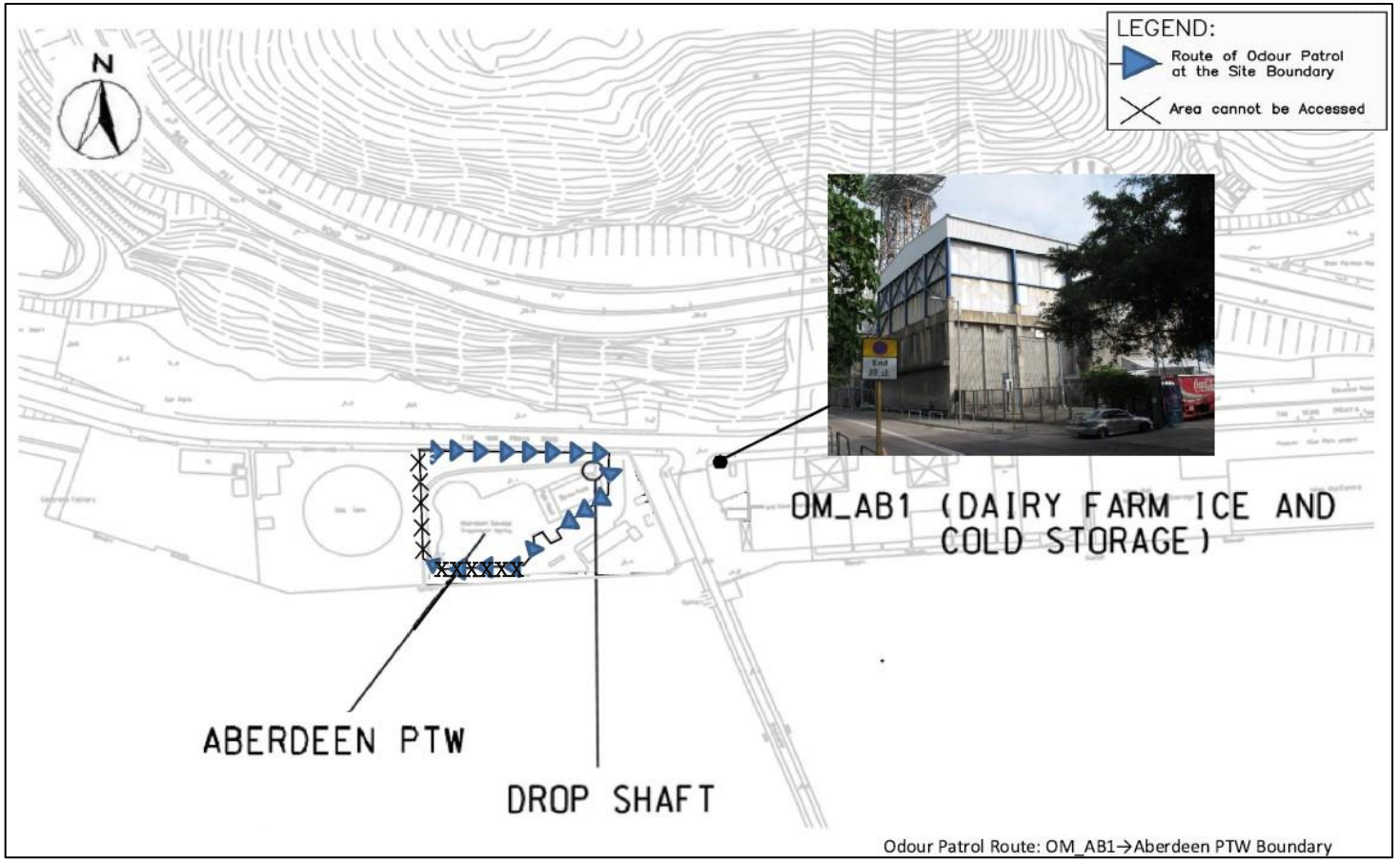
Sandy Bay PTW



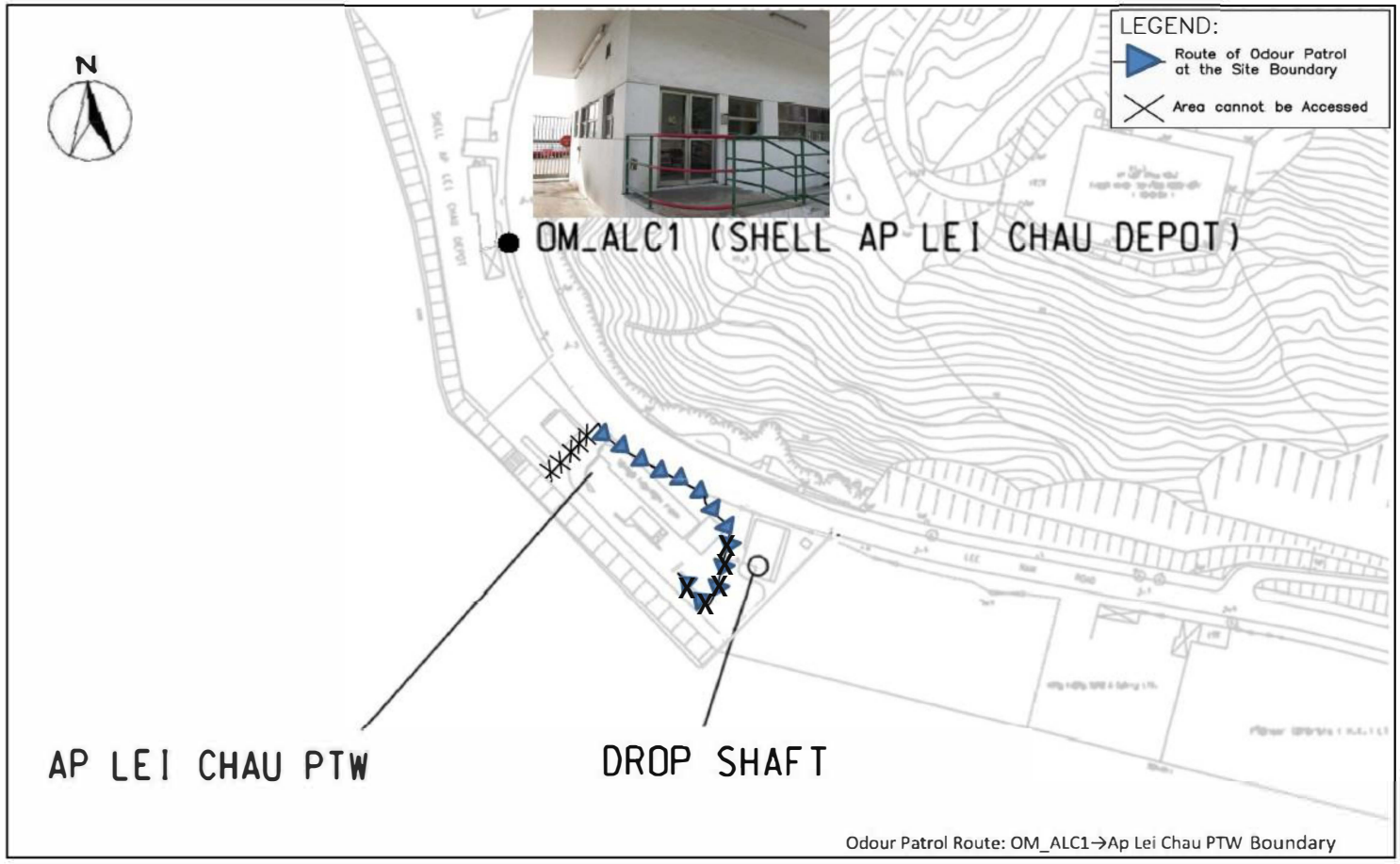
Cyberport PTW


N
LEGEND:
Route of Odour Patrol at the Site Boundary
Area cannot be Accessed
WAH FU PTW
OM_WF1 (WAH MING HOUSE)
DROP SHAFT
Odour Patrol Route: OM_WF1→Wah Fu PTW Boundary

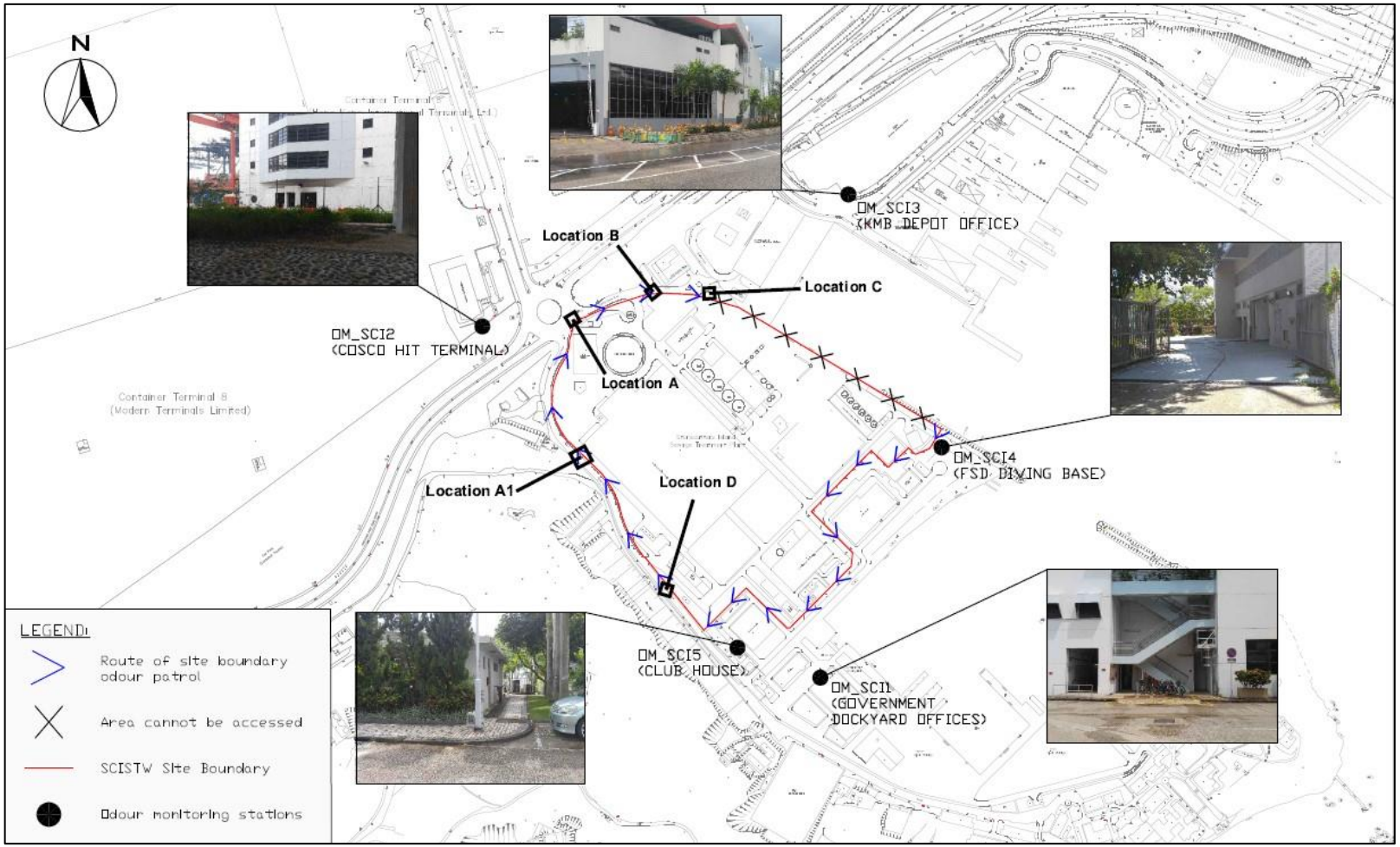
Wah Fu PTW



Aberdeen PTW



Ap Lei Chau PTW


N
Location A
Location A1
Location B
Location C
Location D
DM_SCI2
(COSCO HIT TERMINAL)
DM_SCI3
(KMB DEPOT OFFICE)
DM_SCI4
(FSD DIVING BASE)
DM_SCI5
(CLUB HOUSE)
DM_SCI1
(GOVERNMENT DOCKYARD OFFICES)
LEGEND:
Route of site boundary odour patrol
Area cannot be accessed
SCISTW Site Boundary
Odour monitoring stations

SCISTW

Appendix B

Odour Certificates

ALS Life Sciences | Environmental

Certificate No:: C22001

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	24 March 2023	
Issue Date	**Valid Until**	**Fung Lim Chee, Richard**

ALS Life Sciences | Environmental

Certificate No.: C22002

Certificate for a Qualified Odour Panellist

This is to certify that

LEUNG SZE MAN

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

with Individual Threshold: 32 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	24 March 2023	
Issue Date	**Valid Until**	**Fung Lim Chee, Richard**

ALS Life Sciences | Environmental

Certificate No.: C22003

Certificate for a Qualified Odour Panellist

This is to certify that

YIP CHING MEI

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

with Individual Threshold: 31 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	24 March 2023	
Issue Date	**Valid Until**	**Fung Lim Chee, Richard**

Appendix C

Field Record and Photo Record

Location ID	Panellist	Weather	Time	Temparature (℃)	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	Sunny	1254	31.6	79	0.7	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_NP2	1	Sunny	1255	32.3	79	0.9	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_NP3	1	Sunny	1247	30.4	79	1.0	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
North Point PTW Boundary	1	Sunny	1250	31.2	79	0.0	NA	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_WC1	1	Sunny	1710	32.4	78	0.1	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_WC2	1	Sunny	1704	31.0	79	0.5	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
Wan Chai East Boundary	1	Sunny	1700	31.2	79	2.5	SE	1	Intermittent	Side Wide	Sewage	Sewage Treatment Plant
	2							1				
	3							1				

Location ID	Panellist	Weather	Time	Temparature (℃)	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_C1	1	Sunny	1640	32.4	79	0.7	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_C2	1	Sunny	1636	30.9	79	0.5	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_C3	1	Sunny	1637	32.5	79	0.5	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
Central PTW Boundary	1	Sunny	1629	32.8	79	0.2	SE	2	Continuous	Side Wind	Sewage	Sewage Treatment Plant
	2							1				
	3							2				
OM_FM	1	Sunny	1621	31.3	79	0.8	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SB1	1	Sunny	1605	32.0	79	0.8	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SB2	1	Sunny	1557	32.9	79	0.8	SE	0	NA	NA	NA	NA
	2							0				
	3							0				

Location ID	Panellist	Weather	Time	Temparature (℃)	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_SB3	1	Sunny	1554	31.9	79	0.3	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SB4	1	Sunny	1559	33.1	79	0.8	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
Sandy Bay PTW Boundary	1	Sunny	1602	32.8	79	0.7	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_CB1	1	Sunny	1548	29.5	79	2.5	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_CB2	1	Sunny	1550	32.0	79	0.7	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
Cyberport PTW Boundary	1	Sunny	1547	32.1	79	0.2	SE	1	Intermittent	Side Wind	Sewage	Sewage Treatment Plant
	2							1				
	3							1				
Wah Fu PTW Boundary	1	Sunny	1532	33.6	79	0.9	SE	1	Continuous	Side Wind	Chemical	Sewage Treatment Plant
	2							1				
	3							1				

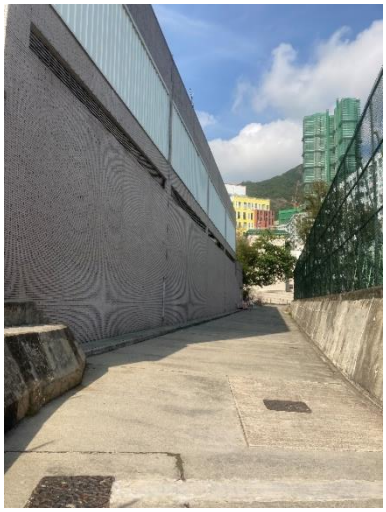
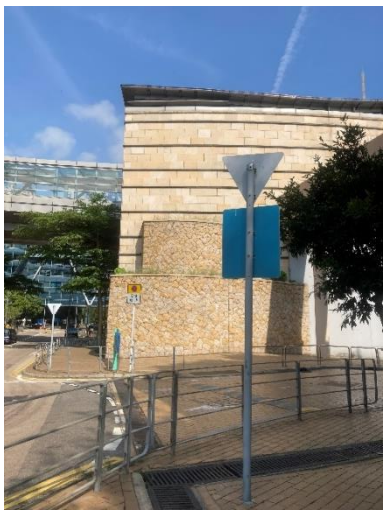
Location ID	Panellist	Weather	Time	Temparature (℃)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_WF1	1	Sunny	1531	32.5	79	1.0	SE	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_AB1	1	Sunny	1518	32.5	79	0.0	NA	1	Continuous	NA	Seawater	Seaside
	2							1				
	3							1				
Aberdeen PTW Boundary	1	Sunny	1524	32.3	79	0.0	NA	1	Continuous	NA	Sewage	Sewage Treatment Plant
	2							1				
	3							1				
OM_ALC1	1	Sunny	1509	31.0	79	0.9	SE	1	Intermittent	Downwind	Sewage	Sewage Treatment Plant
	2							1				
	3							1				
Ap Lei Chau PTW Boundary	1	Sunny	1507	30.8	79	1.0	SE	1	Intermittent	Side Wind	Sewage	Sewage Treatment Plant
	2							1				
	3							1				
OM_SCI1	1	Sunny	1008	30.4	75	0.0	NA	0	NA	NA	NA	NA
	2							0				
	3							0				
OM_SCI2	1	Sunny	951	27.9	75	0.0	NA	0	NA	NA	NA	NA
	2							0				
	3							0				

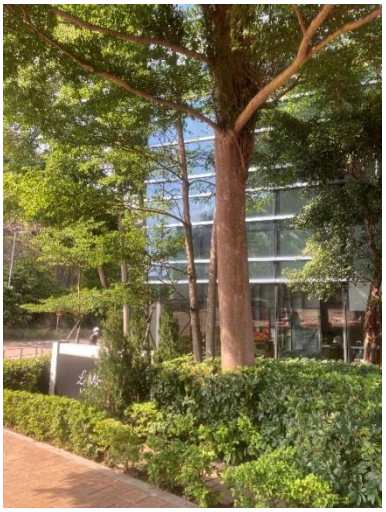
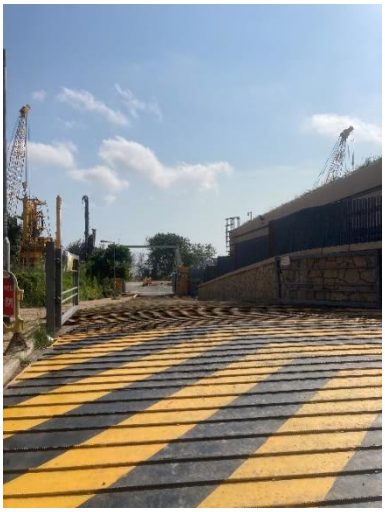
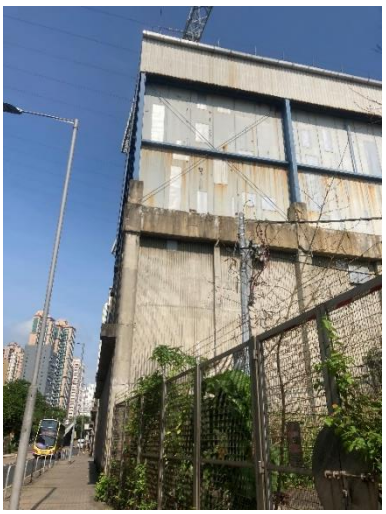
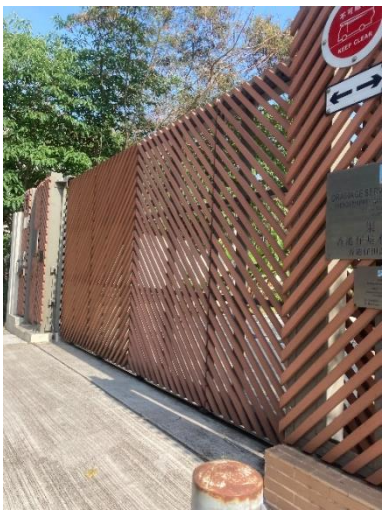
Location ID	Panellist	Weather	Time	Temparature (℃)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
OM_SCI3	1	Sunny	1115	32.3	75	0.5	S	2	Continuous	Downwind	Garbage	Refuse Transfer Station
	2							2				
	3							2				
OM_SCI4	1	Sunny	1017	30.6	75	0.6	S	1	Continuous	Downwind	Diseal, Seawater	Seaside
	2							1				
	3							1				
OM_SCI5	1	Sunny	1028	30.9	74	0.0	NA	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location A	1	Sunny	1041	31.2	75	1.3	S	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location A1	1	Sunny	1038	31.5	74	0.3	S	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location B	1	Sunny	1045	31.7	75	0.9	S	0	NA	NA	NA	NA
	2							0				
	3							0				
SCISTW Boundary Location C	1	Sunny	1051	32.4	75	0.1	S	2	Continuous	Side Wind	Garbage	Refuse Station / Refuse Vehicles
	2							2				
	3							2				

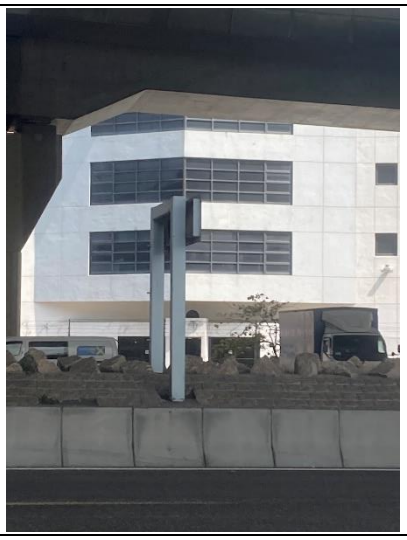
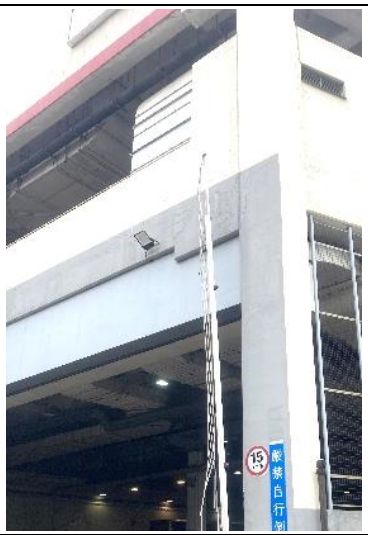
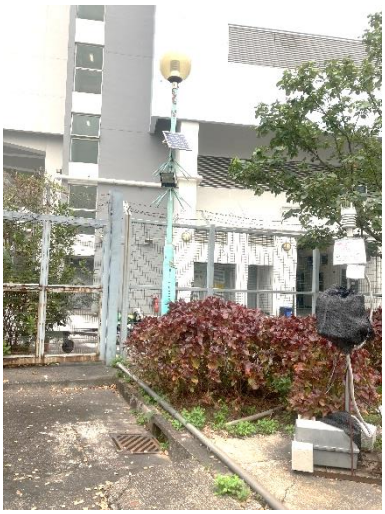
Location ID	Panellist	Weather	Time	Temparature (℃)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
SCISTW Boundary Location D	1	Sunny	1035	31.3	75	0.2	S	0	NA	NA	NA	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

	
OM_SB1	OM_SB2
	
OM_SB3	OM_SB4
	
Sandy Bay PTW Boundary	OM_CB1

	
OM_CB2	Cyberport PTW Boundary
	
OM_WF1	Wah Fu PTW Boundary
	
OM_AB1	Aberdeen PTW Boundary

	
OM_ALC1	Ap Lei Chau PTW Boundary
	
OM_SCI1	OM_SCI2
	
OM_SCI3	OM_SCI4

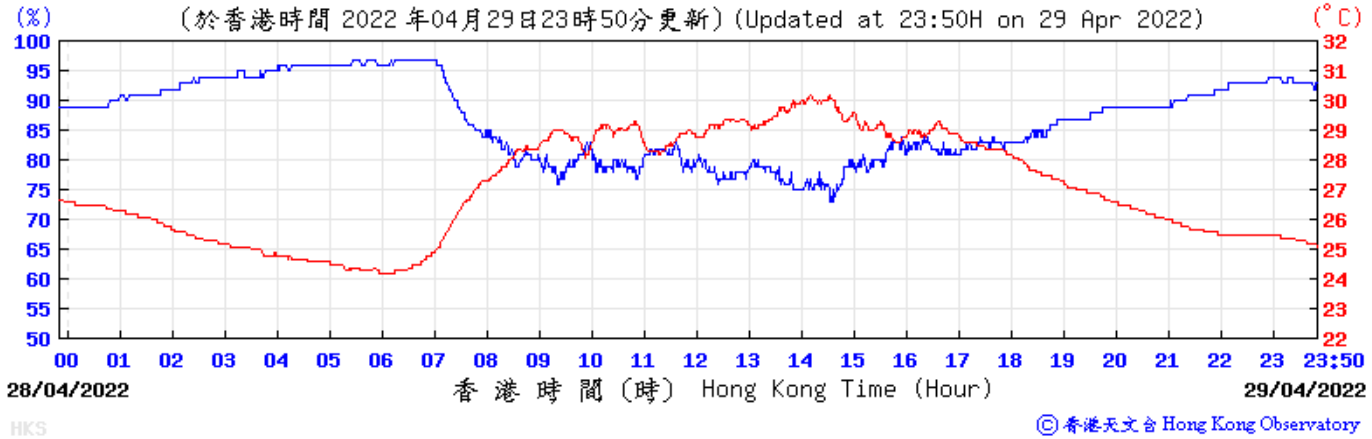
	
OM_SCI5	SCISTW Boundary Location A
	
SCISTW Boundary Location A1	SCISTW Boundary Location B
	
SCISTW Boundary Location C	SCISTW Boundary Location D

Appendix D

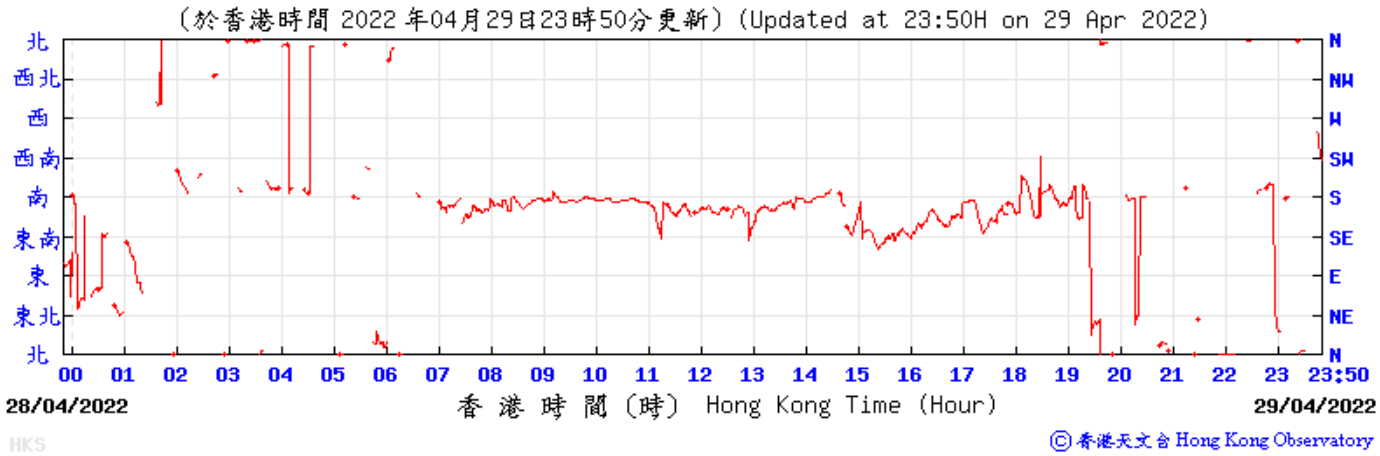
Meteorological Information from the Hong Kong Observatory Station

Meteorological Information from the Hong Kong Observatory Station

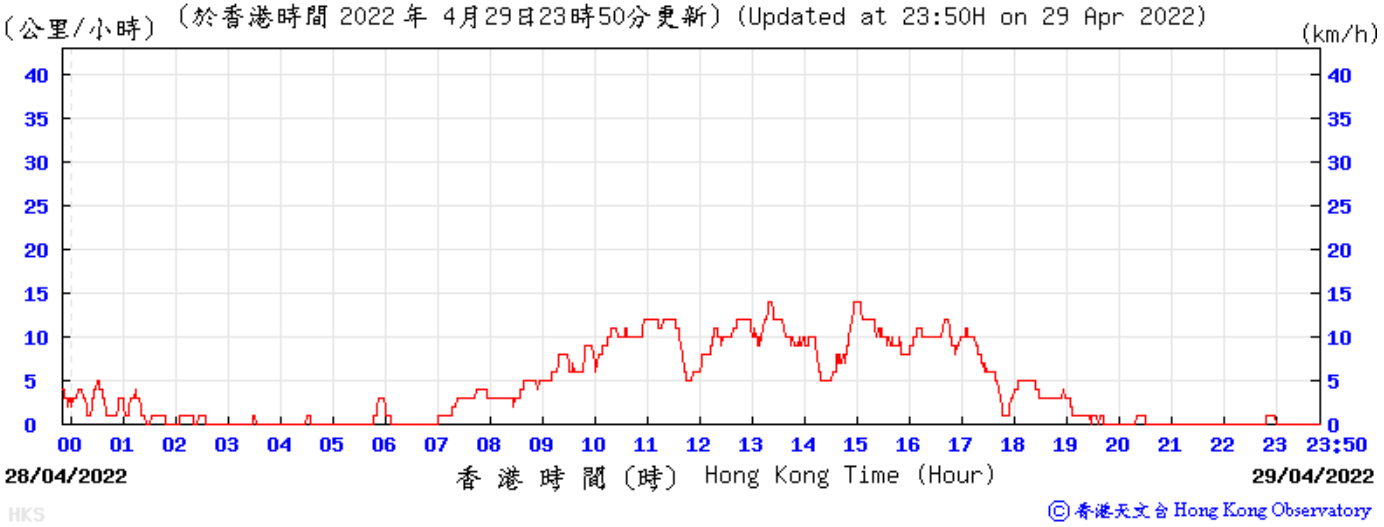
Temperature/Humidity:



Wind Direction:

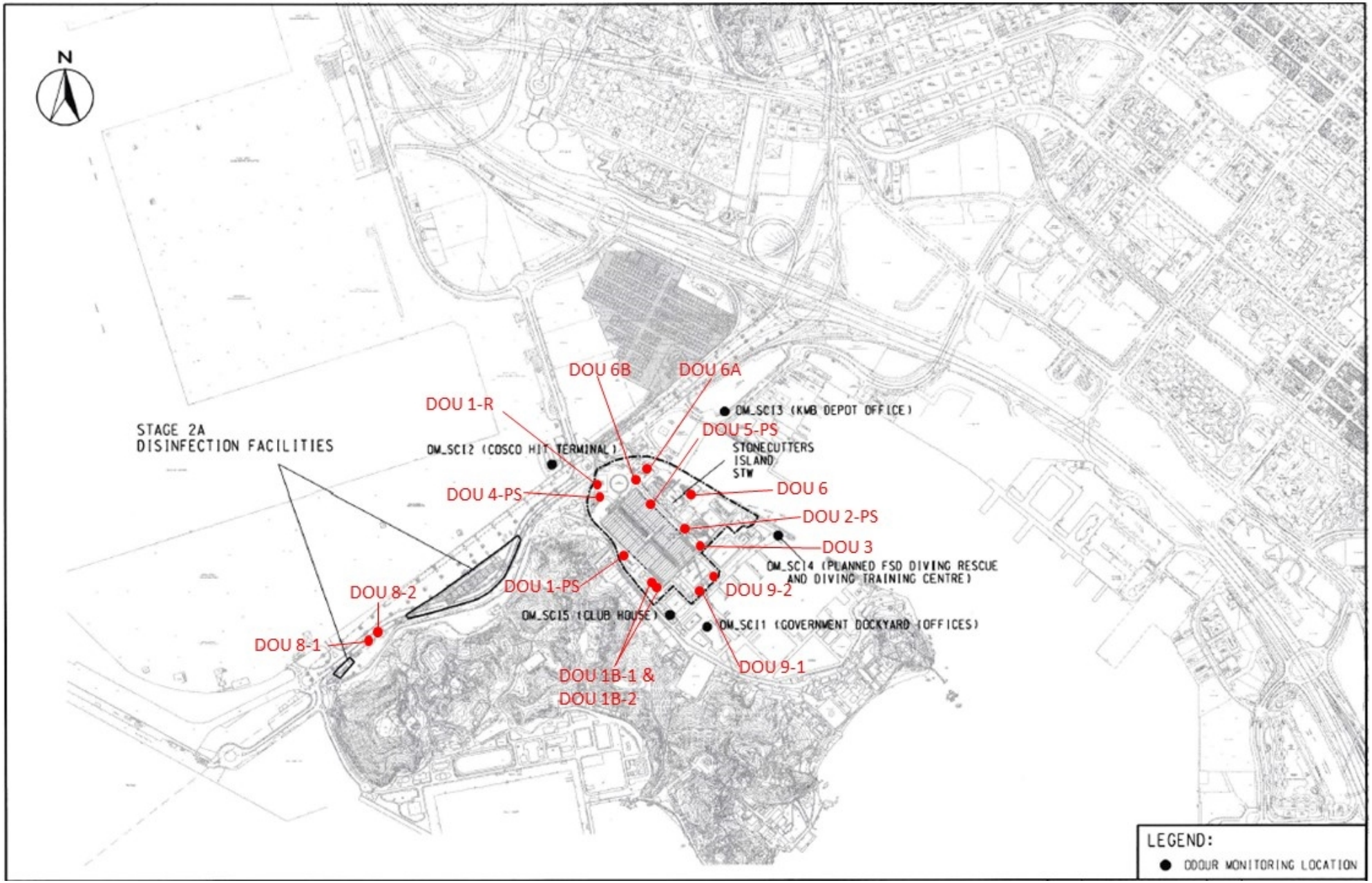


Wind Speed:



Appendix E

Layout of Odour Monitoring Locations for Odour Measurement


N
STAGE 2A
DISINFECTION FACILITIES
DOU 6B
DOU 6A
DOU 1-R
OM_SC13 (KMB DEPOT OFFICE)
DOU 5-PS
OM_SC12 (COSCO HIT TERMINAL)
STONECUTTERS ISLAND STW
DOU 4-PS
DOU 6
DOU 2-PS
DOU 3
OM_SC14 (PLANNED FSD DIVING RESCUE AND DIVING TRAINING CENTRE)
DOU 1-PS
DOU 9-2
DOU 8-2
OM_SC15 (CLUB HOUSE)
OM_SC11 (GOVERNMENT DOCKYARD OFFICES)
DOU 8-1
DOU 9-1
DOU 1B-1 &
DOU 1B-2
LEGEND:
ODOUR MONITORING LOCATION

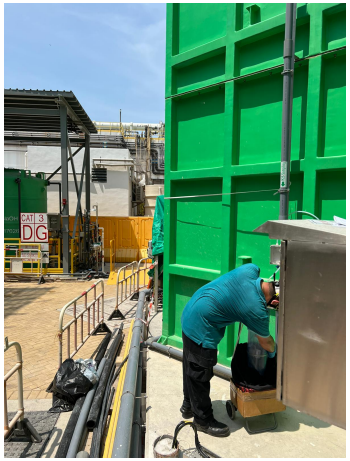
Sampling Locations Photos

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

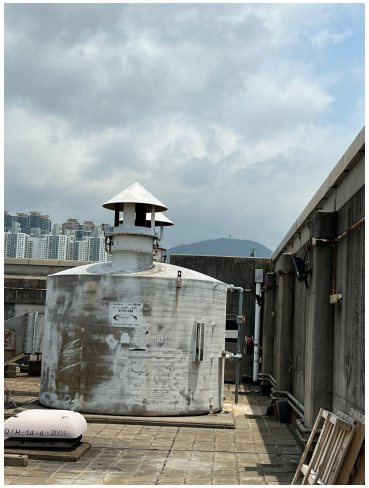
DOU 6A

DOU 6B

DOU 8-1

DOU 8-2

DOU 9-1



DOU 9-2

Appendix F

Odour Measurement Result

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)
LB010678-7	DOU 1B-1	29-April-22	11:28 - 11:31	29-April-22	16:00 – 17:30	< 11	12	7,494	25
LB010678-8	DOU 1B-2	29-April-22	11:36 - 11:42	29-April-22		< 11	16	7,445	33
LB010678-3	DOU 1-PS	29-April-22	10:43 - 10:54	29-April-22		< 11	< 11	12,933	<40
LB010678-1	DOU 1-R	29-April-22	10:26 - 10:39	29-April-22		< 11	< 11	2500	<8
LB010678-4	DOU 2-PS	29-April-22	10:57 - 11:05	29-April-22		< 11	< 11	11,606	<35
LB010678-6	DOU 3	29-April-22	11:19 - 11:26	29-April-22		< 11	15	59,331	250
LB010678-2	DOU 4-PS	29-April-22	10:34 - 10:41	29-April-22		< 11	92	20,123	51
LB010678-5	DOU 5-PS	29-April-22	11:09 - 11:17	29-April-22		< 11	13	865	3
LB010678-11	DOU 6	29-April-22	12:12 - 12:25	29-April-22		< 11	66	36,332	67
LB010678-12	DOU 6A	29-April-22	12:29 - 12:38	29-April-22		< 11	79	37,733	830
LB010678-13	DOU 6B	29-April-22	12:40 - 12:58	29-April-22		< 11	48	37,008	490
LB010678-15	DOU 8-1	29-April-22	13:09 - 13:14	29-April-22		< 11	56	4,312	67
LB010678-14	DOU 8-2	29-April-22	13:00 - 13:06	29-April-22		< 11	63	4,504	79
LB010678-9	DOU 9-1	29-April-22	11:45 - 11:52	29-April-22		< 11	< 11	4,650	<15
LB010678-10	DOU 9-2	29-April-22	11:55 - 12:09	29-April-22		< 11	< 11	4,650	<15
Blank	Field Blank	29-April-22	--	29-April-22		--	< 11	--	--
								Total Emissions [Note 3]	2,008

Note:

1. LOR denotes limit of reporting.
2. The volumetric flow rate data were provided by the client.
3. If calculated odour emission rate are lower than a certain value, integer will be used for calculating the total emissions.
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.

Sample ID	Location ID	Sampling Date	Measured Time	Weather Condition	Ambient Temperature (°C)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Barometric Pressure (hPa)
LB010678-7	DOU 1B-1	29-April-22	11:28	Fine	31.2	75.0	0.3	S	1011
LB010678-8	DOU 1B-2	29-April-22	11:36	Fine	31.1	77.0	0.2	S	1011
LB010678-3	DOU 1-PS	29-April-22	10:43	Fine	31.0	74.0	0.0	--	1011
LB010678-1	DOU 1-R	29-April-22	10:26	Fine	31.1	75.0	0.0	--	1011
LB010678-4	DOU 2-PS	29-April-22	10:57	Fine	31.2	76.0	0.1	SE	1011
LB010678-6	DOU 3	29-April-22	11:19	Fine	31.3	75.0	0.2	SE	1011
LB010678-2	DOU 4-PS	29-April-22	10:34	Fine	31.3	74.0	0.4	SE	1011
LB010678-5	DOU 5-PS	29-April-22	11:09	Fine	31.4	75.0	0.3	SE	1011
LB010678-11	DOU 6	29-April-22	12:12	Fine	31.5	77.0	0.0	--	1011
LB010678-12	DOU 6A	29-April-22	12:29	Fine	31.2	74.0	0.3	S	1011
LB010678-13	DOU 6B	29-April-22	12:40	Fine	31.4	75.0	0.5	S	1011
LB010678-15	DOU 8-1	29-April-22	13:09	Fine	31.2	76.0	0.7	S	1011
LB010678-14	DOU 8-2	29-April-22	13:00	Fine	31.1	78.0	0.6	S	1011
LB010678-9	DOU 9-1	29-April-22	11:45	Fine	31.0	78.0	0.6	S	1011
LB010678-10	DOU 9-2	29-April-22	11:55	Fine	31.6	75.0	0.5	S	1011

Appendix G

Total Odour Emission Rate Extracted from EIA report

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

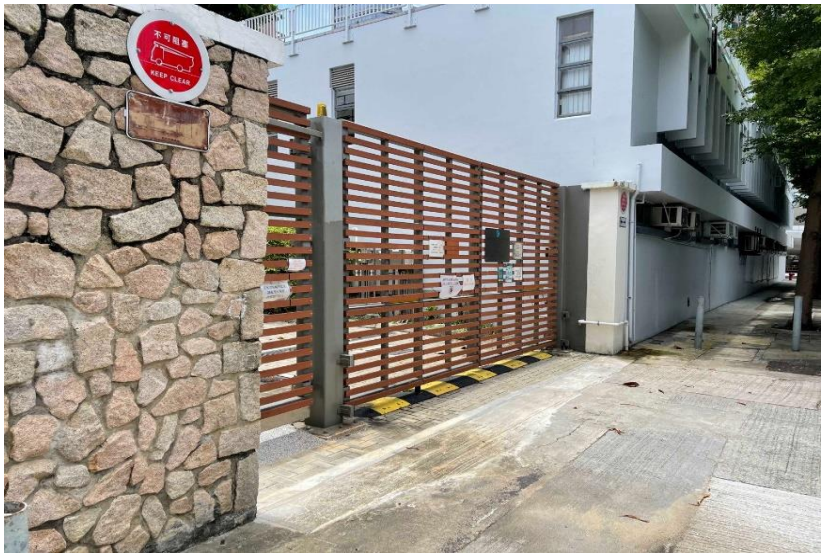
Total: 11,506.21

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.

Appendix H

Field Record and Photo Record for Odour Patrol on 18th May 2022

Location ID	Panellist	Weather	Time	Temparature (℃)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction	Odour Intensity	Duration of Odour	Direction from Source	On-Site Observation	
											Odour Characteristics	Potential Odour Source
Central PTW Boundary	1	Sunny	1155	26.1	38	0.7	NW	1	Continuous	Downwind	Sewage	Sewage Treatment Plant
	2							1				
	3							1				



Central PTW Boundary

Appendix I

Calibration Certificate of Portable H2S Meter

mPower Electronics
Making Powerful Senses

Calibration and Test Certificate

Product Name: POLI

Model Number: MP400P

CO2	0-50000ppm
LEL	0-100%LEL
O2	0-30%
H2S	0-100ppm

Serial Number: M00401003200

Inspection Date: 1/27/2022

Calibration and Test Gases

#	Gas	Concentration	Lot#
1	CO2	5000ppm	L74402180
2	CO	60ppm	93401123
	H2S	15ppm	
	O2	18%	
	LEL	50%LEL(2.5%VOL)	
3	N2	99.9%	2005012

Test Results:

#	Sensor	Span	UOM
1	CO2	5020	ppm
2	LEL	49	%LEL
3	O2(18% / 0%)	18.0 / 0.0	% / %
4	H2S	15.1	ppm

This instrument has been calibrated using valid calibration gases and instrument manual operation procedures. Test and calibration data is on file with the manufacturer, mPower Electronics.

Approved By: Huiping Yao

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