



Lam Geotechnics Limited

Contract No. HY/2019/18
Wanchai Development Phase II and Central-Wanchai Bypass
Sampling, Field Measurement and testing Works (Stage 4)
Operation Phase Odour Monitoring Report
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass
(July 2021)

CONTRACT NO: HY/2019/18

**WANCHAI DEVELOPMENT PHASE II AND CENTRAL
WANCHAI BYPASS
SAMPLING, FIELD MEASUREMENT AND TESTING WORK
(STAGE 4)**

**OPERATION PHASE ODOUR MONITORING REPORT AT
CAUSEWAY BAY TYPHOON SHELTER OF CENTRAL WANCHAI
BYPASS (JULY 2021)**

CLIENTS:

Highways Department

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CERTIFIED BY:

Raymond Dai
Environmental Team Leader

DATE:

02 August 2021

Ref.: AACWBIECEM00_0_12808L.21

2 August 2021

Lam Geotechnics Limited
11/F Centre Point
181-185 Gloucester Road
Wan Chai, Hong Kong

By Post and Fax (2882 3331)

Attention: Mr. Raymond Dai

Dear Sir,

**Re: Environmental Permit No. EP-356/2009
Operation Phase Odour Monitoring Report at
Causeway Bay Typhoon Shelter of Central Wanchai Bypass (July 2021)**

Reference is made to your submission of the captioned Operation Phase Odour Monitoring Report for July 2021 received by email on 30 July 2021 for our review and comment.

Please be informed that we have no adverse comment on the captioned submission.

Thank you very much for your kind attention and please do not hesitate to contact the undersigned should you have any queries.

Yours sincerely,



David Yeung
Independent Environmental Checker

C.C.
HyD
AECOM

Attn: Mr. Enoch Wong
Attn: Mr. David Kwan

by fax: 2714 5289
by fax: 2142 5577

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1. INTRODUCTION

- 1.1.1. According to the approved Environmental Impact Assessment Report (AEIAR-125/2008) for the Central and Wanchai Bypass Project, during operational phase, the Project will not create any new odour source. However, odour nuisance associated with the Causeway Bay Typhoon Shelter (CBTS) is an existing environmental problem.
- 1.1.2. In order to improve the environment, the Project has taken the opportunity to mitigate the potential sources of odour nuisance within the Project area so as to alleviate the pre-existing environmental problem, as well as to provide an acceptable environment for the future land uses within the project area. Enhancement measures have been formulated to alleviate this existing odour problem. These include rectification of expedient connections, regular collection of floating debris, dredging to remove the polluted and odorous sediments at the corner of CBTS and clean up the slime attached on CBTS seawall. With the implementation of these enhancement measures, the predicted odour levels in the vicinity of CBTS would be reduced significantly and the Project will alleviate the existing odour problems in the vicinity of CBTS to a large extent by implementing the proposed enhancement measures.
- 1.1.3. Under the recommendation of the approved EIA Report and the approved Project Environmental Monitoring and Audit Manual (EM&A Manual), during the operation phase of the Project, Monthly monitoring (from July to September) of odour impacts, for a period of 5 years, is proposed during the operational phase of the Project to ascertain the effectiveness of the Enhancement Package over time, and to monitor any on-going odour impacts at the Air Sensitive Receivers along the planned patrol route under the approved EM&A Manual. The monitoring events shall be carried out during daytime and during the period of July to September on a monthly basis in order to capture the likely worst case scenario of a year. If residual odour impact is still found at the end of the odour monitoring programme, further investigation would be carried out to review the odour problem and to identify the parties responsible for further remedial action.
- 1.1.4. According the approved Project EM&A manual, at one year prior to the commissioning of the Project, a programme to monitor odour intensity / odour patrol along the monitoring route specified in the EM&A manual shall be undertaken to assess the odour level prior to the commissioning of the Project. The baseline monitoring events shall be carried out every three months at the same location within the year before the Project commissioned.
- 1.1.5. The baseline odour monitoring at Causeway Bay Typhoon Shelter for Operation Phase of Central Wanchai Bypass was conducted from March to December 2018 according to Approved EM&A manual under EP-356/2009 requirement.
- 1.1.6. According to the agreed time frame, the operation phase odour monitoring was scheduled to be commenced in 2019 (from July to September).
- 1.1.7. This is the 7th monthly odour monitoring report for operational phase for July 2021 prepared in accordance with the proposal for operation phase odour monitoring at Causeway Bay Typhoon Shelter of Central Wanchai Bypass submitted to DEP in July 2019.



2. OPERATION PHASE ODOUR MONITORING

Methodology of Odour Patrol

- 2.1.1. At least three independent trained personnel / competent persons shall be selected to form a patrol team to conduct the odour intensity analysis, who should participated in a set of screening tests.
- 2.1.2. The independent trained personnel / competent persons shall be fulfilled the following requirements:
- 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; and
 - not be allowed to smoke, eat, drink (except water) or use chewing gum or sweets 30 min before and during odour patrol;
 - be engaged for a sufficient period to build up and monitor/detect at several monitoring location;
 - 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; and
 - not communicate with each other about the results of their choices.
- 2.1.3. [The certificate for a qualified odour panel member is enclosed in Appendix 2.1.](#)
- 2.1.4. Subject to the prevailing weather forecast condition, odour patrol shall be conducted by independent trained personnel / competent persons at the downwind locations. During the patrol, the sequence should start from less odorous locations to stronger odorous locations.
- 2.1.5. The qualified persons will use their nose (olfactory sensor) to sniff odours at different locations. The main odour emission sources and the areas to be affected by the odour nuisance shall be identified.
- 2.1.6. The perceived odour intensity is to be divided into 5 levels which are ranked in the descending order as follows:
- 0 - Not detected. No odour perceived or an odour so weak that it cannot be easily characterised or described;
 - 1 - Slight Identifiable odour, and slight chance to have odour nuisance;
 - 2 - Moderate Identifiable odour, and moderate chance to have odour nuisance;
 - 3 - Strong Identifiable, likely to have odour nuisance;
 - 4 - Extreme Severe odour, and unacceptable odour level.



- 2.1.7. The odour monitoring shall be conducted during daytime and the odour monitoring not be conducted on rainy days. Hourly meteorological conditions (temperature, wind speed & direction, humidity) shall be recorded throughout the monitoring period.
- 2.1.8. During the odour monitoring, the findings including odour intensity, odour nature and possible odour sources, and also the local wind speed and direction at each location shall be recorded. The instant weather conditions should be measured and recorded using a portable environment anemometer for references.
- 2.1.9. The independent trained personnel / competent persons shall record the findings including odour intensity, odour nature and possible odour sources, and also the local wind speed and direction at each location. In addition, some relevant meteorological data such as daily average temperature, and daily average humidity, on that surveyed day shall be obtained from the Hong Kong Observatory Station for reference. The tidal data will be referred to the Quarry Bay Station for reference.



3. MONITORING FREQUENCY AND MONITORING ROUTE

- 3.1.1. According the approved Project EM&A manual under EP-356/2009 Section 2.9.2, the monitoring events shall be carried out during daytime and during the period of July to September on a monthly basis for two days in order to capture the likely worst case scenario of a year. The operational odour monitoring shall be carried out for a minimum of 3 years period.
- 3.1.2. The monitoring shall be carried out at low tide condition for capturing the potential worst odour level of that day and shall not be conducted on rainy days. Hourly meteorological conditions (temperature, wind speed & direction, humidity) shall be recorded throughout the monitoring period.
- 3.1.3. On each monitoring date, the odour patrol team (consisting of three independent trained personnel / competent persons) will patrol slowly along the proposed route and use their olfactory senses to detect any odour.
- 3.1.4. The proposed odour patrol route based on the Approved EM&A Manual under EP-356/2009 and the sniffing location along the proposed odour patrol route is attached in [Figure 3.1](#).
- 3.1.5. The operation phase odour monitoring of the Project in July 2021 is attached in [Appendix 3.1](#).



4. RESULTS AND REPORTING

4.1.1. The Action and Limit levels of operation phase odour monitoring of the Project is established according to the Table 2.3 of Approved EM&A Manual under EP-356/2009 and shown in **Table 4.1**.

Table 4.1 Action / Limit Level of Operation Phase Odour Monitoring

Parameter	Action Level	Limit Level
Odour Nuisance (from odour intensity analysis or odour patrol)	<ul style="list-style-type: none">- When two documented complaint are received; or- Odour Intensity of 2 is measured from odour intensity analysis.	<ul style="list-style-type: none">- Five or more consecutive genuine documented complaints within a week; or- Odour Intensity of 3 or above is measured from odour intensity analysis.

4.1.2. No exceedance was recorded in the July 2021 odour monitoring period. Odour monitoring results summary are shown in **Table 4.2**

Table 4.2 Odour Monitoring Results Summary in July 2021

Location	Maximum Odour Intensity	Minimum Odour Intensity
OP1	1	0
OP2	1	0
OP3	0	0
OP4	1	0
OP5	1	0
OP6	1	0
OP7	1	0
OP8	1	0
OP9	0	0

4.1.3. Details of odour monitoring results can be referred in **Appendix 4.1**

4.1.4. The Event and Action Plan of operation phase odour monitoring of the Project is established according to the Table 2.7 of Approved EM&A Manual under EP-356/2009 and shown in **Table 4.3**.

Table 4.3 Event and Action Plan of Operation Phase Odour Monitoring

Event	Action	
	Person-in-charge of Odour Monitoring	CEDD
Action Level		
Exceedance of Action Level	<ol style="list-style-type: none"> 1. Identify source / reason of exceedance; 2. Repeat odour patrol to confirm finding 	<ol style="list-style-type: none"> 1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 week; 2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary; 4. Inform EPD or MD if exceedance is considered to be caused by expedient connections or floating debris.
Limit Level		
Exceedance of Limit Level	<ol style="list-style-type: none"> 1. Identify source / reason of exceedance; 2. Repeat odour patrol to confirm finding; 3. Increase odour patrol frequency to bi-weekly; 4. If exceedance stops, cease additional odour patrol 	<ol style="list-style-type: none"> 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 remedial actions properly implemented; 5. If exceedance continues, consider what more/enhanced mitigation measures shall be implemented; 6. Inform EPD or MD if exceedance is considered to be caused by expedient connections or floating debris.



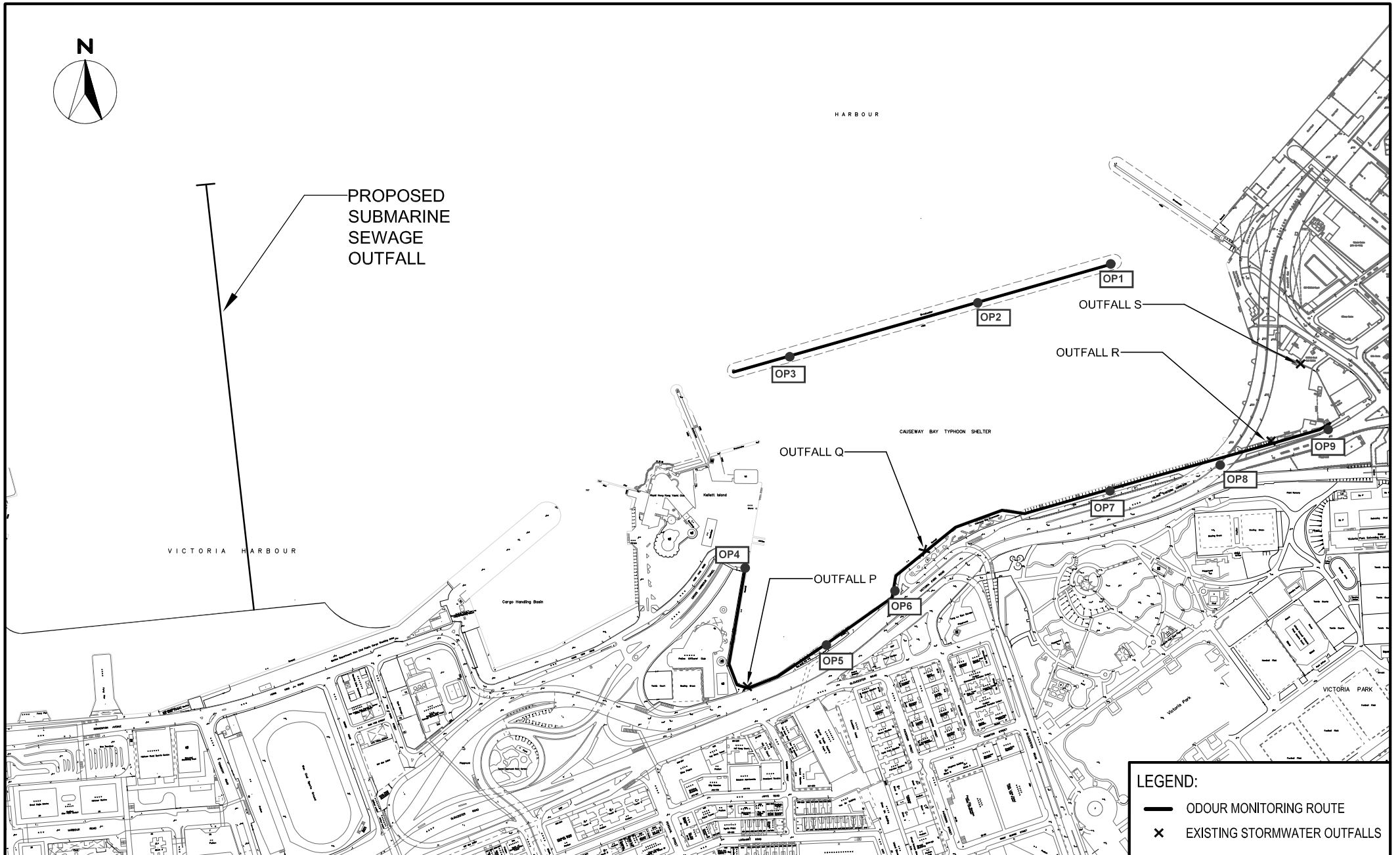
5. DISUSSION, CONCLUSION AND RECOMMENDATION

- 5.1.1. No particular findings related to odour nuisance and no exceedance was recorded in the July 2021 reporting month. In view of the above, the odour nuisance associated with the CBTS was considered as minimized and odour related mitigation measure or remedial action was not required in the monitoring period.
- 5.1.2. The operation phase odour monitoring programme at Causeway Bay Typhoon Shelter of Central Wan Chai Bypass will be maintain in according with EM&A manual requirement to capture long term odour situation during the operation phase of the Project.



Figure 3.1

Layout Plan for Odour Patrol Locations



LEGEND:

- ODOUR MONITORING ROUTE
- x EXISTING STORMWATER OUTFALLS

Location Plan for Odour Monitoring Station

Figure 3.1



Lam Geotechnics Limited

Contract No. HY/2019/18
Wanchai Development Phase II and Central-Wanchai Bypass
Sampling, Field Measurement and testing Works (Stage 4)
Operation Phase Odour Monitoring
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass

Appendix 2.1

Certificate for a Qualified Odour Panelists



Certificate for a Qualified Odour Panellist

This is to certify that

CHAN KAI WING, DEAN

has participated in Ten (10) sets of individual N-Butanol Screening Test
during 30 June 2021 - 08 July 2021

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

08 July 2021
Issue Date

08 July 2022
Valid Until

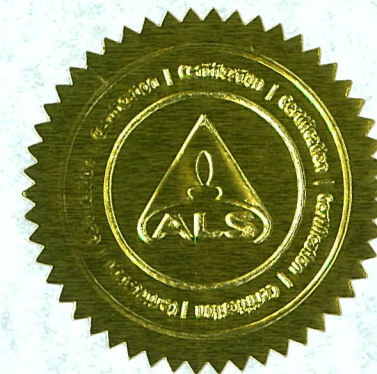

Fung Lim Chee, Richard



ALS Life Sciences | Environmental

Certificate No.: C21069

Certificate for a Qualified Odour Panellist



This is to certify that

CHU KAI WAI, JAMES

has participated in Ten (10) sets of individual N-Butanol Screening Test
during 30 June 2021 - 08 July 2021

with Individual Threshold: 38 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

#Gold Stamp: Successfully fulfilling the Panellist requirement since 2019

08 July 2021
Issue Date

08 July 2022
Valid Until


Fung Lim Chee, Richard



Certificate for a Qualified Odour Panellist

This is to certify that

LAU SIU HANG, HENRY

has participated in Ten (10) sets of individual N-Butanol Screening Test
during 30 June 2021 - 08 July 2021

with Individual Threshold: 39 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

08 July 2021
Issue Date

08 July 2022
Valid Until


Fung Lim Chee, Richard



Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

CHAN KAI WING, DEAN

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between
30 June 2021 to 08 July 2021

and

fulfill the Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 - 80
ppb/v with Standard Deviation less than 2.3
of the European Standard Method of Air Quality -
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

and

Trained with Reference to ASTM Standard Practices for Referencing Suprathreshold Odour Intensity
(ASTM E544) for Hong Kong Four Point Scale on

08 July 2021

08 July 2021
Issue Date

08 October 2021
Valid Until


Fung Lim Chee, Richard



Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

CHU KAI WAI, JAMES

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between
30 June 2021 to 08 July 2021

and

fulfill the Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80
ppb/v with Standard Deviation less than 2.3
of the European Standard Method of Air Quality –
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

and

Trained with Reference to ASTM Standard Practices for Referencing Suprathreshold Odour Intensity
(ASTM E544) for Hong Kong Four Point Scale on

08 July 2021

08 July 2021
Issue Date

08 October 2021
Valid Until


Fung Lim Chee, Richard



Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

LAU SIU HANG, HENRY

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between
30 June 2021 to 08 July 2021

and

fulfill the Requirement of the Odour Threshold of n-Butanol in Nitrogen Gas in the Range of 20 – 80
ppb/v with Standard Deviation less than 2.3
of the European Standard Method of Air Quality -
Determination of Odour Concentration by Dynamic Olfactometry (EN13725)

and

Trained with Reference to ASTM Standard Practices for Referencing Suprathreshold Odour Intensity
(ASTM E544) for Hong Kong Four Point Scale on

08 July 2021

08 July 2021
Issue Date

08 October 2021
Valid Until


Fung Lim Chee, Richard



Lam Geotechnics Limited

Contract No. HY/2019/18
Wanchai Development Phase II and Central-Wanchai Bypass
Sampling, Field Measurement and testing Works (Stage 4)
Operation Phase Odour Monitoring
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass

Appendix 3.1

Odour Monitoring Schedule

Contract No. HY/2019/18
Wan Chai Development Phase II and Central-Wan Chai Bypass
Sampling, Field Measurement and Testing Works (Stage 4)
Operation Phase Odour Monitoring Schedule
July 2021

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				01-Jul	02-Jul	03-Jul
04-Jul	05-Jul	06-Jul	07-Jul	08-Jul	09-Jul	10-Jul
11-Jul	12-Jul	13-Jul	14-Jul	15-Jul	16-Jul	17-Jul
		Odour Monitoring (Operation Phase)				
18-Jul	19-Jul	20-Jul	21-Jul	22-Jul	23-Jul	24-Jul
						Odour Monitoring (Operation Phase)
25-Jul	26-Jul	27-Jul	28-Jul	29-Jul	30-Jul	31-Jul



Lam Geotechnics Limited

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Operation Phase Odour Monitoring
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass

Appendix 4.1

Odour Monitoring Results



Lam Geotechnics Limited

Contract No. HY/2019/18
Wanchai Development Phase II and Central-Wanchai Bypass
Sampling, Field Measurement and testing Works (Stage 4)
Operation Phase Odour Monitoring

Monitoring Date: 13 July 2021 Weather Condition: Fine Tidal Condition: Ebb
Temperature: 31.0°C - 35.9°C Relative Humidity: 59.3% - 72.8%

Field Data Record

Location	Time	Temperature (°C)	Relative Humidity (%)	Observer 1				Observer 2				Observer 3				Wind Speed	Wind Direction	Remark
				Odour Intensity	Odour Nature	Possible Odour Sources	Duration	Odour Intensity	Odour Nature	Possible Odour Sources	Duration	Odour Intensity	Odour Nature	Possible Odour Sources	Duration			
OP1	14:25	32.1	72.8	0	-	-	-	0	-	-	-	0	-	-	-	5.0	S	-
OP2	14:20	34.0	72.6	0	-	-	-	0	-	-	-	0	-	-	-	1.4	W	-
OP3	14:15	34.1	70.0	0	-	-	-	0	-	-	-	0	-	-	-	2.0	W	-
OP4	13:57	31.0	64.6	1	Toilet	Toilet	Constant	0-1	Toilet	Toilet	Constant	1	Toilet	Toilet	Constant	1.6	W	-
OP5	14:02	34.8	59.3	1	Sewage	Sewage	Constant	0	-	-	-	1	Sewage	Sewage	Constant	0.9	N	-
OP6	14:08	35.7	62.1	1	Sea water	Sea	Constant	1	Sea water	Sea	Constant	1	Sea water	Sea	Constant	0.7	N	-
OP7	14:35	35.9	68.0	1	Sea water	Sea	Constant	0	-	-	-	0	-	-	-	0.7	E	-
OP8	14:38	33.7	68.1	0	-	-	-	0	-	-	-	0	-	-	-	2.2	E	-
OP9	14:40	33.1	64.0	0	-	-	-	0	-	-	-	0	-	-	-	1.3	S	-

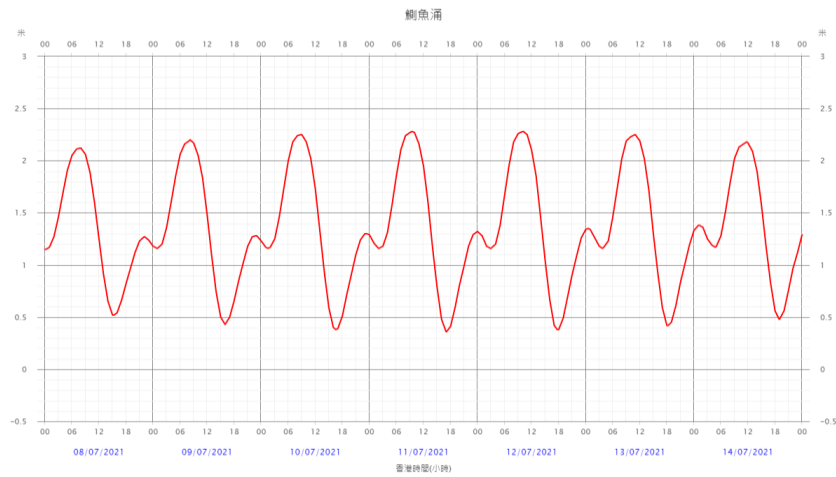
Meteorological Conditions on 13 July 2021

Hong Kong Observatory Weather Station at Hong Kong Observatory

Air Temperature: 28.8°C-35.3°C Average Relative Humidity: 72%

The tidal data at Quarry Bay Station

Tide Time	Tide Height (m)
00:33	1.35
03:41	1.16
10:56	2.25
18:00	0.42





Lam Geotechnics Limited

Contract No. HY/2019/18
Wanchai Development Phase II and Central-Wanchai Bypass
Sampling, Field Measurement and testing Works (Stage 4)
Operation Phase Odour Monitoring

Monitoring Date: 24 July 2021 Weather Condition: Fine Tidal Condition: Ebb
Temperature: 30.1 C - 32.8°C Relative Humidity: 81% - 91.2%

Field Data Record

Location	Time	Temperature (°C)	Relative Humidity (%)	Observer 1				Observer 2				Observer 3				Wind Speed	Wind Direction	Remark
				Odour Intensity	Odour Nature	Possible Odour Sources	Duration	Odour Intensity	Odour Nature	Possible Odour Sources	Duration	Odour Intensity	Odour Nature	Possible Odour Sources	Duration			
OP1	12:30	30.1	90.1	1	Sea water	Sea	Intermittent	0	-	-	-	0	-	-	-	3.0	NW	-
OP2	12:25	30.5	89.3	0	-	-	-	0	-	-	-	1	Sea water	Sea	Intermittent	3.2	NW	-
OP3	12:21	30.4	82.8	0	-	-	-	0	-	-	-	0	-	-	-	3.6	NW	-
OP4	12:06	32.0	91.2	0	-	-	-	0	-	-	-	0	-	-	-	-	-	-
OP5	12:11	32.8	81.0	0	-	-	-	0	-	-	-	0	-	-	-	2.1	W	-
OP6	12:15	32.7	81.6	0	-	-	-	1	Sea water	Sea	Intermittent	1	Sea water	Sea	Intermittent	2.4	NW	-
OP7	12:36	32.7	81.7	1	Sea water	Sea	Intermittent	0	-	-	-	0	-	-	-	-	-	-
OP8	12:38	31.7	82.1	1	Incense	Temple	Intermittent	1	Incense	Temple	Intermittent	1	Incense	Temple	Intermittent	0.8	NW	-
OP9	12:40	32.6	81.9	0	-	-	-	0	-	-	-	0	-	-	-	-	-	-

Meteorological Conditions on 24 July 2021

Hong Kong Observatory Weather Station at Hong Kong Observatory

Air Temperature: 26.5°C-33.2°C Average Relative Humidity: 82%

The tidal data at Quarry Bay Station

Tide Time	Tide Height (m)
02:00	1.17
08:47	2.51
16:00	0.22
23:24	1.43

