



Lam Geotechnics Limited

Contract No. HK/2015/01  
Wanchai Development Phase II and Central-Wanchai Bypass  
Sampling, Field Measurement and testing Works (Stage 3)  
Operation Phase Odour Monitoring Report  
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass  
(September 2019)

**CONTRACT NO: HK/2015/01**

**WANCHAI DEVELOPMENT PHASE II AND CENTRAL  
WANCHAI BYPASS  
SAMPLING, FIELD MEASUREMENT AND TESTING WORK  
(STAGE 3)**

**OPERATION PHASE ODOUR MONITORING REPORT AT  
CAUSEWAY BAY TYPHOON SHELTER OF CENTRAL WANCHAI  
BYPASS (SEPTEMBER 2019)**

**CLIENTS:**

Civil Engineering and Development  
Department

**PREPARED BY:**

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**CERTIFIED BY:**

Raymond Dai  
Environmental Team Leader

**DATE:**

8 October 2019

Ref.: AACWBIECEM00\_0\_11694L.19

8 October 2019

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  
(September 2019)**

Reference is made to your submission of the captioned Operation Phase Odour Monitoring Report for September 2019 received by email on 8 October 2019 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

CEDD

AECOM

AECOM

Attn: Mr. Tony Cheung

Attn: Mr. Jimmy Ling

Attn: Ms. Gloria Tang

Attn: Mr. Eric Wong

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## TABLE OF CONTENTS

1. INTRODUCTION.....	1
2. OPERATION PHASE ODOUR MONITORING .....	2
3. MONITORING FREQUENCY AND MONITORING ROUTE .....	4
4. RESULTS AND REPORTING .....	5
5. DISCUSSION, CONCLUSION AND RECOMMENDATION .....	7

## LIST OF TABLES

<a href="#">Table 4.1</a>	<a href="#">Action and Limit Level of Operation Phase Odour Monitoring</a>
<a href="#">Table 4.2</a>	<a href="#">Odour Monitoring Results Summary in September 2019</a>
<a href="#">Table 4.3</a>	<a href="#">Event and Action Plan of Operation Phase Odour Monitoring</a>

## LIST OF FIGURES

<a href="#">Figure 3.1</a>	<a href="#">Location Plan for Odour Monitoring Stations</a>
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## LIST OF APPENDICES

<a href="#">Appendix 2.1</a>	<a href="#">Certificate for Qualified Odour Panel Members</a>
<a href="#">Appendix 3.1</a>	<a href="#">Odour Monitoring Schedule</a>
<a href="#">Appendix 4.1</a>	<a href="#">Odour Monitoring Results</a>



## 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 is scheduled to be commenced in 2019 (from July to September).
- 1.1.7. [This is the third monthly odour monitoring report for operational phase for September 2019 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 sensors 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 schedule of the Project in September 2019 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"><li>- When two documented complaint are received; or</li><li>- Odour Intensity of 2 is measured from odour intensity analysis.</li></ul>	<ul style="list-style-type: none"><li>- Five or more consecutive genuine documented complaints within a week; or</li><li>- Odour Intensity of 3 or above is measured from odour intensity analysis.</li></ul>

4.1.2. No exceedance was recorded in the September 2019 odour monitoring period. Odour monitoring results summary are shown in **Table 4.2**

**Table 4.2 Odour Monitoring Results Summary in September 2019**

Location	Maximum Odour Intensity	Minimum Odour Intensity
OP1	0	0
OP2	0	0
OP3	0	0
OP4	0-1	0
OP5	0-1	0
OP6	0-1	0
OP7	0	0
OP8	0	0
OP9	0-1	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
<b>Action Level</b>		
Exceedance of Action Level	<ol style="list-style-type: none"> <li>1. Identify source / reason of exceedance;</li> <li>2. Repeat odour patrol to confirm finding</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 week;</li> <li>2. Rectify any unacceptable practice;</li> <li>3. Implement more mitigation measures if necessary;</li> <li>4. Inform EPD or MD if exceedance is considered to be caused by expedient connections or floating debris.</li> </ol>
<b>Limit Level</b>		
Exceedance of Limit Level	<ol style="list-style-type: none"> <li>1. Identify source / reason of exceedance;</li> <li>2. Repeat odour patrol to confirm finding;</li> <li>3. Increase odour patrol frequency to bi-weekly;</li> <li>4. If exceedance stops, cease additional odour patrol</li> </ol>	<ol style="list-style-type: none"> <li>1. Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 2 weeks;</li> <li>2. Rectify any unacceptable practice;</li> <li>3. Formulate remedial actions;</li> <li>4. Ensure remedial actions properly implemented;</li> <li>5. If exceedance continues, consider what more/enhanced mitigation measures shall be implemented;</li> <li>6. Inform EPD or MD if exceedance is considered to be caused by expedient connections or floating debris.</li> </ol>



## **5. DISUSSION, CONCLUSION AND RECOMMENDATION**

- 5.1.1. No particular findings related to odour nuisance and no exceedance was recorded in the September 2019 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***





**Lam Geotechnics  
Limited**

Contract No. HK/2015/01  
Wanchai Development Phase II and Central-Wanchai Bypass  
Sampling, Field Measurement and testing Works (Stage 3)  
Operation Phase Odour Monitoring  
at Causeway Bay Typhoon Shelter of Central Wanchai Bypass

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## ***Appendix 2.1***

### ***Certificate for a Qualified Odour Panelists***



## Certificate for a Qualified Odour Panellist

This is to certify that

CHAN KAI WING

has participated in Ten (10) sets of individual N-Butanol Screening Test  
during 27 June 2019 - 05 July 2019

**with Individual Threshold: 49 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

05 July 2019  
Issue Date

05 July 2020  
Valid Until

  
Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

CHAN KAI WING

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between  
27 June 2019 to 05 July 2019

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 Odor Intensity  
(ASTM E544) for Hong Kong Four Point Scale at

05 July 2019

05 July 2019

Issue Date

05 October 2019

Valid Until

  
Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist

This is to certify that

LAU SIU HANG

has participated in Ten (10) sets of individual N-Butanol Screening Test  
during 27 June 2019 – 05 July 2019

**with Individual Threshold: 47 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

05 July 2019  
Issue Date

05 July 2020  
Valid Until

  
Fung Lim Chee, Richard





## Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

LAU SIU HANG

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between  
27 June 2019 to 05 July 2019

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 Odor Intensity  
(ASTM E544) for Hong Kong Four Point Scale at

05 July 2019

05 July 2019  
Issue Date

05 October 2019  
Valid Until

  
Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist

This is to certify that

CHU KAI WAI

has participated in Ten (10) sets of individual N-Butanol Screening Test  
during 27 June 2019 - 05 July 2019

**with Individual Threshold: 49 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

05 July 2019  
Issue Date

05 July 2020  
Valid Until

  
Fung Lim Chee, Richard



## Certificate for a Qualified Odour Panellist For Field Odour Patrol

This is to certify that

CHU KAI WAI

Participated in a set of n-Butanol Screening Tests in ALS Technichem (HK) Pty Ltd between  
27 June 2019 to 05 July 2019

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 Odor Intensity  
(ASTM E544) for Hong Kong Four Point Scale at

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## ***Appendix 3.1***

### ***Odour Monitoring Schedule***

Contract No. HK/2015/01  
**Wan Chai Development Phase II and Central-Wan Chai Bypass**  
**Sampling, Field Measurement and Testing Works (Stage 3)**  
**Tentative Odour Monitoring Schedule**  
**September 2019**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1-Sep	2-Sep	3-Sep	4-Sep	5-Sep	6-Sep	7-Sep
8-Sep	9-Sep	10-Sep	11-Sep	12-Sep	13-Sep	14-Sep
15-Sep	16-Sep	17-Sep	18-Sep	19-Sep	20-Sep	21-Sep
22-Sep	23-Sep	24-Sep	25-Sep	26-Sep	27-Sep	28-Sep
			Odour Monitoring (Operation Phase)	Odour Monitoring (Operation Phase)		
29-Sep	30-Sep					

\*The monitoring shall be carried out during daytime and during the period of July to September on a monthly basis for two days. The actual operation phase odour monitoring of the Project shall be taken into consideration of the actual weather condition.



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## ***Appendix 4.1***

### ***Odour Monitoring Results***



Lam Geotechnics Limited

Contract No. HK/2015/01  
Wanchai Development Phase II and Central-Wanchai Bypass  
Sampling, Field Measurement and testing Works (Stage 3)  
Operation Phase Odour Monitoring

Monitoring Date: 25 September 2019 Weather Condition: Fine Tidal Condon: Ebb  
Temperature: 27.4 C - 33.7°C Relative Humidity: 49.4% - 75.5%

**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	12:19	30.1	64.2	0	-	-	-	0	-	-	-	0	-	-	-	1.5	N	-
OP2	12:28	30.2	60.2	0	-	-	-	0	-	-	-	0	-	-	-	1.8	N	-
OP3	12:30	31.2	60.3	0	-	-	-	0	-	-	-	0	-	-	-	2.0	N	-
OP4	12:05	27.4	75.5	0	-	-	-	0	-	-	-	0	-	-	-	0.0	-	-
OP5	12:10	30.7	59.8	0	-	-	-	0	-	-	-	0	Seawater	Sea	Intermittent	0.8	N	-
OP6	12:14	33.7	55.4	0	-	-	-	0	-	-	-	0	-	-	-	0.7	N	-
OP7	12:36	31.5	60.3	0	-	-	-	0	-	-	-	0	-	-	-	0.8	N	-
OP8	12:39	30.6	49.4	0	-	-	-	0	-	-	-	0	-	-	-	2.1	N	-
OP9	12:42	31.5	49.6	0	-	-	-	0	-	-	-	0-1	Seawater	Sea	Intermittent	0.7	N	-

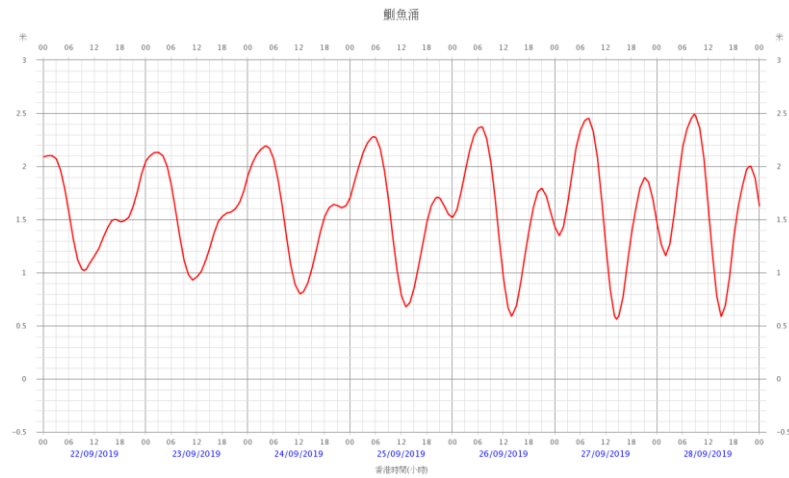
**Meteorological Conditions on 25 September 2019**

**Hong Kong Observatory Weather Station at Hong Kong Observatory**

Air Temperature: 25.7°C-30.8°C Average Relative Humidity: 71%

**The tidal data at Quarry Bay Station**

Tide Time	Tide Height (m)
05:29	2.28
13:08	0.68
20:27	1.71
23:54	1.52





Monitoring Date: 26 September 2019 Weather Condition: Fine Tidal Condition: Ebb  
Temperature: 29.2°C-33.2°C Relative Humidity: 55.2% - 75.7%

**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	12:17	29.5	70.1	0	-	-	-	0	-	-	-	0	-	-	-	1.8	N	-
OP2	12:14	28.4	75.6	0	-	-	-	0	-	-	-	0	-	-	-	3.0	N	-
OP3	12:08	32.4	66.8	0	-	-	-	0	-	-	-	0	-	-	-	0.8	N	-
OP4	11:50	29.2	75.7	0	-	-	-	0	-	-	-	0-1	Seawater	Sea	Intermittent	2.0	E	-
OP5	11:55	30.4	70.8	0-1	Sewage	Culvert	Intermittent	0-1	Seawater	Sea	Intermittent	0	-	-	-	2.0	N	-
OP6	12:02	33.2	65.4	0	-	-	-	0	-	-	-	0-1	Seawater	Sea	Intermittent	0.0	-	-
OP7	12:22	32.3	67.0	0	-	-	-	0	-	-	-	0	-	-	-	0.0	-	-
OP8	12:25	32.9	55.2	0	-	-	-	0	-	-	-	0	-	-	-	0.0	-	-
OP9	12:28	32.1	60.3	0	-	-	-	0	-	-	-	0	-	-	-	1.0	W	-

**Meteorological Conditions on 26 September 2019**

**Hong Kong Observatory Weather Station at Hong Kong Observatory**

Air Temperature: 25.5°C-30.8°C Average Relative Humidity: 71%

**The tidal data at Quarry Bay Station**

Tide Time	Tide Height (m)
06:37	2.37
13:50	0.59
20:49	1.79

