Mott MacDonald Hong Kong Limited

Report on

Odour Study at Kong Nga Po

(Revision No. 1) (Project code : 10002769)



Hong Kong Productivity Council Environmental Management Division

Quality Index

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1. INTRODUCTION

The client, Mott MacDonald Hong Kong Limited (MMHK), was commissioned to conduct an Odour Study at Kong Nga Po. The main purpose of the study project was to undertake a feasibility study of the development area to evaluate whether the study area is suitable for re-provisioning of existing police facilities. The project site is located at Kong Nga Po in the North District, part of the study area falls within the Frontier Closed Area. There are active livestock (pig) farms which might lead to odour impact to the study area. The odour study is to evaluate if there is significant odour impact to the study area due to the existing livestock feeding grounds. Hong Kong Productivity Council (HKPC) was commissioned by the client to carry out an on-site odour study at the Kong Nga Po area.

This project was to carry out an on-site odour evaluation at the designated locations at Kong Nga Po area and to collect air samples for laboratory odour concentration analysis. The on-site odour study was carried out on 19 and 26 August 2015. On-site odour evaluation including odour intensity, hedonic tone and odour quality determination and collection of air sampling at the designated locations were conducted. Besides, field measurements of weather conditions such as ambient temperature, relative humidity, wind direction and wind speed were also conducted during the study. Details of the findings and the laboratory results are presented in this report.

2. STUDY METHODOLOGY

2.1 Study Schedule

The odour study consisted of 2 days odour evaluation and air sampling taken at the Kong Nga Po area. The work schedule is shown in the table below.

Day	Date	Number of sampling locations
1	19 August 2015	10
2	26 August 2015	8

Table 2.1: Schedule of the odour Study

2.2 On-site Odour Study

Nine monitoring locations were assigned by MMHK for the odour study. Figure 2.1 showed the sampling locations (in red) at Kong Nga Po area. For S5, it divided into two locations S5-1 and S5-2 (Figure 2.2). There were 10 number of sampling locations arranged at Day 1 because firing practice at the fire range (S5) was carried out.



A total of 18 samples were collected at S1 - S9 in the two days. Besides, odour evaluation was also carried out at each location.

2.3 Field Measurement

2.3.1 On-site Measuring Equipment

The measuring equipment for on-site measurement are summarized in Table 2.2.

Description	Equipment	Model
Air sample collection	Odour sampler	Ecoma
	Sampling bags	Nalophan NA, PET (9L)
Odour concentration measurement	Dynamic olfactometer	Model TO9, Ecoma
Temperature, relative humidity, wind direction and wind speed measurement	Weather tracker	Kestrel 4500
GPS Tracking and Navigation	A handheld GPS	Garmin eTrex Vista HCx

Table 2.2Measuring Equipment Adopted for Odour Study

2.3.2 In-situ Measurement Method

Odour intensity

An odour monitoring team was formed by 3 certified odour panelists to determine the odour strength in term of odour intensity at the study area. The odour intensity classification is listed in in **Table 2.3**.

Table 2.3 Classification of Odour Intensity

Intensity number	Intensity	Description
4	Extreme	Severe odour
3	Strong	Identifiable odour, strong
2	Moderate	Identifiable odour, moderate
1	Slight	Identifiable odour, slight
0	Not detected	No odour perceived or an odour so weak that it cannot be easily characterized or described

Hedonic Tone Test

Hedonic tone was an evaluation of relatively pleasant or unpleasant senses of the odour samples. The three odour panelists indicated their perceived hedonic tone for each determination according to the five points hedonic tone scale (**Table 2.4**).

Hedonic tone	Description
0	Neutral odour / no odour
-1	Mildly unpleasant
-2	Moderately unpleasant
-3	Unpleasant
-4	Offensive

Table 2.4 Classification of Hedonic Tone Test

Ambient temperature, relative humidity, wind direction and wind speed

Measurement of meteorological conditions including ambient temperature, relative humidity, wind speed, and wind direction was conducted with a Kestrel weather tracker (**Photo 2.1**) during the odour monitoring.



2.3.3 <u>Air Sampling</u>

Air samples were collected with an odour sampler (Photo 2.2) at sampling rate of 0.45L/s by

adopting the lung principle. The sampling bag (**Photo 2.3**) is made of polyethyleneterephthalate (PET, Nalophan) which is one of the approved materials in compliance with BS EN13725:2003. At each monitoring location, 3 replicate samples were collected for laboratory analysis.



2.4 Laboratory Analysis

Laboratory analysis by dynamic olfactometry, BS EN13725

The odour samples were delivered to HKPC's Odour Research Laboratory for dynamic olfactometry analysis. The odour analysis was conducted by 4 certified odour panelists with a forced-choice olfactometer within 24 hours after sample collection. The olfactometer was an apparatus that automatically presents an odorous sample at different dilution accomplished with odour-free air to the panelists. The odour concentration was determined according to the dilution factor required to reach the detection threshold of each panelist. **Photo 2.4** shows the olfactometer installed in HKPC Odour Research Laboratory for determination of sample odour concentration.



2.5 Field Logs and Meteorological Conditions

During odour patrol, the field staff recorded the required information as follows:-

- ✓ Time
- ✓ Location
- ✓ GPS location
- ✓ The prevailing weather condition
- ✓ Temperature
- \checkmark Relative humidity
- ✓ Wind direction
- ✓ Wind speed
- ✓ Possible source of odour
- ✓ Perceived intensity of the odour
- ✓ Hedonic test
- ✓ Duration of odour episodes
- ✓ Odour characteristics (e.g. sewage or rotten-egg smell, etc)
- ✓ Observed activities would be the possible of odour

3. ON-SITE OBSERVATIONS AND TEST RESULTS

3.1 Sampling Trip Findings

3.1.1 Locations for Odour Evaluation

The actual sampling points with GPS locations are showed in Table 3.1.

Sompling point	GPS Lo	ocation
Samping point	Ν	Е
<u>19 August 2015</u>		
S1	22°31'45.0	114°08'04.0
S2	22°31'37.9	114°08'03.5
\$3	22°31'31.9	114º08'00.7
S4	22°31'31.9	114°07'52.7
S5-1	22°31'39.1	114°07'59.8
\$5-2	22°31'39.2	114°08'00.1
\$6	22°31'45.7	114°08'16.6
S7	22°31'30.2	114°08'04.2
S8	22°31'29.5	114°08'14.1
S 9	22°31'31.6	114°08'18.9
26 August 2015		
	22°31'45.0	114°08'04.0
S2	22°31'37.9	114°08'03.5
S3	22°31'31.9	114°08'00.7
S4	22°31'31.9	114°07'52.7
\$6	22°31'45.7	114°08'16.6
S7	22°31'30.2	114°08'04.2
S8	22°31'34.4	114°08'10.9
S 9	22°31'31.6	114°08'18.9

Table 3.1 Summary of GPS locations

The GPS locations for day 1 and day 2 odour monitoring were almost the same except for S5 and S8. There was no odour evaluation and sampling activity at S5 on day 2 as advised by MMHK. Besides, as the wind direction changed for day 2, the S8 location was changed to downwind position for odour evaluation and sampling activity as suggested by EPD.

3.1.2 In-situ Odour Evaluation and Sampling Results

During air sampling, the odour monitoring team carried out the following odour measurement at each sampling point:-

- ✓ on-site measurement of odour intensity, hedonic tone, odour quality, duration of the odour episode and determined the possible odour sources (Photo 3.1),
- ✓ measurement of ambient temperature, relative humidity, wind direction, and wind speed

(Photo 3.2), GPS recording

 \checkmark air samples collection (**Photo 3.3 – 3.4**)

The results of the in-situ and laboratory measurement were summarized in Table 3.2.



Photo 3.4 Sample was collected at one of the sampling point

Upon completion of both days odour monitoring at Kong Nga Po, the following observations were drawn:

- Pig farm odour with intensity 1-2 was detected at S7 and S8 on both monitoring days and S9 with odour intensity 2-3 on day 1 only.
- 2. For S5-1 and S5-2 (which is a firing range), gunpowder odour with intensity 1 was

detected after gun firing practice was taken. The perceived odour was very intermittent since there were only two gunners and the firing frequency was low.

- 3. The hedonic tone test results near the pig farms (S7-S9) were found from -1 to -2, representing slightly to moderately unpleasant smell.
- 4. Since the perceived odour was intermittent and the odour detection frequency was low, the air samples mixed with large amount of ambient air (with no smell) during air sampling such that the odour concentration of air samples was low.

6	6	C. P.		W	eather condi	tions		Possible	(filed pero	Odour I ception by	ntensity individual	panelist)	(filed per	Odour l	Hedonic individua	l panelist)	Perceived		Odour
point point	starting time	time (s)	Prevailing condition*	Temp. (°C)	Rel. Humidity (%)	Wind Direction	Wind Speed (m/s)	Wind Source of Speed Odour (m/s)		СС	KW	Median	KC	СС	KW	Median2	Odour Duration#	Quality	Concentration (ou/m ³)
<u>Day 1 (19 Au</u>	<u>gust 2015)</u>																		
S1	15:42	20	S	34	62.9	SE	0.8	Grass	1	1	1	1	0	0	0	0	С	Grass	<2
S2	15:10	20	S	33	63.2	SE	0.6	NA	0	0	0	0	0	0	0	0	NA	NA	<2
S 3	16:19	20	S	35	56.8	NIL	NIL	Grass	0	1	1	1	0	0	0	0	С	Grass	<2
S4	11:36	20	S	34	62.1	Е	1.0	Grass	1	1	1	1	1	0	0	0	Ι	Grass	<2
S5-1	11:15	20	S	33	60.9	S	1.2	Firing practice	1	1	1	1	0	0	0	0	Ι	Gunpowder	<2
S5-2	11:25	20	S	35	59.6	Ν	0.8	Firing practice	1	1	1	1	0	0	0	0	Ι	Gunpowder	<2
S6	14:15	20	S	36	54.5	Е	0.6	NA	0	0	0	0	0	0	0	0	NA	NA	<2
S7	14:38	20	S	35	57.4	SE	0.4	Pig farm	2	2	2	2	-2	-2	-2	-2	Ι	Pig fecal	23
S8	14:01	20	S	36	55.1	W	0.7	Pig farm	2	2	2	2	-2	-2	-2	-2	Ι	Pig fecal	18
S9	13:45	20	S	37	48.5	w	0.7	Pig farm	3	2	3	3	-2	-2	-2	-2	Ι	Pig fecal	29

Table 3.2 Summary of the sampling information, odour concentration, odour evaluation and weather conditions on 19 August 2015

*S – Sunny; C – Cloudy

C – Continuous; I – Intermittent

NA – Not applicable (because odour was not detected)

NIL – No wind (Calm)

				w	eather condi	tions				Odour I	ntensity			Odour 1	Hedonic				
Sampling	Sampling	Sampling			cather conta	tions		Possible	(filed per	ception by	individual	panelist)	(filed per	ception by	individual	panelist)	Perceived	Odour	Odour
point	starting time	time (s)	Prevailing condition*	Temp. (℃)	Rel. Humidity (%)	Wind Direction	Wind Speed (m/s)	Source of Odour	КС	CC	KL	Median	КС	CC	KL	Median2	Odour Duration#	Quality	Concentration (ou/m ³)
Day 2 (26 Aug	<u>ust 2015)</u>																		
S 1	16:10	20	С	30	82.8	SE	0.8	Grass	1	1	1	1	1	0	1	1	С	Grass	<2
S2	15:43	20	С	30	81.5	S	0.6	NA	0	0	0	0	0	0	0	0	NA	NA	<2
S 3	14:04	20	С	32	69.6	Е	0.4	Grass	1	1	1	1	1	0	1	1	С	Grass	<2
S4	13:41	20	С	33	70.2	SW	0.5	Grass	1	1	1	1	1	0	1	1	С	Grass	<2
S 6	14:56	20	С	30	77.4	SE	0.6	Grass	1	1	1	1	1	0	1	1	С	Grass	<2
S7	15:18	20	С	30	78.2	Е	0.4	Pig Farm	1	1	2	1	-1	-1	-2	-1	Ι	Pig fecal	16
S8	14:40	20	С	30	78.9	S	0.6	Pig Farm	2	1	2	2	-2	-1	-2	-2	Ι	Pig fecal	18
S9	14:26	20	С	32	71.4	Е	0.5	NA	0	0	0	0	0	0	0	0	NA	NA	<2

Table 3.3 Summary of the sampling information, odour concentration, odour evaluation and weather conditions on 26 August 2015

*S – Sunny; C – Cloudy

C – Continuous; I – Intermittent

NA – Not applicable (because odour was not detected)

The laboratory odour concentration determination results are shown in Annex 1.

4. LIMITATION OF MEASUREMENT

The results obtained in the odour concentration measurement and on-site odour evaluation are only representative of the odour level at the measurement locations during the specified measurement periods. The results should not be used to extrapolate in other conditions. Besides, the laboratory testing conditions are shown in Annex 2.

Environmental Management Division Hong Kong Productivity Council

21 September 2015

Annex 1

Laboratory odour concentration determination results



Hong Kong Productivity Council 香港生産力促進局

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Test Report No: A0001720 Folder No: 1508662 Page No: Page 1 of 1 Date of Issue: 02/09/2015

Client : Mott Mac Donald Hong Kong Ltd

Address :

Sample Description : 10 air samples were collected at Kong Nga Po by HKPC staff. Sample Received Date : 20/08/2015 Test Completed Date : 31/08/2015 Remarks : Analytical Results: Parameter Odour Concentration OU/m3 Unit

Sample Name	Method Code Sample No Analysis Date	ATM-ODOR-1 20/08/2015	
S1	AC-1508-0085	<2	
S2	AC-1508-0086	<2	
S3	AC-1508-0087	<2	
S4	AC-1508-0088	<2	
S5-1	AC-1508-0089	<2	
S5-2	AC-1508-0090	<2	
S6	AC-1508-0091	<2	
S7	AC-1508-0092	23	
S8	AC-1508-0093	18	
S9	AC-1508-0094	29	

-- End of Report --

TESTI	NG METHODS
Method	Reference
ATM-ODOR-1	BS EN 13725:2003

Parameter Odour Concentration

Reference Notes: BS EN European technical standard

Approval Signatory:

Fung Kam Wing (Consultant)

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Hong Kong **Productivity Council** 香港生産力促進局

Environment and Product Innovation Laboratory

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Test Report No: A0001723 Folder No: 1508943 Page No: Page 1 of 1 Date of Issue: 02/09/2015

Client : Mott Mac Donald Hong Kong Ltd

Address :

Sample Description : 8 odour samples were collected by HKPC staff. : 26/08/2015 Sample Received Date Test Completed Date : 02/09/2015 Remarks : Analytical Results: Parameter Odour

Sample Name	Unit Method Code Sample No Analysis Date	Concentration OU/m3 ATM-ODOR-1 27/08/2015	
S1	AC-1508-0107	<2	
S2	AC-1508-0108	<2	
S3	AC-1508-0109	<2	
S4	AC-1508-0110	<2	
S6	AC-1508-0111	<2	
S7	AC-1508-0112	16	
S8	AC-1508-0113	18	
S9	AC-1508-0114	<2	

-- End of Report --

	TESTING METHODS		
Parameter	<u>Method</u>	Reference	
Odour Concentration	ATM-ODOR-1	BS EN 13725:2003	

Reference Notes: BS EN

European technical standard

Approval Signatory:

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Annex 2

Laboratory testing conditions



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TESTING CONDITIONS

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- 4. In the event that any test report shall be proved to be inaccurate due to the act, default, error or neglect of the Council, the liability of the Council shall be limited to refunding to the Client the fee, free of interest, paid to the Council for such test report and in no circumstances shall the Council be liable to compensate or indemnify the Client or any third party whomsoever for or in respect of any loss or damage sustained by such party as a result of an inaccuracy of the test report.
- 5. While the Council will exercise all reasonable care in handling and testing samples submitted to it no liability shall attach to the Council for the loss or damage to any such sample.
- 6. In no event shall the issuing of any test report by the Council operate to involve the Council as party or agent or in any other way in any relationship contractual or otherwise between the Client and any other party whatsoever.
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