Appendix H
Investigation Report

Report No. **001**
Monitoring Date **28 January 2022**

According to Table 2.3 of EM&A Manual, the Action and Limit Levels of Odour Patrol are shown below:

Parameter	Action Level (AL)	Limit Level (LL)
Odour Nuisance	Odour Intensity of 2 is measured from odour patrol	Odour Intensity of 3 or above is measured from odour patrol

Odour Patrol Results

Monitoring Location	Odour Patrol Member			Level Exceedance
	O-1	O-2	O-3	
	Odour Intensity (0 to 4)			
Wan Chai East PTW Boundary	2	2	2	Action
SCISTW Boundary Location B	2	2	1	Action
SCISTW Boundary Location C	2	2	1	Action

Investigation Results:

a) Causes of exceedances

- With reference to on-site observation, the odour characteristics and potential odour source of Wan Chai East PTW Boundary, SCISTW Boundary Location B and SCISTW Boundary Location C are listed below:

Location ID	On-Site Observation	
	Odour Characteristics	Potential Odour Source
Wan Chai East PTW Boundary	Sewage	Wan Chai East PTW
SCISTW Boundary Location B	Garbage	Refuse Collection Vehicle / Roadside
SCISTW Boundary Location C	Garbage	West Kowloon Refuse Transfer Station

- SCISTW Boundary Location B 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 SCISTW Boundary Location B and SCISTW Boundary Location C are non-project related. For Wan Chai East PTW Boundary, odour was recorded occasionally with side wind and thus it is not a significant nuisance.
- Investigation was conducted by DSD to identify the reason / source of exceedance. It was noted that West Kowloon Refuse Transfer Station is located next to the SCISTW. SCISTW Boundary Location B is the entrance of SCISTW and near a roundabout which connect the only access to the West Kowloon Refuse Transfer Station and thus lots of refuse collection vehicles passed SCISTW Boundary Location B. SCISTW Boundary Location C is a monitoring point in front of the West Kowloon Refuse Transfer Station. Therefore, the exceedances at SCISTW Boundary Location B and SCISTW Boundary Location C were largely related to the West Kowloon Refuse Transfer Station. For Wan Chai East PTW Boundary, occasional odour nuisance was recorded. To find out the reason, the performance of deodorization units and the internal monitoring data were checked. No abnormality was recorded and thus the reason for exceedance cannot be defined. Mitigation measures will be implemented if the exceedance is recorded again on the same monitoring stations or any abnormality is recorded.
- To confirm the findings and conclusion, odour patrol at these three locations was proposed to be repeated in February 2022. However, with the outbreak of COVID-19 in late January, conducting odour patrol without wearing a mask in public areas creates a risk of infection and thus it was proposed to postpone the repeat odour patrol until the pandemic becomes more stable. The fifth wave of epidemic lasted for over two months from late January to late April. Therefore, the repeating of odour patrol for confirmation of exceedance findings was not performed before the regular odour monitoring in April 2022. The results and findings of the regular odour patrol will be presented in the Odour Monitoring Report (Apr 2022).

b) Action required under the Event/Action plan

Refer to Table 2.5 of the EM&A Manual.

c) Action taken under the Event/Action plan

Person-in-charge of Odour Monitoring	DSD
1. After considered the above-mentioned investigation results, the exceedances are non-project related or insignificant.	1.&2. Investigation had been carried out within 2 weeks as shown above.
2. The repeating of odour patrol for confirmation of exceedance findings could not be carried out due to COVID-19 outbreak in February 2022 to March 2022. Regular odour monitoring was carried out in April 2022. The results and findings of the regular odour patrol will be presented in the Odour Monitoring Report (Apr 2022).	3. Mitigation measures will be implemented if the exceedance is recorded again on the same monitoring stations for the next monitoring.

d) Conclusions and Recommendations for mitigation

- All plants and deodorization units were checked to be in normal condition. It is recommended to take more attention on Wan Chai East PTW and implement more mitigation measures if necessary to better manage the odour from Wan Chai East PTW.

Report No. **002**

Monitoring Date **28 January 2022**

According to Table 2.3 of EM&A Manual, the Action and Limit Levels of Odour Measurement are shown below:

Parameter	Action Level (AL)	Limit Level (LL)
Odour Nuisance	- When two documented complaint 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

Odour Measurement Results

Total Odour Emission Rate (ou/s)	
Operation Phase Impact	**EIA**
44,101	11,506.21

Investigation Results:

a) Causes of exceedances

DSD Investigation:

- Based on the odour sampling results, the odour emissions were mainly come from deodorization units DOU 3, DOU 6, DOU 6A and DOU 6B with odour concentration 1291, 608, 470 and 387 OU/m^3 respectively. However, the measurements of H2S by the sensors at the emission stack of these deodorization units at the sampling time were 0.11ppm, 0.01ppm, 0.01ppm and 0.01ppm respectively.
- Since it was the first odour monitoring for the operational phase, there were not enough data for developing the correlation between H2S concentrations and odour units.
- With limited information, it is difficult to make conclusion on the reason of odour measurement exceedance. It was suggested to carry out further monitoring to review the results and increase the monitoring frequency to monthly according to Table 2.5 of the EM&A Manual. However, the 5th wave of the COVID-19 pandemic in Hong Kong was

very severe in February and March 2022. There were substantial risks of infection of COVID-19 during the odour patrol and odour measurement by smelling the gas from sewage treatment plant. Hence, the monthly odour monitoring in February and March 2022 was cancelled. The odour monitoring was resumed in April 2022 and the results will be further reviewed. The results and findings of the scheduled regular odour measurement will be presented in the Odour Monitoring Report (Apr 2022).

<u>Investigation from person-in-charge of odour monitoring:</u>

- With the on-site observation by the person-in-charge of odour monitoring, it was noted that the DOU 6 and DOU 6B take a much longer sampling time with comparison to other DOUs. The average sampling time was about 15 minutes while DOU 6 and DOU 6B take more than an hour to finish the sampling process. The sampling time is affected by the duct volumetric flow rate. However, with the volumetric flow rate data provided by DSD, no relationship could be found between the sampling time and flow rate. For example, DOU 6B and DOU 6A were with similar flow rate but the sampling time was varied by around 4 times. For DOU 1-R and DOU 3, they were with the same sampling time (5 minutes) but the flow rate was differenced by over 20 times. As the flow rate is measured continuously and is average for one hour at the measurement time, the flow rate data provided by DSD were not exactly reflect the flow rate of the sampling period of each monitoring point. The calculated odour emission rate may be underestimated or overestimated.
- With the data observation by the person-in-charge of odour monitoring, it was noted that the odour emission rate of DOU 3, DOU 6, DOU 6A and DOU 6B contributed a large portion to the total emission rate. The measured odour concentration and duct volumetric flow rate provided by DSD of DOU 3 were high. For DOU 6, DOU 6A and DOU 6B, the duct volumetric flow rate provided by DSD were also higher than other monitoring locations. Therefore, the calculated odour emission rate from DOU 3, DOU 6, DOU 6A and DOU 6B were much higher than other monitoring locations. Other than DOU 3, the measured odour concentration DOU 8-1 and DOU 8-2 were also high. The odour emission is related to measured odour concentration and duct volumetric flow rate. As it was the first monitoring during operational phase, there were no reference of optimum flow rate and odour concentration under normal operation. To investigate the reason of exceedance, the responsible treatment processes of each DOUs and how the flow rate is derived should be studied.
- The flow rates are based on the air change requirements, the space volume of different locations and the performance of the DOUs. The DOUs were operated 24 hours normally

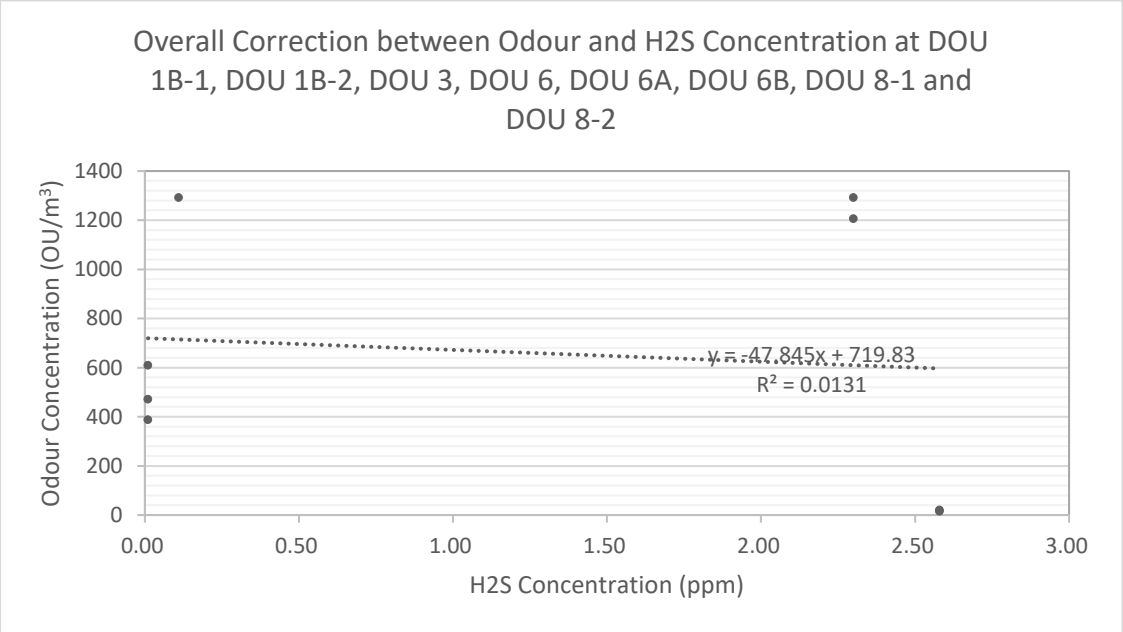
and the flow rate is measured continuously. Different DOUs treated foul air from different treatment process as follow:

DOU	Foul Air Sources
DOU 1-R	Rapid Mixing Tanks
DOU 1-PS	CEPT Tanks
DOU 1B-1	North West Kowloon Pumping Station
DOU 1B-2	
DOU 2-PS	CEPT Tanks
DOU 3	Main Pumping Station No.2
DOU 4-PS	Main Pumping Station No.1 and Effluent Flow Distribution Chamber
DOU 5-PS	Sludge Holding Tank
DOU 6	Sludge Centrifuge Building
DOU 6A	Northern Sludge Cake Silo
DOU 6B	Southern Sludge Cake Silo
DOU 8-1	Effluent Chamber 15A
DOU 8-2	
DOU 9-1	North West Kowloon Preliminary Treatment Works
DOU 9-2	

- The difference in foul air source of each DOU may lead to large variation in odour concentration and flow rate. Also, it can affect the gas or odour emission composition of each DOU. To understand the gas composition from the existing data for providing more information on investigating the exceedance, the overall correlation between H2S concentrations and odour units of available DOUs was listed and plotted below:

Location ID	In-house H2S Concentration (ppm)	Odour Concentration (OU/m^3)
DOU 1-R	N/A	289
DOU 1-PS	N/A	695
DOU 1B-1	2.58	19
DOU 1B-2	2.58	14
DOU 2-PS	N/A	53
DOU 3	0.11	1,291
DOU 4-PS	N/A	73

DOU 5-PS	N/A	12
DOU 6	0.01	608
DOU 6A	0.01	470
DOU 6B	0.01	387
DOU 8-1	2.3	1,291
DOU 8-2	2.3	1,205
DOU 9-1	N/A	73
DOU 9-2	N/A	470



- With limited past operation data, no correlation can be established and thus no further information can be obtained for concluding the reasons of exceedance. To provide more information for future investigation, the correlations between H2S concentrations and odour units of individual deodourization units are suggested to be established to understand if there are any difference in gas emission composition if available.

- To further confirm the performance of deodorization device, it is recommended to counter check the H2S reading of the in-house sensors and portable equipment in order to provide more information on determination of odour exceedance reason in the next monitoring.

b) Action required under the Event/Action plan

Refer to Table 2.5 of the EM&A Manual.

c) Action taken under the Event/Action plan

Person-in-charge of Odour Monitoring	DSD
1. After considered the above-mentioned investigation results, the reason of exceedance cannot be concluded based on limited information.	1. Investigation had been carried out within 2 weeks and the reason of exceedance is unable to be identified based on limited information.
2. Not applicable	2. No abnormal performance of deodorization units is recorded.
3.&4. Further monitoring to review the results and increase the monitoring frequency to monthly was proposed to be conducted. However, the 5th wave of the COVID-19 pandemic in Hong Kong was very severe in February and March 2022. There were substantial risks of infection of COVID-19 during the odour patrol and odour measurement by smelling the gas from sewage treatment plant. Hence, the monthly odour monitoring in February and March 2022 was cancelled. The odour monitoring was resumed in April 2022. The results and findings of the regular odour measurement will be presented in the Odour Monitoring Report (Apr 2022).	3.&4. After considered the above-mentioned investigation results, the in-house H2S measurement results were kept monitored to ensure the H2S levels were under acceptable condition. Further remedial actions will be implemented if the exceedance is recorded again for the next monitoring.

d) Conclusions and Recommendations for mitigation

- The reason of exceedance is unable to be identified based on the discrepancy of the odour measurement result and the odour concentration measured by the in-house H2S sensor. The correlations between H2S concentrations and odour units of individual deodourization units are suggested to be established if available.
- To further confirm the performance of deodorization device, it is recommended to

counter check the H2S reading of the in-house sensors and portable equipment in order to provide more information on determination of odour exceedance reason in the next monitoring.