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ATAL-Degremont-China Harbour Joint Venture

Contract No. DC/2013/10

Design, Build and Operate San Wai Sewage Treatment Works

Quarterly Operational Phase EM&A Report for September to November 2021

[09/2022]

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ANEWR

Drainage Services Department
Sewage Services Branch
Harbour Area Treatment Scheme
5/F, Western Magistracy
2A Po Fu Lam Road
Hong Kong

Your reference:

Our reference: HKDSD203/50/108310

Date: 25 October 2022

Attention: Mr Paul Law

BY EMAIL & POST
(email: psclaw@dsd.gov.hk)

Dear Sirs

Agreement No. HATS 02/2016
Services for Independent Environmental Checker (IEC) for
Contract No. DC/2013/10 – Design, Build and Operate San Wai Sewage Treatment Works – Phase 1
Quarterly Operational Phase Environmental Monitoring and
Audit Report (September – November 2021)

We refer to email on 19 September 2022 from AECOM Asia Co. Ltd. attaching the Quarterly Operational Phase Environmental Monitoring and Audit Report (September – November 2021).

We have no comments and hereby verify the Quarterly Operational Phase Environmental Monitoring and Audit Report (September – November 2021) in accordance with Clause 5.4 of the Environmental Permit no. EP-464/2013.

Should you have any queries, please do not hesitate to contact the undersigned or our Mr Ricky Lau on 2618 2831.

Yours faithfully
ANEWR CONSULTING LIMITED

James Choi
Independent Environmental Checker

CPSJ/LCCR/lsmt

cc AECOM – Mr CY Hung (email: cy.hung@swstw-aecom.com)
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EXECUTIVE SUMMARY

In accordance with the Environmental Monitoring and Audit Manual (EM&A Manual) and the Environmental Permit (EP-464/2013) for the Contract No. DC/2013/10 - Design, Build and Operate San Wai Sewage Treatment Works – Stage 1 (the Project), air quality and water quality monitoring are required during operational phase of the Project. The purpose of operational phase monitoring is to confirm the predictions of mitigation measures advised in the EIA report.

As confirmed by the Contractor, all major construction activities of the Project has been completed in May 2021. The Operational Phase of the Project commenced in March 2021. This Quarterly Operational Phase Monitoring Report summarizes monitoring events carried out during period from 1 September 2021 to 30 November 2021. There was a total of eight (8) monitoring events carried out during the reporting period. The exact dates of monitoring carried out during the reporting period are tabulated below:

Monitoring Event	Date
H_2S measurement	10 and 11 September 2021
Odour Patrol	10 September 2021, 18 October 2021 & 23 November 2021
Marine Water Quality Monitoring	10 September 2021
Effluent Quality Monitoring	10 September 2021
Toxicity Testing	10 September 2021
Landscape and Visual Auditing	04 October 2021

Monitoring Summary

- No Action and Limit Levels exceedance of H_2S measurement was recorded in the reporting period.
- Odour intensity were recorded from 0 to 1 during odour patrols in the reporting period.
- No non-compliance of marine water and effluent quality monitoring was recorded in the reporting period.
- Toxicity test results were complied with the target levels in reporting period.
- No non-compliance of landscape and visual auditing was recorded in the reporting period.
- No environmental complaint, notification of summons and successful prosecution was received in the reporting period.

1 INTRODUCTION

1.1 Background

1.1.1. This Quarterly Operational Phase Environmental Monitoring and Audit (EM&A) Report is prepared for Contract No. DC/2013/10 - Design, Build and Operate San Wai Sewage Treatment Works – Stage 1 (the Project). The Project was awarded to ATAL-Degremont-China Harbor Joint Venture (ADCJV) by the Drainage Services Department (DSD). AECOM Asia Co. Ltd. was appointed as the Environmental Team (ET) by ADCJV to implement the operational phase EM&A program in compliance with the EP and the EM&A Manuals.

1.1.2. The project involves expansion of the preliminary treatment works at San Wai STW from 164,000 m^3/d to 200,000 m^3/d Average Dry Weather Flow, upgrading the preliminary treatment level to CEPT and adding centralized disinfection. The site layout plan is shown in **Figure1.1**.

1.1.3. According to the Section 25 of the Particular Specification (PS) and the Environmental Permit No. EP-464/2013, an EM&A programme should be implemented in accordance with the procedures and requirements in the Environmental Monitoring & Audit Manual (EM&A Manual) of the approved EIA report (Registration No. AEIAR-072/2003). The EM&A Manual and EP provide guidelines for the Operational Phase Monitoring Reports and for preparation of the Operational Phase Monitoring Reports.

1.1.4. The operational phase of the Project was commenced in March 2021.

1.1.5. As part of the project EM&A program, baseline monitoring was conducted during July 2019 to April 2020 to determine the ambient environmental conditions before the Project commence operation works.

1.1.6. This is the 2nd Quarterly Operational Phase Environmental Monitoring and Audit (EM&A) Report for the Project which summaries the audit findings of the EM&A programme during the reporting period from 1 September 2021 to 30 November 2021.

2 ENVIRONMENTAL MONITORING REQUIREMENT

2.1 Air quality monitoring

2.1.1 15-min Hydrogen Sulphide (H_2S) concentration (in parts per million) was measured at the site boundary, nearby air sensitive receivers and the exhaust of deodourisation units. Meteorological conditions including temperature, wind speed, wind direction and relative humidity was measured at the time of the monitoring.

2.1.2 Since no correlation between H_2S concentration and odour units was established in the first set of odour monitoring, no subsequent odour units monitoring would be conducted in the air quality monitoring as requested in Section 2.5.1.34 of the EM&A manual.

2.1.3 Apart from odour monitoring, regular oduor patrolling in the vicinity of the STW was also conducted in a monthly interval during the operational phase to ensure that prompt action would be taken whenever any excessive odour emissions area detected.

2.1.4 The monitoring frequency of each odour parameters are listed in the **Table 2.1**.

Table 2.1 Parameter and Frequency of Odour monitoring

Monitoring Parameter	Frequency
Odour Panel	Quarterly
H_2S Measurement	
Odour Patrol	Monthly

2.1.5 Odour sampling and H_2S measurements were undertaken at the proposed monitoring locations, the proposed monitoring locations were determined by the ET Leader and agreed with ER and EPD as the request of the Section 2.5.1.25 and 2.5.1.26 of the EM&A Manual. The monitoring locations are presented in **Table 2.2** and shown in **Figure 2.1** and **Figure 2.2**.

Table 2.2 Proposed Monitoring Locations for Odour Sampling and H_2S Measurement

Identification of Monitoring Location	Description
ASR1a	晉榮貨櫃服務有限公司
ASR2b	永康貨櫃服務有限公司
Site Boundary, SB1[*1]	Site boundary
OD1[*2]	Downwind of the exhaust point of deodourisation units
OD2[*2]	

*1 According to Sections 2.5.1.25 of the EM&A Manual, the H_2S measurement shall be undertaken at the site boundary downwind of the exhaust point of the deodourisation unit and the covered odour source. **Figure 2.2** shown the locations of the site boundary downwind of the exhaust point of the deodourisation unit.

*2 According to Sections 2.5.1.26 of the EM&A Manual, H_2S measurement shall be conducted at the exhaust point of the deodorization unit (OD1&2). Considered the situation of the COVID-19, the ET Leader proposed to conduct only the H_2S measurement at OD1&2. The proposal for this change was approved by the EPD.

2.1.6 The Action and Limit Levels established from the baseline monitoring are shown in the **Appendix B**.

2.2 Water Quality monitoring

Marine Water Quality Monitoring

2.2.1 Marine water samples and in situ measurement should be collected from all the sampling stations on 8 occasions at intervals of approximates 3 months during the operational phase of the Project. On each occasion, marine water samples should be collected every 2 hours for a 12-hour duration. When significant change in the marine water quality are detected, the monitoring frequency should be increase as necessary until the cause for the change is identified.

2.2.2 **Table 2.3** summarises the monitoring parameters, frequency and duration of marine water quality monitoring, as request in Section 4.5.1.13 of the EM&A manual.

Table 2.3 Marine Water Quality Monitoring Parameters, Frequency and Duration

Monitoring Stations	Parameters, unit	Frequency	Duration
W1 to W8	**In-situ Measurement:** • Temperature, °C • Salinity, ppt • DO, mg/L • DO Saturation, % • Turbidity, NTU **Laboratory Analysis:** • SS, mg/L • TIN, mg/L • Unionised ammonia, mg/L • BOD_5,mg/L • *E. coli* , cfu/100mL • Cadmium, Copper, Nickel, Lead, Chromium, Mercury and Zinc, µg/L • PAHs & PCBs, µg/L	8 occasions at intervals of approximately 3 months during the operation phase of the upgraded and expanded San Wai STW.	On each occasion, marine water samples will be collected every 2 hours for a 12-hour duration.

2.2.3 Marine water quality monitoring was undertaken at the proposed monitoring stations set out in the Section 4.5.1.6 of EM&A Manual. The proposed marine water quality stations were shown in **Figure 3.1**.

Effluent Quality Monitoring

2.2.4 As recommended by the EM&A Manual, the effluent quality monitoring was included the follows parameters:

- pH
- SS (mg/L)
- TIN (µg/L)
- NH_3-N (mg/L)
- E. coli (cfu/100mL)
- PAHs & PCBs (µg/L)
- Cadmium, Copper, Nickel, Lead, Chromium, Mercury and Zinc (µg/L)

2.2.5 Effluent quality monitoring was carried out at the effluent outlet of the San Wai STW as shown in **Figure 3.2**.

2.3 Toxicity Testing

2.3.1 In accordance with Section 4.6.1.2 of the EM&A Manual, toxicity testing shall be carried out on 8 occasions at intervals of approximately 3 months during the operational phase of the Project for two marine species. One of the two marine species shall be selected from local environment. The representative species that will be chosen for testing and technical details of the testing method should be agreed and approved by the EPD prior to the operation of the sewage treatment works. The testing method was approved by the EPD on 25 July 2022.

Table 2.4 Methodology for Toxicity Testing

Types of Respective Species	Diatom (Skeletonema costatum)	Barnacle larvae (Balanus Amphitrite)
Toxicity Testing	Chronic Toxicity	Acute Toxicity
Time requirement	7 days	48 hours
Toxicity testing methods	NOEC in 7-day diatom growth inhibition test	LC50 in 48-hr barnacle larvae survival test
Target Levels Proposed in Method Statement	≥0.51%	≥7.10%

3 MONITORING RESULT

3.1 Air quality monitoring

H_2S Measurement

3.1.1 The H_2S measurement at the proposed locations was carried out on 10 September 2021 at 10:00 to 11 September 2021 at 09:00. Measurements of H_2S were conducted in parallel (within a 3-hour period) at the sources and receivers. A total of eight sets of data were obtained from samples collected over different periods of a 24-hour cycle day.

3.1.2 The H_2S measurement results for site boundary/ ASR and dedourisation unit are summarized in **Table 3.1** and **Table 3.2**.

Table 3.1 Summary of H_2S Measurement Results for Site boundary / ASRs

Round	Date	Location	Averaged H_2S Concentration, ppm	Action Level, ppm	Limit Level, ppm
Round 1 to 8	10 and 11 September 2021	SB1	0.0063	0.0109	0.0109
		ASR1a	0.0048	0.0100	0.0100
		ASR1b	0.0055	0.0157	0.0157

Table 3.2 Summary of Odour Monitoring Results for Exhaust of Deodourisation Unit

Round	Date	Location	Averaged H_2S Concentration, ppm	Expressed as µg/s	Action Level, µg/s	Limit Level, µg/s
Round 1 to 8	10 and 11 September 2021	OD1	0.0085	116.5	139	277
		OD2	0.0081	84.0		

Odour Patrol

3.1.3 The odour patrols were carried out on 10 September 2021, 18 October 2021 and 23 November 2021. The observer was patrolling and sniffing around the facilities to detect the any odour, as required by the EM&A Manual.

3.1.4 During the odour patrols, the odour intensity were recorded from 0 (not detectable) to 1 (slight) in the reporting period.

3.2 Water quality monitoring

Marine Water Quality Monitoring

3.2.1 The marine water quality monitoring was conducted on 10 September 2021 in the reporting period. The summary of monitoring results and criteria of Water Quality Objectives (WQOs) are summarized in **Table 3.3**.

Table 3.3 Summary of Monitoring Results and criteria of WQOs

Parameter	Average		Minimum		Maximum		Water Quality Objectives (in marine waters)
	Result	Baseline	Result	Baseline	Result	Baseline	
Temp. (°C)	25.3	24.1	24.8	18.8	26.0	29.9	Change due to waste discharge < 2 ^{o}C
Salinity (ppt)	31.6	25.5	30.5	4.3	32.4	33.1	Change due to waste discharge < 10% of natural ambient level
pH	8.07	7.95	7.86	7.64	8.23	8.38	6.5 – 8.5 and change due to waste discharge < 0.2
DO Depth Average (mg/L)	5.53	6.46	5.34	2.96	6.00	10.14	Depth averaged: > 4 mg/L for 90% samples
Turbidity (NTU)	9.7	7.9	6.9	2.3	13.4	31.9	Not available
SS (mg/L)	10.3	7.6	4.0	<2.5	37.0	29.0	< 30% increase in the natural ambient level
Cadmium (µg/L)	<0.5	0.5	<0.5	<0.5	<0.5	4.2	Not available
Copper (µg/L)	5.3	6.0	2.0	1.0	14.0	119.0	Not available
Nickel (µg/L)	2.1	1.9	1.0	<1.0	8.0	36.0	Not available
Lead (µg/L)	1.2	1.8	<1.0	<1.0	6.0	166.0	Not available
Mercury (µg/L)	0.6	0.6	<0.5	<0.5	1.0	44.0	Not available
Chromium (µg/L)	1.1	1.3	<1.0	<1.0	5.0	50.0	Not available
Zinc (µg/L)	18.9	25.8	5.0	3.0	98.0	871.0	Not available
TIN (mg/L)	0.55	1.20	0.36	0.27	0.84	2.51	< 0.5 mg/L (annual mean depth average)
NH3-N (mg/L)	0.12	0.004	0.06	0.001	0.25	0.031	Not available
BOD_5 (mg/L)	<2.0	2.6	<2.0	<2.0	<2.0	7.0	Not available
***E. coli* (cfu/100mL)**	35.4	60.3	7.0	<1.0	74.0	980.0	< 610 per 100mL (annual geometric mean)
PAHs (µg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	Not available
PCBs (µg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	Not available

3.2.2 The weather condition during the monitoring was fine. Sea conditions for the majority of monitoring days was moderate. No major water pollution source and no marine construction activities in the vicinity of the stations, which might affect the results was observed during the marine water quality monitoring.

3.2.3 No non-compliance of the marine water monitoring was recorded in reporting period.

Effluent Quality Monitoring

3.2.4 The effluent monitoring results during the reporting period is summarized in **Table 3.4**.

Table 3.4 Monitoring Result of Effluent Quality Monitoring

Parameter	**Result**	Limitation on Discharge
pH	7.1	Not available
BOD_5 (mg/L)	290	180
SS (mg/L)	11	120
TIN (µg/L)	37	Not available
NH_3-N (mg/L)	37	Not available
E. coli (cfu/100mL) (Grab sample)	70,000	300,000
Cadmium (µg/L)	<0.5	Not available
Copper (µg/L)	5	Not available
Nickel (µg/L)	33	Not available
Lead (µg/L)	1	Not available
Mercury (µg/L)	<0.5	Not available
Chromium (µg/L)	4	Not available
PCBs (µg/L)	<0.02	<0.02
PAHs (µg/L)	<0.1	<0.1

3.2.5 An exceedance of BOD5 was recorded in the reporting period.

3.2.6 An investigation was conducted and considered due to the dirtiness of the autosampler hose. The impurity in the autosampler hose caused the abnormal BOD_5 value, but it did not relate to the treatment process and the effluent quality. Mitigation measures were implemented by the operator. The operator checked all the effluent treatment processes, and no malfunction in the treatment process was found. All equipment for effluent quality monitoring will be also checked before the start of next effluent quality monitoring.

3.2.7 After investigation, the exceedance was due to improper practice of sampling method but not related to the treatment process and the effluent quality, the exceedance was considered not a non-compliance.

3.3 Toxicity Testing

3.3.1 The toxicity testing was conducted on 10 September 2021.

3.3.2 The NOEC in 7-day diatom growth inhibition test for Diatom was 2.5%

3.3.3 The LC50 in 48-hr barnacle larvae survival test for Barnacle larvae was 28.0%

3.3.4 The NOEC and LC50 monitoring results were complied with the target levels proposed in the method statement, no non-compliance was recorded in the reporting period.

4 LANDSCAPE AND VISUAL AUDITING

4.1 Monitoring Requirement

4.1.1 In accordance with Section 6.4 of the EM&A Manual, a competent landscape architect should be employed by the Contractor for the implementation of landscape construction works and subsequent maintenance operations during the 12 months establishment period. The establishment works should be undertaken throughout the Contractor's first year maintenance period which will be within the first operational year of the Project.

4.1.2 All measures undertaken by both Contractor and the Landscape Contractor during the first year of the operational phase should be audited by a Landscape Architect, as a member of the ET, on a regular basis to ensure compliance with the intended aims of the measures. Site inspections should be undertaken at least once every two months during the operational phase.

4.2 Result and Recommendations

4.2.1 Landscape and visual auditing was conducted by a Landscape Architect on 04 October 2021 during the reporting period.

4.2.2 No non-compliance of landscape and visual auditing was identified in the reporting period.

5 WASTE MANAGEMENT FOR SLUDGE

5.1.1 All dewatered sludge from the operation stage of the Project has been transported to the Sludge Treatment Facility (STF) for disposal, in accordance with the admission tickets obtained from VW-VES(HK) Ltd, the contractor of EPD operating the STF. When the CEPT sludge reception and dilution facilities in Shatin Sewage Treatment Works are commissioned, part or all of the dewatered sludge will be transported to Shatin Sewage Treatment Works for digestion and / or co-digestion with food waste, while STF will remain to be the default location of disposal.

6 ENVIRONMENTAL COMPLAINT, NOTIFICATION OF SUMMONS AND SUCCESSFUL PROSECUTION

6.1.1 No environmental complaint, notification of summons and successful prosecution was received in the reporting period.

7 CONCLUSIONS

7.1.1 No Action and Limit Levels exceedance of H_2S measurement was recorded in the reporting period.

7.1.2 Odour intensity were recorded from 0 to 1 during odour patrolling in the reporting period.

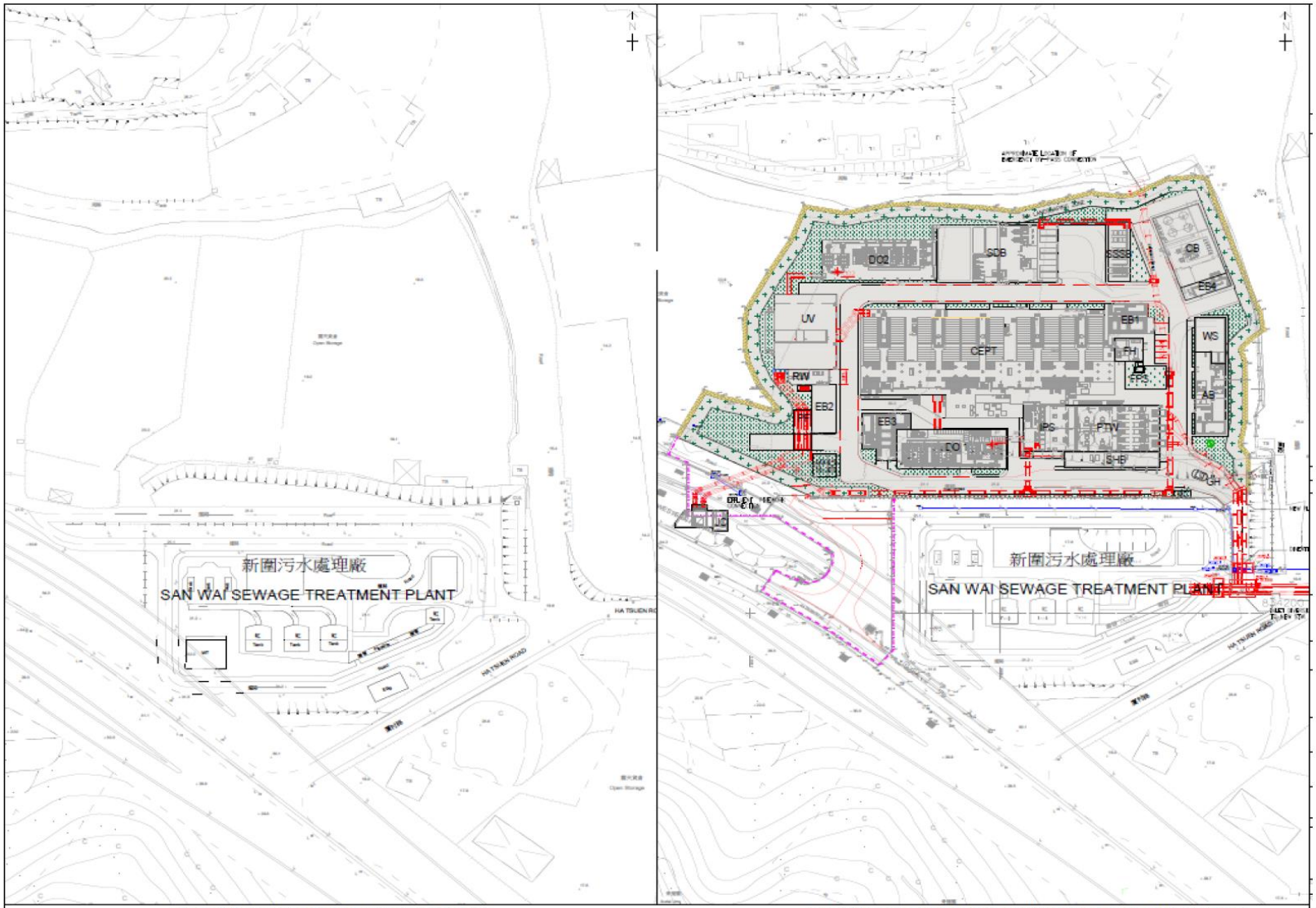
7.1.3 No non-compliance of marine water and effluent monitoring was recorded in the reporting period.

7.1.4 Toxicity testing results were complied with the target levels in reporting period.

7.1.5 No non-compliance of landscape and visual auditing was identified in the reporting period.

7.1.6 No environmental complaint, notification of summons and successful prosecution was received in the reporting period.

FIGURES



EXISTING SAN WAI SEWAGE TREATMENT WORKS

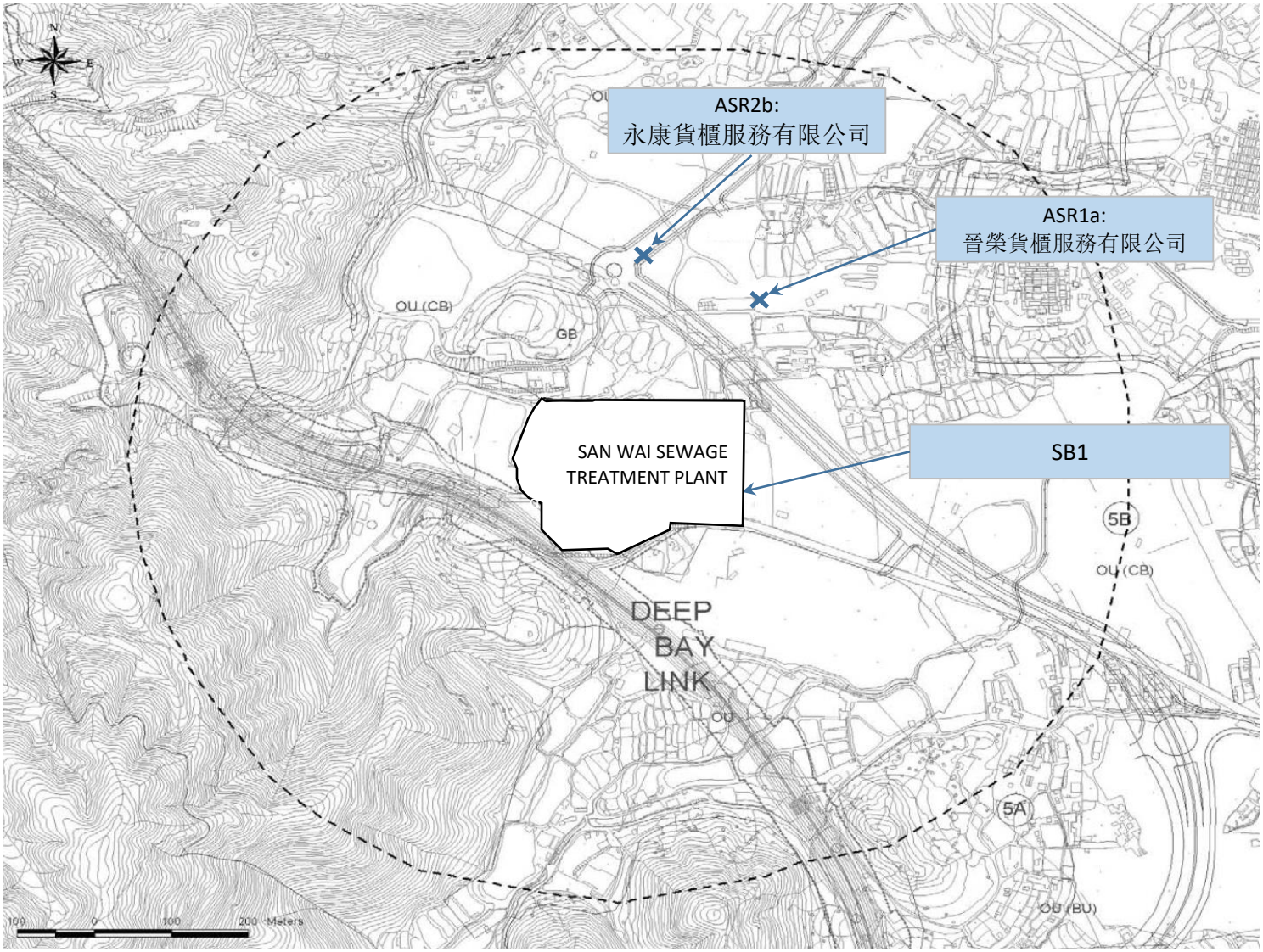
EXPANDED AND UPGRADED SAN WAI SEWAGE TREATMENT WORKS

Contract No. DC/2013/10: Design, Build and Operate
San Wai Sewage Treatment Works –
Operational Phase Monitoring

Site Layout Plan

Date: July 2021

Figure 1.1



Contract No. DC/2013/10: Design, Build and Operate
San Wai Sewage Treatment Works –
Operational Phase Monitoring

Locations of Odour Monitoring Stations

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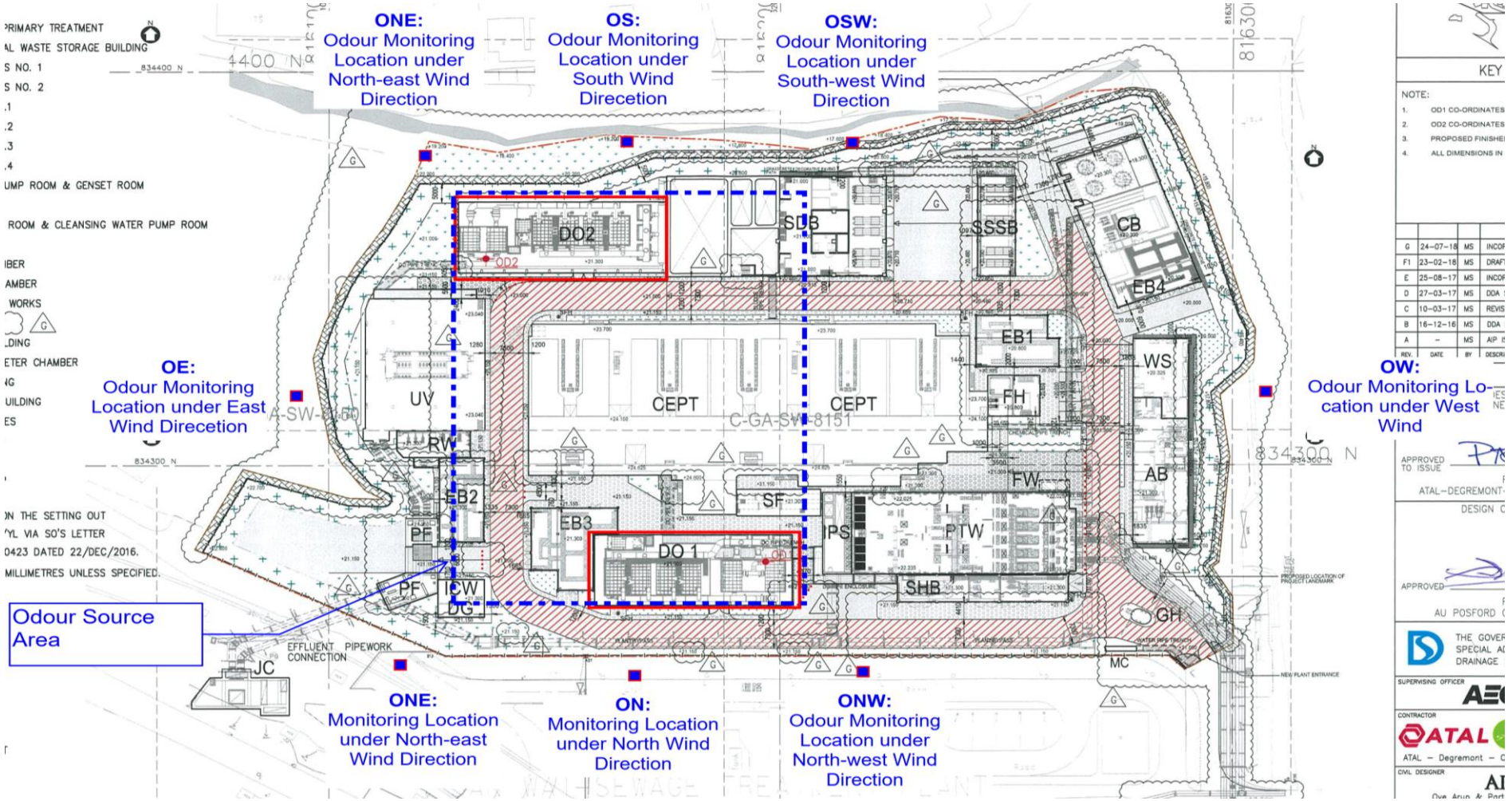
Date: July 2021

Figure 2.1

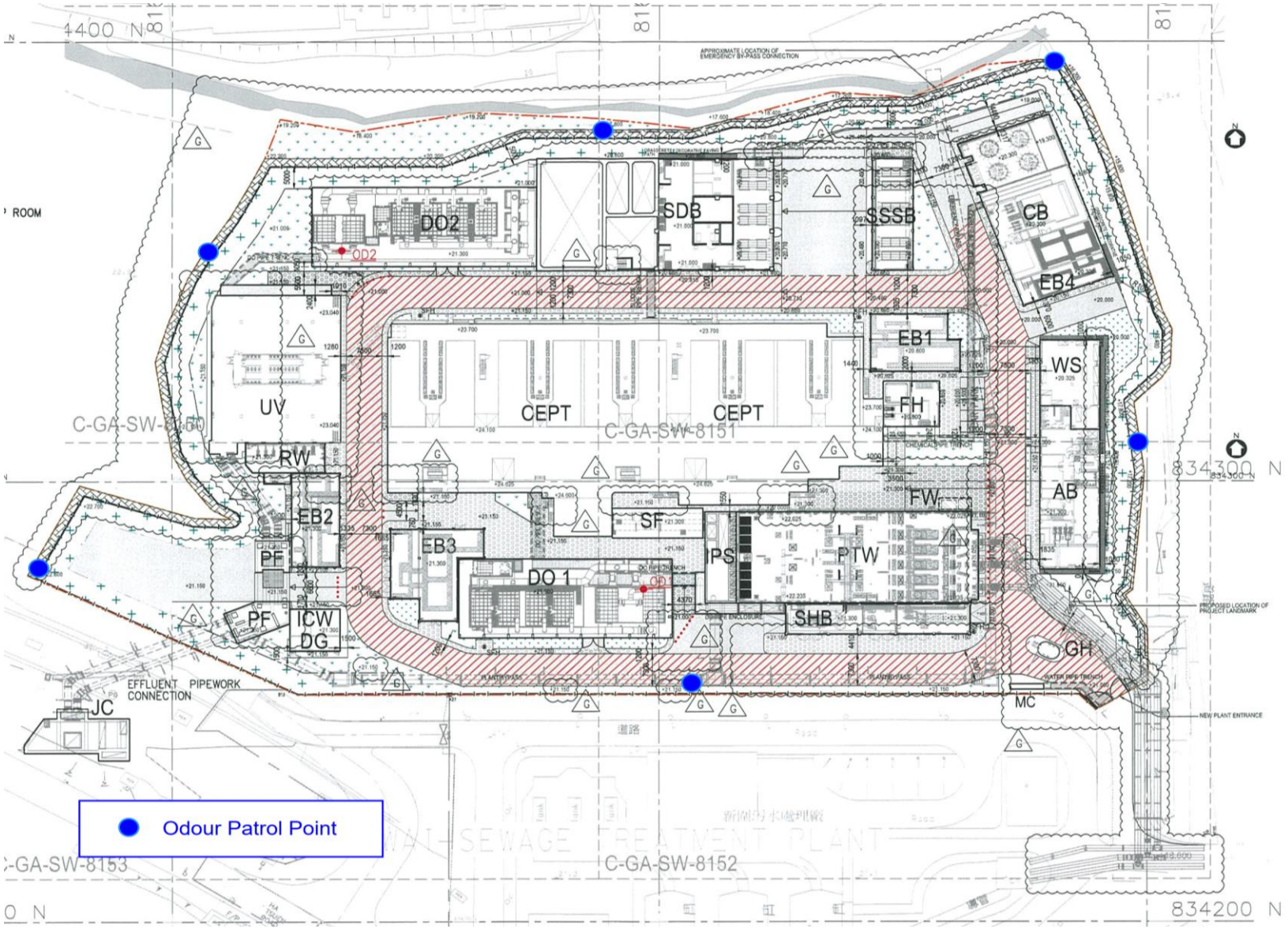


Contract No. DC/2013/10: Design, Build and Operate San Wai Sewage Treatment Works – Operational Phase Monitoring

Site Boundary Downwind Location of Exhaust Point of the Deodourisation Unit

Date: August 2021

Figure 2.2



Contract No. DC/2013/10: Design, Build and Operate
San Wai Sewage Treatment Works –
Operational Phase Monitoring

Locations of Odour Patrol Point

AECOM

Date: July 2021

Figure 2.3

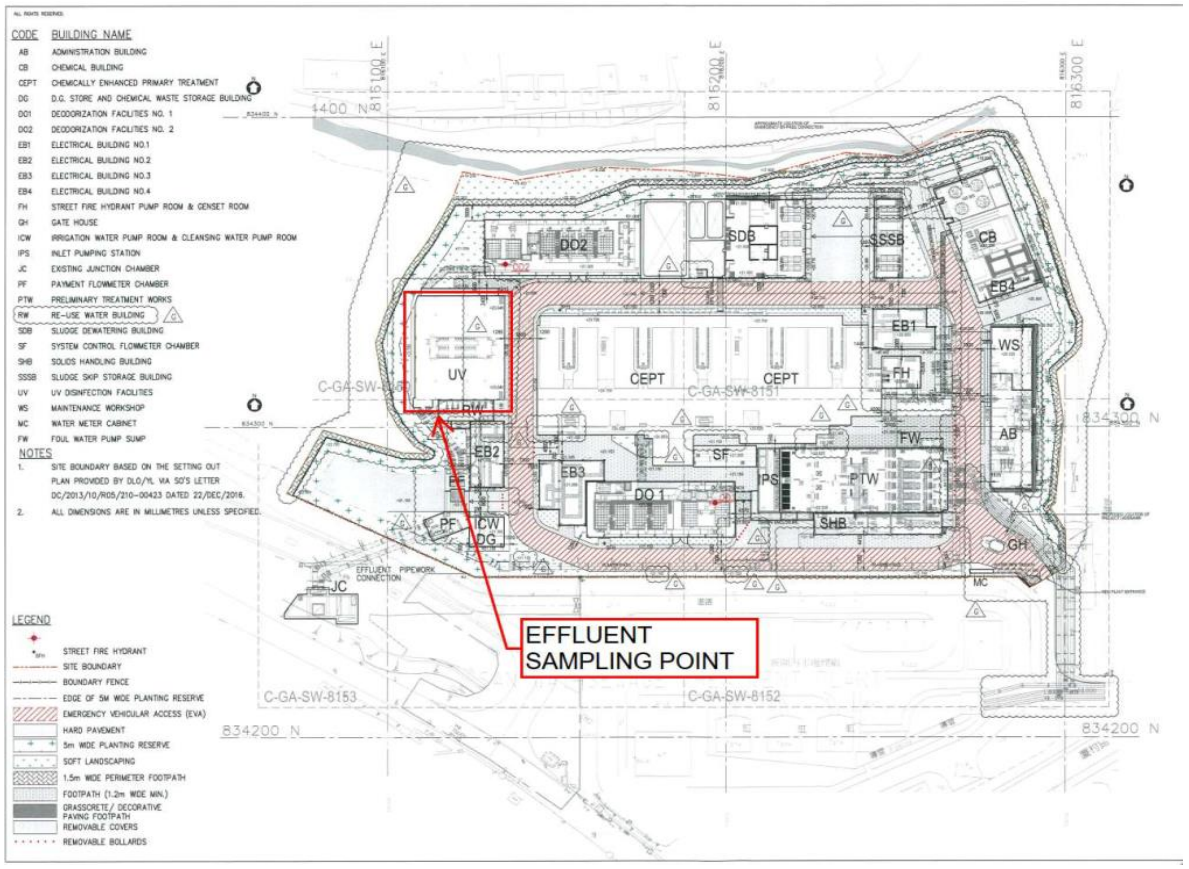
Contract No. DC/2013/10: Design, Build and Operate
San Wai Sewage Treatment Works –
Operational Phase Monitoring

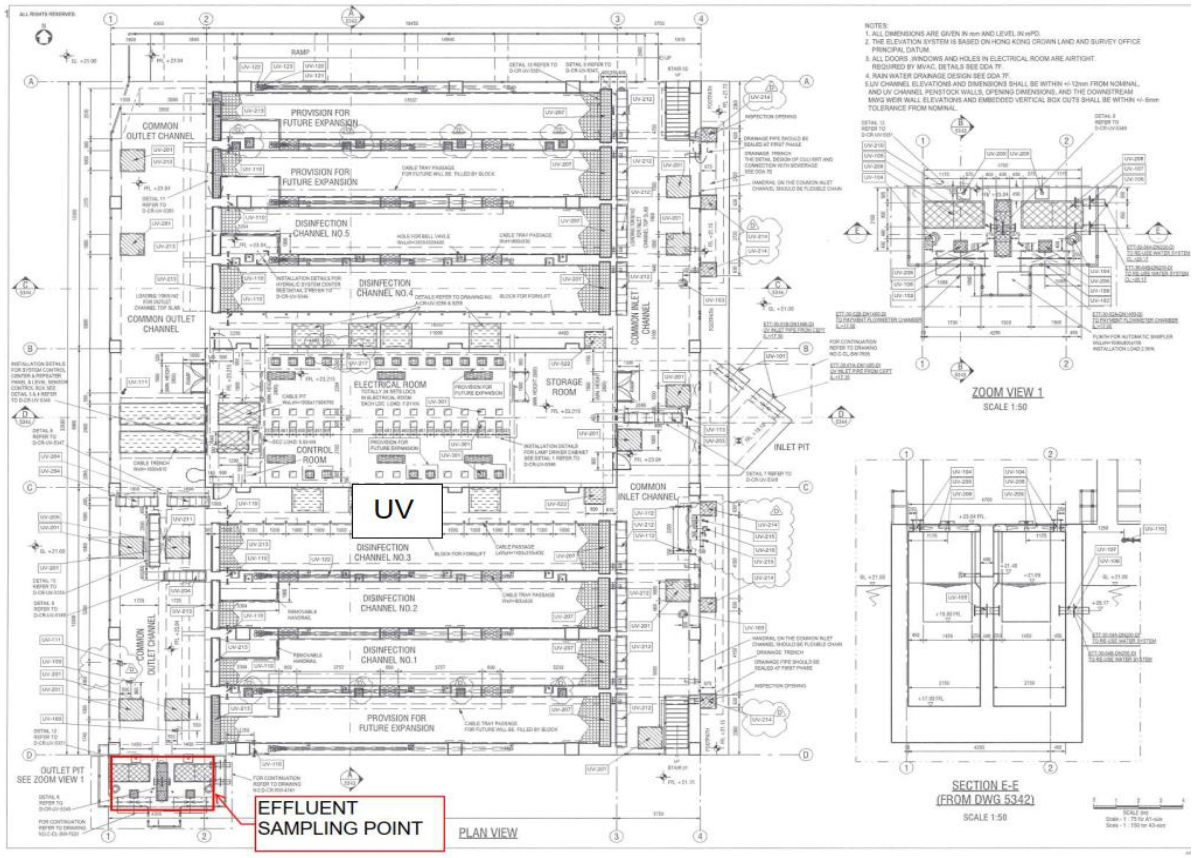
Locations of Marine Warer Qaulity Monitoring Stations

AECOM

Date: July 2021

Figure 3.1





Contract No. DC/2013/10: Design, Build and Operate
San Wai Sewage Treatment Works –
Operational Phase Monitoring

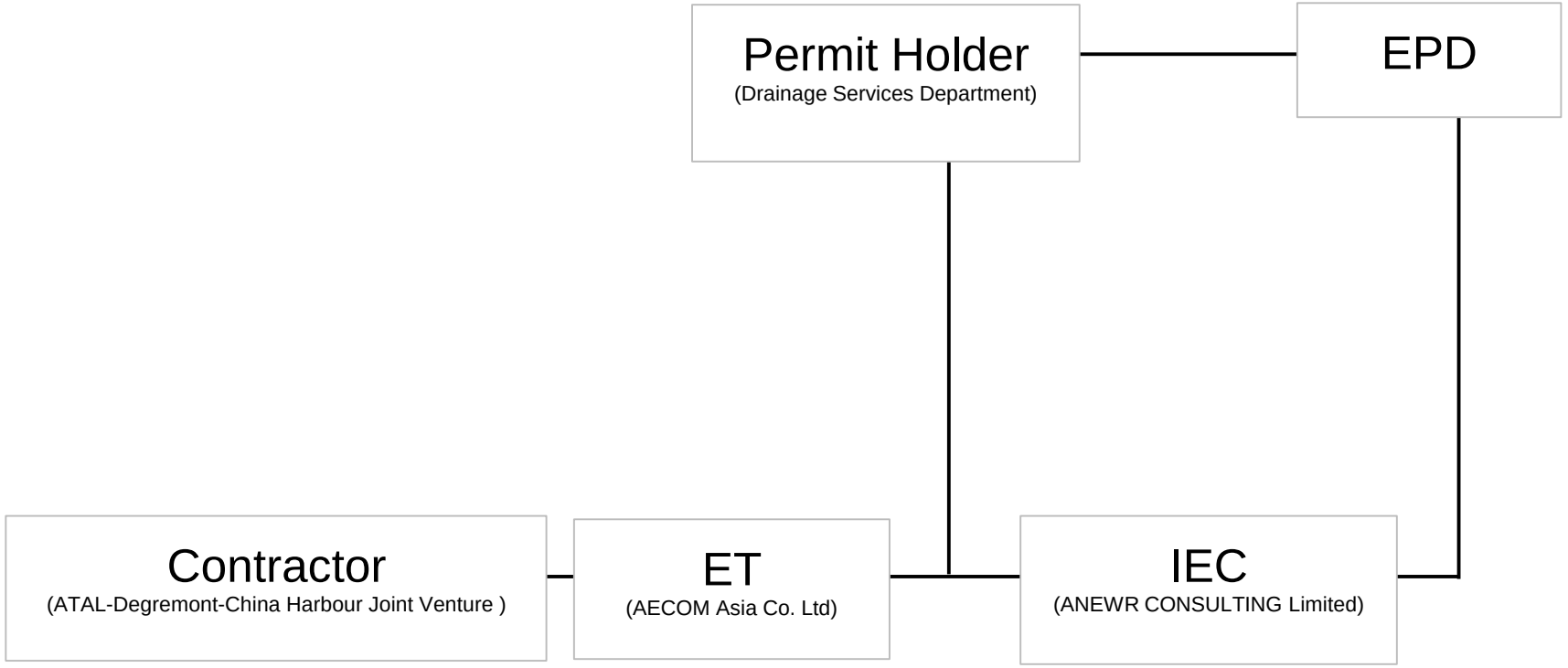
Locations of Effluent Monitoring Stations

AECOM

Date: July 2021

Figure 3.2

APPENDIX A
PROJECT ORGANIZATION STRUCTURE



Project Organization Structure

Contract No. DC/2013/10
Design, Build and Operate San Wai Sewage Treatment Works

Date: June 2022

Appendix A

APPENDIX B
ACTION AND LIMIT LEVELS

Action and Limit Levels

Action and Limit Levels for Operational Phase Odour Monitoring

Location of Monitoring	Parameters	Action Level	Limit Level
SB1	H_2S concentration, ppm	0.0109	0.0109
ASR1		0.0100	0.0100
ASR2		0.0157	0.0157
OD1	H_2S concentration in ppb/ppm, flow rate of exhaust in m^3/s and temperature of exhaust (^oC)	AL = LL/2 = 139 µg/s of H_2S	LL = 277 µg/s of H_2S
OD2			

APPENDIX C
EVENT AND ACTION PLAN

Event and Action Plan

Event / Action Plant for the Operational Phase Odour Monitoring

Event	Action			
	ET	IEC	ER	Contractor
Exceedance of Action Level for one sample at site boundary, ASRs or exhaust of deodourisation unit	• Identify source/ reason of exceedance; • Inform IEC and ER; • Repeat measurement to confirm finding.	• Check with Contractor on the operating activities and implementation of odour mitigation measures; • Discuss with ET and Contractor on the possible remedial actions; • Advise the ER on the effectiveness of the proposed remedial measures; • Supervise implementation of remedial measures.	• Confirm receipt of notification of exceedance in writing; • Notify Contractor; • Ensure remedial actions properly implemented.	• Carry out investigation to identify the source/reason of exceedance or complaints. Investigation shall be completed within 1 week; • Rectify any unacceptable practice; • Amend working methods as required; • Inform ET and EPD if the cause of exceedance is considered to be caused by the project; • Implement amended working methods.
Exceedance of Limit Level for one or more samples at site boundary, ASRs or exhaust of deodourisation unit	• Notify IEC, ER, Contractor and EPD; • Identify source of odour; • Increase monitoring frequency; • Carry out analysis of the operating activities and implementation of odour mitigation measures to determine possible mitigation to be implemented • Arrange meeting with IEC and ER to discuss the remedial actions to be taken; • Assess effectiveness of the remedial actions and keep IEC, EPD and ER informed of the results; • Carry out odour measurement using dynamic olfactometry after implementation of remedial measures to confirm their effectiveness.	• Discuss amongst ET, ER and the Contractor on the potential remedial actions; • Review the proposed remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly; • Supervise implementation of remedial measures.	• Confirm receipt of notification of exceedance in writing; • Notify Contractor; • In consultation with the ET, agree with the Contractor on the remedial measures to be implemented; • Ensure remedial measures properly implemented; • If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	• Carry out investigation to identify the source/reason of exceedance. Investigation shall be completed within 1 week; • Rectify any unacceptable practice; • Amend working methods as required; • Inform ET and EPD; • Formulate remedial actions; • Ensure amended working methods and remedial actions properly implemented; • If exceedance continues, consider what portion of the work is responsible and stop that portion of work until the exceedance is abated.