

OSCAR Bioenergy Joint Venture

Contract No. EP/SP/61/10
Organic Resources Recovery
Centre (Phase 1):
Forty-eighth Monthly EM&A Report

1 May 2019 – 31 May 2019

Environmental Resources Management

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Meinhardt Infrastructure and Environment Limited

**Organic Resources Recovery Centre,
Phase I**

Monthly EM&A Report
(1 May 2019 – 31 May 2019)

(June 2020)

Verified by: Helen Cochrane



Position: Independent Environmental Checker

Date: 26 June 2020

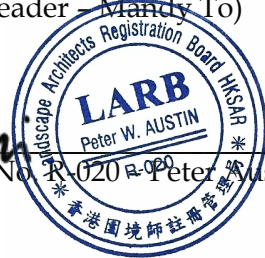
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Reference 0279222

For and on behalf of ERM-Hong Kong, Limited	
Approved by:	Frank Wan
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EXECUTIVE SUMMARY

The construction works of *No. EP/SP/61/10 Organic Resources Recovery Centre Phase 1 (the Project)* commenced on 21 May 2015. This is the 48th monthly Environmental Monitoring and Audit (EM&A) report presenting the EM&A works carried out during the period from 1 to 31 May 2019 in accordance with the EM&A Manual. Substantial completion of the construction works was confirmed on 3 December 2018. In the meantime, the operation phase EM&A programme had commenced in March 2019.

Summary of Works undertaken during the Reporting Month

Works undertaken in the reporting month included:

- Operation of the Project, including organic waste reception, and operation of the pre-treatment facilities, anaerobic digesters, composting facilities, air pollution control systems, on-line emission monitoring system for the Centralised Air Pollution Control Unit (CAPCS), Co-generation Units (CHP)s and Ammonia Stripping Plant (ASP), and the wastewater treatment plant;
- Process fine-tune, including adjustment of the ASP with new treatment media, modification of Continuous Environmental Monitoring System (CEMS) and Supervisory Control and Data Acquisition System (SCADA) rectification and improvement works following equipment failures and the alteration of different operation modes and measures to adapt to the high variation of SSOW nature and sources; and
- Construction of the Visitor Centre.

Environmental Monitoring and Audit Progress

Air Quality Monitoring

Exceedances on NO_x and SO₂ from CHP and on Dust, CO, NO_x, SO₂, VOCs, NH₃ and HF from ASP were recorded on the on-line monitoring system. It should be noted that measurements recorded under abnormal operating conditions, e.g. start up and stopping of stacks, unstable operation, test runs and interference of sensor, are disregarded.

Exceedances in emission parameters of CHP and ASP were found to be a result of problems with the continuous fine-tuning of CHP setting, incomplete desulphurisation of biogas which fed to the CHPs, and tripping and stopping of ASP and the incomplete thermal combustion of the thermal combustion unit of the ASP.

The Contractor has implemented mitigation measures to control the exceedance (including the re-adjustment for NO_x control for CHP; continuous monitoring and routine maintenance of the desulphurisation column is carried out; and tuning the thermal combustion unit of the ASP to optimise combustion efficiency and overall performance).

The Contractor has implemented mitigation measures to control the exceedance by further fine-tuning the thermal combustion unit of the ASP to optimise combustion efficiency and overall performance.

The Contractor is recommended to closely monitor the processes, including the desulphurisation process, and combustion of biogas in the ASP to rectify any abnormal operating conditions.

Water Quality

No non-compliance to the effluent discharge limit stipulated in the discharge licence issued by the EPD under the *Water Pollution Control Ordinance* was recorded during this reporting period.

Waste Management

Waste generated from the construction of the Project includes inert construction and demolition (C&D) materials (public fill) and non-inert C&D materials (construction wastes).

Inert C&D materials (public fill) include bricks, concrete, building debris, rubble and excavated spoil. In total, 0.00 tonnes of inert C&D material were generated from the construction of the Project.

Non-inert C&D materials (construction wastes) from the construction of this Project include metals, paper/ cardboard packaging waste, plastics and other wastes such as general refuse. 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 0.00 kg of plastics were sent to recyclers for recycling during the reporting period. 4.16 tonnes of general refuse was disposed of at the landfill.

0.00 L of chemical waste was collected by licenced waste collector from the construction of the Project.

Waste generated from the operation of the Project includes chemical waste, waste generated from pre-treatment process and general refuse.

1,000 L of chemical waste was collected by licenced waste collector from the operation of the Project.

528.22 tonnes of waste generated from pre-treatment process from the operation of the Project was disposed of at landfill. Among the recyclable waste generated from pre-treatment process from the operation of the Project, 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 0.00 kg of plastics were sent to recyclers for recycling during the reporting period.

Around 2.88 tonnes of general refuse from the operation of the Project was disposed of at landfill. Among the recycled general refuse from the operation of the Project, 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 390 kg of plastics were sent to recyclers for recycling during the reporting period.

Findings of Environmental Site Audit

A summary of the monitoring activities undertaken in this reporting period is listed below:

- Joint Environmental Site Inspections 4 times
- Landscape & Visual Inspections 2 times

4 weekly joint environmental site inspections were carried out by the representatives of the Contractor and the ET. The IEC was also present at the joint inspections on 31 May 2019. The environmental control/ mitigation measures (related to air quality, water quality, waste (including land contamination prevention), hazard-to-life and landscape and visual) recommended in the approved EIA Report and the EM&A Manual were properly implemented by the Contractor during the reporting month.

Environmental Exceedance/Non-conformance/Compliant/Summons and Prosecution

Exceedances for the air emission limits for the CHP and ASP stacks were recorded during the reporting period.

An incident related to the leakage of treated effluent occurred on 21 May 2019.

No complaint/ summon/prosecution was received in this reporting period.

Future Key Issues

Activities to be undertaken in the next reporting month include:

- Operation of the Project.
- Contractor should resolve the technical issue related to the on-line monitoring of methane emission (hence the calculation of the NMVOC concentration) from the CHP stacks as soon as possible and undertake gas sampling every 10 days and laboratory analysis of NMVOC when the on-line monitoring equipment for methane is not available.
- Implementation of further measures to control the air emission from the CHP and ASP.
- Continue construction of the Visitor Centre.

ERM-Hong Kong, Limited (ERM) was appointed by OSCAR Bioenergy Joint Venture (the Contractor) as the Environmental Team (ET) to undertake the construction Environmental Monitoring and Audit (EM&A) programme for the *Contract No. EP/SP/61/10 of Organic Waste Treatment Facilities Phase I*, which the project name has been updated to *Organic Resources Recovery Centre (Phase I) (the Project)* since November 2017. ERM was also appointed by the Contractor to undertake the operation EM&A programme starting 1 March 2019.

1.1 PURPOSE OF THE REPORT

This is the 48th EM&A report which summarises the monitoring results and audit findings for the EM&A programme during the reporting period from 1 to 31 May 2019.

1.2 STRUCTURE OF THE REPORT

The structure of the report is as follows:

Section 1: Introduction

It details the scope and structure of the report.

Section 2: Project Information

It summarises the background and scope of the Project, site description, project organisation and status of the Environmental Permits (EP)/licences.

Section 3: Environmental Monitoring and Audit Requirements

It summarises the environmental monitoring requirements including monitoring parameters, programmes, methodologies, frequency, locations, Action and Limit Levels, Event/ Action Plans, as well as environmental audit requirements as recommended in the EM&A Manual and approved EIA report.

Section 4: Monitoring Results

It summarises monitoring results of the reporting period.

Section 5: Site Audit

It summarises the audit findings of the environmental as well as landscape and visual site audits undertaken within the reporting period.

Section 6: Environmental Non-conformance

It summarises any exceedance of environmental performance standard, environmental complaints and summons received within the reporting period.

Section 7: Further Key Issues

It summarises the impact forecast for the next reporting month.

Section 8: Conclusions

2.1

BACKGROUND

The Organic Resources Recovery Centre (ORRC) Phase I development (hereinafter referred to as “the Project”) is to design, construct and operate a biological treatment facility with a capacity of about 200 tonnes per day and convert source-separated organic waste from commercial and industrial sectors (mostly food waste) into compost and biogas through proven biological treatment technologies. The location of the Project site is shown in *Annex A*.

The environmental acceptability of the construction and operation of the Project had been confirmed by findings of the associated Environmental Impact Assessment (EIA) Study completed in 2009. The Director of Environmental Protection (DEP) approved this EIA Report under the *Environmental Impact Assessment Ordinance* (EIAO) (Cap. 499) in February 2010 (Register No.: AEIAR-149/2010) (hereafter referred to as the approved EIA Report). Subsequent Report on Re-assessment on Environmental Implications and Report on Re-assessment on Hazard to Life Implications were completed in 2013, respectively.

An Environmental Permit (EP) (No. EP-395/2010) was issued by the DEP to the EPD (Project Team), the Permit Holder, on 21 June 2010 and varied on 18 March 2013 (No. EP-395/2010/A) and 21 May 2013 (No. EP-395/2010/B), respectively. The Design Build and Operate Contract for the ORRC Phase 1 (Contract No. EP/SP/61/10 Organic Resources Recovery Centre (Phase 1) (the Contract)) was awarded to SITA Waste Services Limited, ATAL Engineering Limited and Ros-Roca, Sociedad Anonima jointly trading as the OSCAR Bioenergy Joint Venture (OSCAR or the Contractor). A Further EP (No. FEP-01/395/2010/B) was issued by the DEP to the OSCAR on 16 February 2015. Variation to both EPs (Nos. EP-395/2010/B and FEP-01/395/2010/B) were made in December 2015. The latest EPs, Nos. EP-395/2010/C and FEP-01/395/2010/C, were issued by the DEP on 21 December 2015.

Under the requirements of Condition 5 of the EP (No. FEP-01/395/2010/C), an Environmental Monitoring and Audit (EM&A) programme as set out in the approved EM&A Manual (hereinafter referred to as EM&A Manual) is required to be implemented during the construction and operation of the Project. ERM-Hong Kong, Ltd (ERM) has been appointed by OSCAR as the Environmental Team (ET) for the construction phase EM&A programme and the Monitoring Team (MT) for the operation phase EM&A programme for the implementation of the EM&A programme in accordance with the requirements of the EP and the approved EM&A Manual.

The construction works commenced on 21 May 2015. The operation phase of

the EM&A programme commenced on 1 March 2019 ⁽¹⁾.

2.2 GENERAL SITE DESCRIPTION

The Project Site is located at Siu Ho Wan in North Lantau with an area of about 2 hectares. The layout of the Project Site is illustrated in *Annex A*. The facility received and treated an average of 100 tonnes of source separated organic waste per day during the reporting month.

2.3 MAJOR ACTIVITIES UNDERTAKEN

A summary of the major activities undertaken in the reporting period is shown in *Table 2.1*. The site layout plan is shown in *Annex B*. The construction programme is shown in *Annex C*.

Table 2.1 Summary of Activities Undertaken in the Reporting Period

Activities Undertaken in the Reporting Period
<ul style="list-style-type: none"> Systems being operated – waste reception, pre-treatment, CAPCS extraction, the digesters, the centrifuge, the composting tunnels the desulphurisation, the emergency flare, the CHPs, the ASP and the biological waste water treatment plant (about 100-130 t/d SSOW input); Process fine-tune – adjustment of the ASP operational parameters with new treatment media, CEMS/SCADA modification and improvement work following equipment failures and the alteration of different operation modes and measures to adapt to the high variation of SSOW nature and sources; and Construction of the Visitor Centre.

2.4 PROJECT ORGANISATION AND MANAGEMENT STRUCTURE

The project organisation chart and contact details are shown in *Annex D*.

2.5 STATUS OF ENVIRONMENTAL APPROVAL DOCUMENTS

A summary of the valid permits, licences, and/or notifications on environmental protection for this Project is presented in *Table 2.2*.

Table 2.2 Summary of Environmental Licensing, Notification and Permit Status

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
Environmental Permit	FEP-01/395/2010/C	Throughout the Contract	Permit granted on 21 December 2015
Notification of Construction Works under the Air Pollution Control	Ref No. 386715	Throughout the Contract	-

(1) As some of the minor items are yet to be closed out in March 2019, the construction phase EM&A programme and Operation Phase EM&A programme were undertaking in parallel in March 2019.

Permit/ Licences/ Notification	Reference	Validity Period	Remarks
(Construction Dust) Regulation			
Effluent Discharge License	WT00024352-2016	3 June 2016 – 30 June 2021	Approved on 3 June 2016
Construction Noise Permit – P1&P2	GW-RW0538-18 (Superseded CNP GW-RW0229-18)	21 January 2019-20 July 2019	Approved on 31 December 2018
Chemical Waste Producer Registration	WPN 5213-961- O2231-01	Throughout the Contract	Approved on 29 April 2015
Chemical Waste Producer Registration	WPN 5213-961- O2231-02	Throughout the implementation of the Project	Approved on 10 November 2017
Waste Disposal Billing Account	Account number: 702310	Throughout the Contract	-

3.1 ENVIRONMENTAL MONITORING

The air quality (including odour) monitoring to be carried out during the commissioning and operation phase of the Project are described below. No monitoring for noise, waste, land contamination, hazard-to-life and landscape and visual are required during construction and operation phases of the Project. Although water quality monitoring is not required for the construction and operation phases under the EM&A programme, there are water quality monitoring requirement under the Water Discharge Licence of the plant under the *Water Pollution Control Ordinance* (WPCO). As part of this EM&A programme, the monitoring results will be reviewed to check the compliance with the WPCO requirements.

3.1.1 Air Quality

According to the EM&A Manual and EP requirements, stack monitoring are required during the commissioning and operation phase of the Project.

On-line monitoring (using continuous environmental monitoring system (CEMS) shall be carried out for the centralised air pollution unit (CAPCS), cogeneration units (CHP) and the ammonia stripping plant (ASP) during the commissioning and operation phase. The calibration certificate for the on-line monitoring equipment is provided in *Annex E*.

The monitoring data is transmitted instantaneously to EPD (Regional Office) by telemetry system.

When the on-line monitoring for certain parameter cannot be undertaken, monitoring will be carried out using the following methodology approved by the EPD.

Table 3.1 Sampling and Laboratory Analysis Methodology

Parameters	Method	Stacks to be Monitored
Gaseous and vaporous organic substances (including methane)	USEPA Method 18	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Particulate	USEPA Method 5	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Carbon monoxide (CO)	USEPA Method 10	<ul style="list-style-type: none"> • CHP • ASP
Nitrogen oxides (NO _x)	USEPA Method 7E	<ul style="list-style-type: none"> • CHP • ASP
Sulphur dioxide (SO ₂);	USEPA Method 6	<ul style="list-style-type: none"> • CHP • ASP

Parameters	Method	Stacks to be Monitored
Hydrogen chloride (HCl)	USEPA Method 26A	<ul style="list-style-type: none"> • CHP • ASP
Hydrogen fluoride (HF)	USEPA Method 26A	<ul style="list-style-type: none"> • CHP • ASP
Oxygen (O ₂);	USEPA Method 3A	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Velocity and Volumetric Flow	USEPA Method 2	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Ammonia (NH ₃)	USEPA CTM 027	<ul style="list-style-type: none"> • ASP
Odour (including NH ₃ and H ₂ S)	EN 13725	<ul style="list-style-type: none"> • CAPCS
Water vapour content (continuous measurement of the water vapour content should not be required if the sample exhaust gas is dried before the emissions are analysed)	USEPA Method 4	<ul style="list-style-type: none"> • CAPCS • CHP • ASP
Temperature	USEPA Method 4	<ul style="list-style-type: none"> • CAPCS • CHP • ASP

With reference to the EM&A Manual, the air emission of the stacks shall meet the following emission limits as presented in *Tables 3.2 to 3.5*.

Table 3.2 *Emission Limit for CAPCS Stack*

Parameter	Emission Level (mg/Nm ³) ^(a)
VOCs (including methane)	680
Dust (or Total Suspended Particulates (TSP))	6
Odour (including NH ₃ & H ₂ S)	220 ^(b)
Notes:	
(a) Hourly average concentration	
(b) The odour unit is OU/Nm ³	

Table 3.3 *Emission Limit for CHP Stack*

Parameter	Maximum Emission Level (mg/Nm ³) ^{(a) (b)}
Dust (or Total Suspended Particulates)	15
Carbon Monoxide	650
NO _x	300
SO ₂	50
NMVOCs ^(c)	150
VOCs (including methane) ^(d)	1,500
HCl	10
HF	1
Notes:	
(a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.	
(b) Hourly average concentration	

Parameter	Maximum Emission Level (mg/Nm ³) (a) (b)
(c) Due to technical issue related to the monitoring range of the methane sensor, the monitoring of NMVOCs is conducted at agreed interval.	
(d) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.	

Table 3.4 *Emission Limit for ASP Stack*

Parameter	Maximum Emission Level (mg/Nm ³) (a) (b)
Dust (or Total Suspended Particulates)	5
Carbon Monoxide	100
NO _x	200
SO ₂	50
VOCs (including methane) (c)	20
NH ₃	35
HCl	10
HF	1

Notes:

(a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.
(b) Hourly average concentration
(c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

Table 3.5 *Emission Limit for Standby Flaring Gas Unit* ⁽¹⁾

Parameter	Maximum Emission level (mg/Nm ³) (a) (b)
Dust (or Total Suspended Particulates)	5
Carbon Monoxide	100
NO _x	200
SO ₂	50
VOCs (including methane) (c)	20
HCl	10
HF	1

Notes:

(a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.
(b) Hourly average concentration
(c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.

3.1.2 Odour

To determine the effectiveness of the proposed odour mitigation measures and to ensure that the operation of the ORRC1 will not cause adverse odour impacts, odour monitoring of the CAPCS stack (see *Section 3.1.1*) and odour patrol will be carried out.

Odour patrol shall be conducted by independent trained personnel/competent persons in summer months (i.e. from July to September) for the

(1) A standby facility. Only operate when the CHPs are not in operation or when the biogas generated exceeded the utilisation rate of the CHPs.

first two operational years of ORRC1 at monthly intervals along an odour patrol route at the Project Site boundary as shown in *Annex A*.

The perceived odour intensity is divided into 5 levels. *Table 3.6* describes the odour intensity for different levels.

Table 3.6 *Odour Intensity Level*

Level	Odour Intensity
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

Table 3.7 shows the action level and limit level to be used for odour patrol. Should any exceedance of the action and limit levels occurs, actions in accordance with the event and action plan in *Table 3.8* should be carried out.

Table 3.7 *Action and Limit Levels for Odour Nuisance*

Parameter	Action Level	Limit Level
Odour Nuisance (from odour patrol)	When one documented compliant is received ^(a) , or Odour Intensity of 2 is measured from odour patrol.	Two or more documented complaints are received ^(a) within a week; or Odour intensity of 3 or above is measured from odour patrol.
Note:		
(a) Once the complaint is received by the Project Proponent (EPD), the Project Proponent would investigate and verify the complaint whether it is related to the potential odour emission from the ORRC1 and its on-site wastewater treatment unit.		

Table 3.8 *Event and Action Plan for Odour Monitoring*

Event	Action	
	Person-in-charge of Odour Monitoring	Project Proponent ^(a)
Action Level		
Exceedance of action level (Odour Patrol)	<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 should be completed within 2 weeks; 2. Rectify any unacceptable practice; 3. Implement more mitigation measures if necessary; 4. Inform Drainage Services Department (DSD) or the operator of the Siu Ho Wan Sewage Treatment Works (SHWSTW) if exceedance is considered to be caused by the operation of the SHWSTW. 5. Inform North Lantau Refuse Transfer Station (NLTS) operator if exceedance is considered to be caused by the operation of NLTS.
Exceedance of action level (Odour Complaints)	<ol style="list-style-type: none"> 1. Identify source/reason of exceedance; 2. Carry out odour patrol to determinate odour intensity. 	<ol style="list-style-type: none"> 1. Carry out investigation and verify the complaint whether it is related to potential odour emission from the nearby SHWSTW; 2. Carry out investigation to identify the source/reason of exceedance. Investigation should be completed within 2 weeks; 3. Rectify any unacceptable practice; 4. Implement more mitigation measures if necessary; 5. Inform DSD or the operator of the SHWSTW if exceedance is considered to be caused by the operation of the SHWSTW. 6. Inform NLTS operator if exceedance is considered to be caused by the operation of NLTS.
Limit Level		
Exceedance of limit level	<ol style="list-style-type: none"> 1. Identify source/reason of exceedance; 2. Inform EPD; 3. Repeat odour patrol to confirm findings; 4. Increase odour patrol frequency to bi-weekly; 5. Assess effectiveness of remedial action and keep EPD informed of the results; 6. 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 should 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 should be implemented; 6. Inform DSD or the operator of the SHWSTW if exceedance is considered to be caused by the operation of the SHWSTW.
Note:		
(a) Project Proponent shall identify an implementation agent.		

3.2

SITE AUDIT

Environmental mitigation measures (related to air quality, water quality, waste, land contamination, hazard-to-life, and landscape and visual) to be implemented during the construction and operation phase of the Project are recommended in the approved EIA Report and EM&A Manual and are summarised in *Annex F*. Weekly site audits for construction phase and monthly site audits for operation phase will be carried out to check the implementation of these measures.

3.2.1

Water Quality

Compliance audits are to be undertaken to ensure that a valid discharge licence has been issued by EPD prior to the discharge of effluent from the operation of the Project site. The audit shall be conducted to ensure that the effluent quality is in compliance with the discharge licence requirements. The effluent quality shall meet the discharge limits as described in *Table 3.9*.

Table 3.9 *Discharge Limits for Effluent*

Parameters	Discharge Limit (mg/L)
Flow Rate (m ³ /day)	685
pH (pH units)	6-10 (a)
Suspended Solids	800
Biochemical Oxygen Demand (5 days, 20°)	800
Chemical Oxygen Demand	2,000
Oil & Grease	40
Total Nitrogen	200
Total Phosphorus	50
Surfactants (total)	25

Note:
(a) Range.

3.2.2

Landscape and Visual

In accordance with EM&A Manual, the landscape and visual mitigation measures shall be implemented. Bi-weekly landscape and visual audit during the construction phase is required to ensure that the design, implementation and maintenance of landscape and visual mitigation measures recommended in the approved EIA Report are fully achieved. The implementation status of the mitigation measures for construction phase is summarised in *Annex F*.

For operation phase, site inspection shall be conducted once a month for the first year of operation of the Project. All measures as stated in the implementation schedule of the EM&A Manual (see *Annex F*), including compensatory planting, undertaken by both the Contractor and the specialist Landscape Sub-Contractor during the first year of the operation phase shall be audited by a Registered Landscape Architect (RLA) to ensure compliance with

the intended aims of the measures and the effectiveness of the mitigation measures.

4 MONITORING RESULTS

4.1 AIR QUALITY

4.1.1 Commissioning Phase Monitoring

Monitoring results of air quality parameters from stack emissions of the centralised air pollution control system, the ammonia stripping plant and the cogeneration units will be provided once available to show compliance with the monitoring requirements stated in the EM&A Manual (Rev. E) to support the termination of the construction phase EM&A programme.

4.1.2 Operation Phase Monitoring

The concentrations of concerned air pollutants emitted from the stacks of the CAPCS, CHP, and ASP during the reporting period are monitored on-line by the continuous environmental monitoring system (CEMS). During the reporting period, there is no need to operate the standby flare and therefore no monitoring of the flare stack was undertaken.

With reference to the emission limits shown in *Tables 3.2, 3.3 and 3.4*, the hourly average concentrations and the number of exceedances of the concerned air emissions monitored for the CAPCS, CHP and ASP during this reporting period are presented in *Tables 4.1 to 4.5*.

It should be noted that measurements recorded under abnormal operating conditions, e.g. start up and stopping of stacks, unstable operation, test runs and interference of sensor, are disregarded.

Table 4.1 *Hourly Average of Parameters Recorded for CAPCS*

Parameter	Range of Hourly Average Conc. (mg/Nm ³)	Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
VOCs (including methane)	0 - 680	680	Nil	Nil
Dust (or TSP)	0 - 2	6	Nil	Nil
Odour (including NH ₃ & H ₂ S) ^(a)	0 - 64	220	Nil	Nil

Notes:
(a) The odour unit is OU/Nm³.

Table 4.2 Hourly Average of Parameters Recorded for CHP 1

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
Dust (or TSP)	0 - 4	15	Nil	Nil
Carbon Monoxide	0 - 567	650	Nil	Nil
NO _x	0 - 320	300	Identified ^(d)	CHP setting was fine-tuned for performance optimisation. Continuous re-adjustment for NO _x control of CHP has been carried out.
SO ₂	0 - 123	50	Identified ^(e)	Tripping of the desulphurisation column. Continuous monitoring to reduce the duration of tripping.
NMVOCs ^(b)	5 - 5.7	150	Nil	See Annex G for laboratory results
VOCs (including methane) ^(c)	0 - 1,090	1,500	Nil	Nil
HCl	0 - 2	10	Nil	Nil
HF	0 - 0.4	1	Nil	Nil

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.
- (b) Technical issue related to monitoring range of methane sensors and the Contractor is solving the problem together with the equipment suppliers. 2 samplings were conducted during the reporting period because the biogas production rate could not sustain the operation of the CHP stack for the scheduled sampling, hence one of the scheduled sampling was cancelled.
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.
- (d) Dates with exceedances on NO_x (number of exceedances on the day) were identified on 20 (1), 21 (1), 27 (9), 29 (4) and 30 (2) May 2019.
- (e) Dates with exceedances on SO₂ (number of exceedances on the day) were identified on 1 (1), 3 (1), 11 (2), 12 (7), 16 (4), 18 (3), 21 (2) and 22 (3) May 2019.

Table 4.3 Hourly Average of Parameters Recorded for CHP 2

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a) ^(b)	Max. Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
Dust (or TSP)	0 - 6	15	Nil	Nil
Carbon Monoxide	0 - 358	650	Nil	Nil
NO _x	0 - 628	300	Identified ^(d)	CHP setting was fine-tuned for performance optimisation. Continuous re-adjustment for NO _x control of CHP has been carried out.

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a) (b)	Max. Emission Limit (mg/Nm ³)	Exceedance Identified	Remarks
SO ₂	0 – 105	50	Identified ^(e)	Tripping of the desulphurisation column. Continuous monitoring to reduce the duration of tripping.
NMVOCs ^(b)	Not Available	150	Nil	Nil
VOCs (including methane) ^(c)	0 – 1,281	1,500	Nil	Nil
HCl	0 – 2	10	Nil	Nil
HF	0 –1	1	Nil	Nil

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.
- (b) Technical issue related to monitoring range of methane sensors and the Contractor is solving the problem together with the equipment suppliers. No sampling was undertaken at CHP2 as biogas production rate could not sustain the operation of the CHP stack for the scheduled samplings.
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.
- (d) Dates with exceedances on NO_x (number of exceedances on the day) were identified on 1 (1), 15 (1), 16 (1), 20 (2), 21 (13) and 27 (9) May 2019.
- (e) Dates with exceedances on SO₂ (number of exceedances on the day) were identified on 16 (2), 20 (3) and 21 (2) May 2019.

Table 4.4 Hourly Average of Parameters Recorded for CHP 3

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
Dust (or TSP)	0 – 7	15	Nil	Nil
Carbon Monoxide	23 – 109	650	Nil	Nil
NO _x	26 – 274	300	Nil	Nil
SO ₂	1 – 34	50	Nil	Nil
NMVOCs ^(b)	5.2	150	Nil	See Annex G for laboratory results
VOCs (including methane) ^(c)	288 – 1,291	1,500	Nil	Nil
HCl	0 – 1	10	Nil	Nil
HF	0 – 1	1	Nil	Nil

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 6% and dry basis.
- (b) Technical issue related to monitoring range of methane sensors and the Contractor is solving the problem together with the equipment suppliers. 1 sampling was conducted during the reporting period because the biogas production rate could not sustain the operation of the CHP stack for the 3 scheduled samplings, hence 2 scheduled samplings were cancelled.
- (c) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
process.				

Table 4.5 *Hourly Average of Parameters Recorded for ASP*

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
Dust (or TSP)	0 – 6	5	Identified ^(c)	Ongoing optimisation of ASP combustion efficiency has been carried out.
Carbon Monoxide	0 – 655	100	Identified ^(d)	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.
NO _x	0 – 519	200	Identified ^(e)	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.
SO ₂	0 – 70	50	Identified ^(f)	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.
VOCs (including methane) ^(b)	0 – 3,370	20	Identified ^(g)	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.
NH ₃	0 – 2,772	35	Identified ^(h)	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.
HCl	0 – 4	10	Nil	Nil
HF	0 – 1.5	1	Identified ⁽ⁱ⁾	ASP tripped and stopped. Ongoing optimisation of ASP combustion efficiency has been carried out.

Notes:

- (a) All values refer to an oxygen content in the exhaust gas of 11% and dry basis.
- (b) The VOCs emission limit include methane as biogas is adopted as fuel in the combustion process.
- (c) 1 exceedance on Dust was identified on 8 May 2019.
- (d) Dates with exceedances on CO (number of exceedances on the day) were identified on 9 (1), 17 (2) and 22 (1) May 2019.
- (e) Dates with exceedances on NO_x (number of exceedances on the day) were identified on 2 (1), 5 (5), 6 (4), 8 (5), 9 (3), 11 (6), 12 (12), 13 (7), 14 (12), 15 (8), 17 (8), 18 (5), 19 (6), 20 (6), 22 (8), 24 (1), 25 (1) and 28 (1) May 2019.
- (f) 1 exceedance on SO₂ was identified on 17 May 2019.
- (g) Dates with exceedances on VOCs (including methane) (number of exceedances on the day) were identified on 8 (1), 9 (2), 15 (1), 17 (4), 18 (1), 19 (4) and 20 (2) May 2019.

Parameter	Range of Hourly Average Conc. (mg/Nm ³) ^(a)	Max. Emission Limit (mg/Nm ³)	Exceedances Identified	Remarks
(h)	Dates with exceedances on NH ₃ (number of exceedances on the day) were identified on 1 (2), 2 (3), 3 (8), 4 (6), 5 (2), 6 (2), 7 (6), 8 (6), 9 (15), 10 (5), 11 (8), 12 (9), 13 (1), 14 (3), 15 (2), 17 (9), 18 (5), 19 (12), 20 (7), 22 (9), 23 (1), 24 (2), 30 (6) and 31 (7) May 2019.			
(i)	Dates with exceedances on HF (number of exceedances on the day) were identified on 17 (1) and 20 (1) May 2019.			

4.2 ODOUR

4.2.1 Commissioning Phase Monitoring

No odour patrol was required to be conducted for this reporting period.

4.2.2 Operation Phase Monitoring

No odour patrol was required to be conducted for this reporting period.

4.3 WATER QUALITY

4.3.1 Construction Phase Monitoring

No effluent was discharged from the construction activity in the reporting month, hence it was not necessary to carry out effluent discharge sampling for this reporting period.

4.3.2 Operation Phase Monitoring

Effluent discharge was sampled monthly from the Effluent Storage Tank as stipulated in the operation phase discharge licence. The results of the discharge sample is recorded in *Table 4.6*.

Table 4.6 Results of the Discharge Sample

Parameters	Discharged Effluent Concentration (mg/L)	Discharge Limit (mg/L)	Compliance with Discharge Limit
pH (pH units)	7.50 – 8.50	6-10 ^(a)	Yes
Suspended Solids ^(b)	115	800	Yes
Biochemical Oxygen Demand (5 days, 20°) ^(b)	55	800	Yes
Chemical Oxygen Demand ^(b)	706	2,000	Yes
Oil & Grease ^(b)	<5	40	Yes
Total Nitrogen ^(b)	94	200	Yes
Total Phosphorus ^(b)	36.5	50	Yes
Surfactants (total) ^(b)	<1.0	25	Yes

Notes:

(a) Daily Average.

(b) Effluent sample collected on 6 May 2019.

No exceedance of discharge limit was recorded during the reporting period.

4.4 WASTE MANAGEMENT

4.4.1 Construction Phase Monitoring

Wastes generated from this Project include inert construction and demolition (C&D) materials (public fill) and non-inert C&D materials (construction waste). Construction waste comprises general refuse, metals and paper/cardboard packaging materials. Metals generated from the construction of the Project are also grouped into construction waste as the materials were not disposed of with others at public fill. Reference has been made to the Monthly Summary Waste Flow Table prepared by the Contractor (see *Annex H*). With reference to the relevant handling records and trip tickets of this Project, the quantities of different types of waste generated in the reporting month are summarised in *Table 4.7*.

Table 4.7 Quantities of Waste Generated from the Construction of the Project

Month/Year	Quantity			
	Total Inert C&D Materials Generated ^(a)	Non-inert C&D Materials ^(b)		
		C&D Materials Recycled ^(c)	C&D Waste Disposed of at Landfill ^(d)	Chemical Waste
May 2019	0.00 tonnes	0.00 kg	4.16 tonnes	0.00 L

Notes:

- (a) Inert C&D materials (public fill) include bricks, concrete, building debris, rubble and excavated spoil. In total, 0.00 tonnes of inert C&D material were generated from the Project. The detailed waste flow is presented in *Annex H*.
- (b) Non-inert C&D materials (construction wastes) include metals, paper / cardboard packaging waste, plastics and other wastes such as general refuse. Metals generated from the Project were grouped into construction wastes as the materials were not disposed of with others at the public fill.
- (c) 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 0.00 kg of plastics were sent to recyclers for recycling during the reporting period.
- (d) Construction wastes other than metals, paper/cardboard packaging, plastics and chemicals were disposed of at NENT Landfill by subcontractors.

4.4.2 Operation Phase Monitoring

Wastes generated from the operation of the Project include chemical waste, wastes generated from pre-treatment process and general refuse ⁽¹⁾. Reference has been made to the Monthly Summary Waste Flow Table prepared by the Contractor (see *Annex H*). With reference to the relevant handling records and trip tickets of this Project, the quantities of different types of waste generated from the operation of the Project in the reporting month are summarised in *Table 4.8*.

(1) Public fill and construction waste may only be generated during maintenance works when there are civil or structural works.

Table 4.8 Quantities of Waste Generated from the Operation of the Project

Month/Year	Chemical Waste	Waste Generated from Pre-treatment Process		General Refuse	
		Disposed of at Landfill ^(a)	Recycled ^(b)	Disposed of at Landfill ^(a)	Recycled ^(c)
April 2019	1,000 L	528.22 tonnes	0.00 tonnes	2.88 tonnes ^(d)	390 kg

Notes:

- (a) Waste generated from pre-treatment process and general refuse other than chemical waste and recyclables were disposed of at NENT landfill by sub-contractors.
- (b) Among waste generated from pre-treatment process, 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 0.00 kg of plastics were sent to recyclers for recycling during the reporting period.
- (c) Among general refuse, 0.00 kg of metals, 0.00 kg of papers/ cardboard packing and 390 kg of plastics were sent to recyclers for recycling during the reporting period.
- (d) It was assumed that four 240-litre bins filled with 80% of general refuse were collected at each collection. The general refuse density was assumed to be around 0.15 kg/L.

5 *SITE AUDIT*

5.1 *ENVIRONMENTAL SITE AUDIT*

5.1.1 *Construction Phase*

Joint site inspections were conducted by representatives of the Contractor and the ET on 7, 17, 24 and 31 May 2019 as required for the construction of the Project. The IEC was present at the joint inspection on 31 May 2019.

The audits checked the implementation of the recommended mitigation measures for air quality, landscape and visual, water quality, waste (land contamination) and hazard-to-life stated in the Implementation Schedule (see *Annex F*).

Follow-up actions resulting from the last site inspections were generally taken as reported by the Contractor.

Key observations during the reporting period are summarised as follows:

7 May 2019

- No particular observation during this inspection.

17 May 2019

- No particular observation during this inspection.

24 May 2019

- No particular observation during this inspection.

31 May 2019

- There was no display of the approval/exemption label for one of the non-road mobile machineries (i.e. a lifting platform) used. The contractor was advised to provide the approval/exemption label in accordance to the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation.

Other than the above observation, the Contractor has implemented environmental mitigation measures recommended in the approved EIA Report and EM&A Manual.

5.1.2 *Operation Phase*

The monthly inspection of the landscape and visual mitigation measures for the operation phase of the Project on 31 May 2019 covered the operation phase environmental site audit. Joint site inspections was conducted by representatives of the Contractor, IEC and the MT on 31 May 2019 as required for the operation of the Project.

The audits checked the implementation of the recommended mitigation

measures for air quality, landscape and visual, water quality, waste (land contamination) and hazard-to-life stated in the Implementation Schedule (see *Annex F*).

Follow-up actions resulting from the last site inspections were generally taken as reported by the Contractor.

Key observations during the reporting period are summarised as follows:

31 May 2019

- A chemical waste container without label was observed in the laboratory and chemical drums were observed near Building 2. The contractor was advised to clearly label the container in the laboratory and provide drip trays to the chemical drums or replace the drums to designed storage area in accordance to the Code of Practice.

Other than the above observation, the Contractor has implemented environmental mitigation measures recommended in the approved EIA Report and EM&A Manual.

5.2

LANDSCAPE AND VISUAL AUDIT

Inspection of the landscape and visual mitigation measures for the construction phase of the Project was performed on 17 and 31 May 2019. Inspection of the landscape and visual mitigation measures for the operation phase of the Project was performed on 31 May 2019.

It was confirmed that the necessary landscape and visual mitigation measures during the construction and operation phase as summarised in *Annex F* were generally implemented by the Contractor. No specific observation was found during site inspections on 17 and 31 May 2019. No non-compliance in relation to the landscape and visual mitigation measures was identified during the site audits in this reporting period and therefore no further actions are required. The ET/MT will keep track of the EM&A programme to check compliance with environmental requirements and the proper implementation of all necessary mitigation measures.

6.1

SUMMARY OF ENVIRONMENTAL NON-COMPLIANCE

Non-compliance of emission limits for CHP and ASP were recorded during the reporting period.

The Contractor has reviewed the organic waste treatment processes (i.e. waste reception, waste pre-treatment, anaerobic digesters, and composting processes) and found that they were operated normally during the reporting period. The Contractor has investigated air pollution control system and the combustion system of the CHP and ASP and identified the following potential causes for the exceedance.

- (a) CHP setting was undergoing fine-tuning for performance optimisation. Therefore, it could not effectively remove NO_x at a certain period of time which leads to the exceedance for NO_x limit for the CHP stacks;
- (b) Tripping of the desulphurisation column resulting in the incomplete desulphurisation of biogas that leads to the exceedances of SO₂ limits for CHP stacks; and
- (c) Tripping and stopping of the ASP and the ongoing performance optimisation of the ASP result in the incomplete combustion of biogas. The unstable emission leads to the exceedances of Dust, CO, NO_x, SO₂, VOCs, NH₃ and HF in ASP.

For item (a), continuous optimisation of CHP and re-adjustment of NO_x control for CHP has been carried out. It is expected to complete in the next reporting period.

For item (b), routine maintenance of the desulphurisation column, e.g. cleaning of sensors, has been carried out. Continuous monitoring of the desulphurisation column will remain in place to reduce the duration of tripping which causes exceedances in SO₂ in CHP stacks.

For item (c), the Contractor will continue to fine-tune the thermal combustion unit of the ASP in order to restore the combustion efficiency so that the concerned pollutants will be effectively destroyed.

The investigation report is presented in *Annex J*.

Leakage of treated effluent was observed at the discharge outlet on 21 May 2019. The investigation report and the extract of the incident report provided by the Contractor are presented in *Annex J*.

6.2

SUMMARY OF ENVIRONMENTAL COMPLAINT

No complaint was received during the reporting period.

6.3

SUMMARY OF ENVIRONMENTAL SUMMON AND SUCCESSFUL PROSECUTION

No summon/prosecution was received during the reporting period. The cumulative summons/prosecution log is shown in *Annex I*.

Activities to be undertaken for the coming reporting period are:

- Operation of the Project.
- Contractor should resolve the technical issue related to the on-line monitoring of methane emission (hence the calculation of the NMVOC concentration) from the CHP stacks as soon as possible and undertake gas sampling and laboratory analysis of NMVOC at agreed interval when the on-line monitoring equipment for methane is not available.
- Implementation of measures to further rectify the abnormal operating conditions for the CHP and ASP.
- Continue construction of the Visitor Centre.

This EM&A Report presents the EM&A programme undertaken during the reporting period from **1 to 31 May 2019** in accordance with EM&A Manual (Version E) and requirements of EP (FEP-01/395/2010/C).

No air quality, noise and water quality monitoring is required under the construction EM&A requirements.

For the operation phase, exceedances of the emission limits for stack monitoring (including CHP and ASP stacks) were recorded under normal operating conditions during the reporting period (see *Table 8.1*).

Table 8.1 *Exceedances for Stack Emissions*

Stack	Exceedances During the Reporting Period
Cogeneration Unit (CHP)	<ul style="list-style-type: none"> • Exceeded emission limit of NO_x on 1, 15, 26, 20, 21, 27, 29 and 30 May 2019 • Exceeded emission limit of SO₂ on 1, 3, 11, 12, 16, 18 and 20 to 22 May 2019
Ammonia Stripping Plant (ASP)	<ul style="list-style-type: none"> • Exceeded emission limit of Dust on 8 May 2019 • Exceeded emission limit of CO on 9, 17 and 22 May 2019 • Exceeded emission limit of NO_x on 2, 5, 6, 8, 9, 11 to 15, 17 to 20, 22, 24, 25 and 28 May 2019 • Exceeded emission limit of SO₂ on 17 May 2019 • Exceeded emission limit of VOCs on 8, 9, 15 and 17 to 20 May 2019 • Exceeded emission limit of NH₃ on 1 to 15, 17 to 20, 22 to 24, 30 and 31 May 2019 • Exceeded emission limit of HF on 17 and 20 May 2019

Exceedances in emission parameters of CHP and ASP were found to be a result of problems with the continuous fine-tuning of CHP setting, incomplete desulphurisation of biogas which fed to the CHPs, and tripping and stopping of ASP and the incomplete thermal combustion of the thermal combustion unit of the ASP.

The Contractor has implemented mitigation measures to control the exceedance (including the re-adjustment for NO_x control for CHP; continuous monitoring and routine maintenance of the desulphurisation column is carried out; and tuning the thermal combustion unit of the ASP to optimise combustion efficiency and overall performance).

No non-compliance to the effluent discharge limit was recorded during this reporting period.

The environmental control /mitigation measures related to air quality, water quality, waste (including land contamination prevention), hazard-to-life and landscape and visual recommended in the approved EIA Report and the

EM&A Manual were properly implemented by the Contractor during the reporting month.

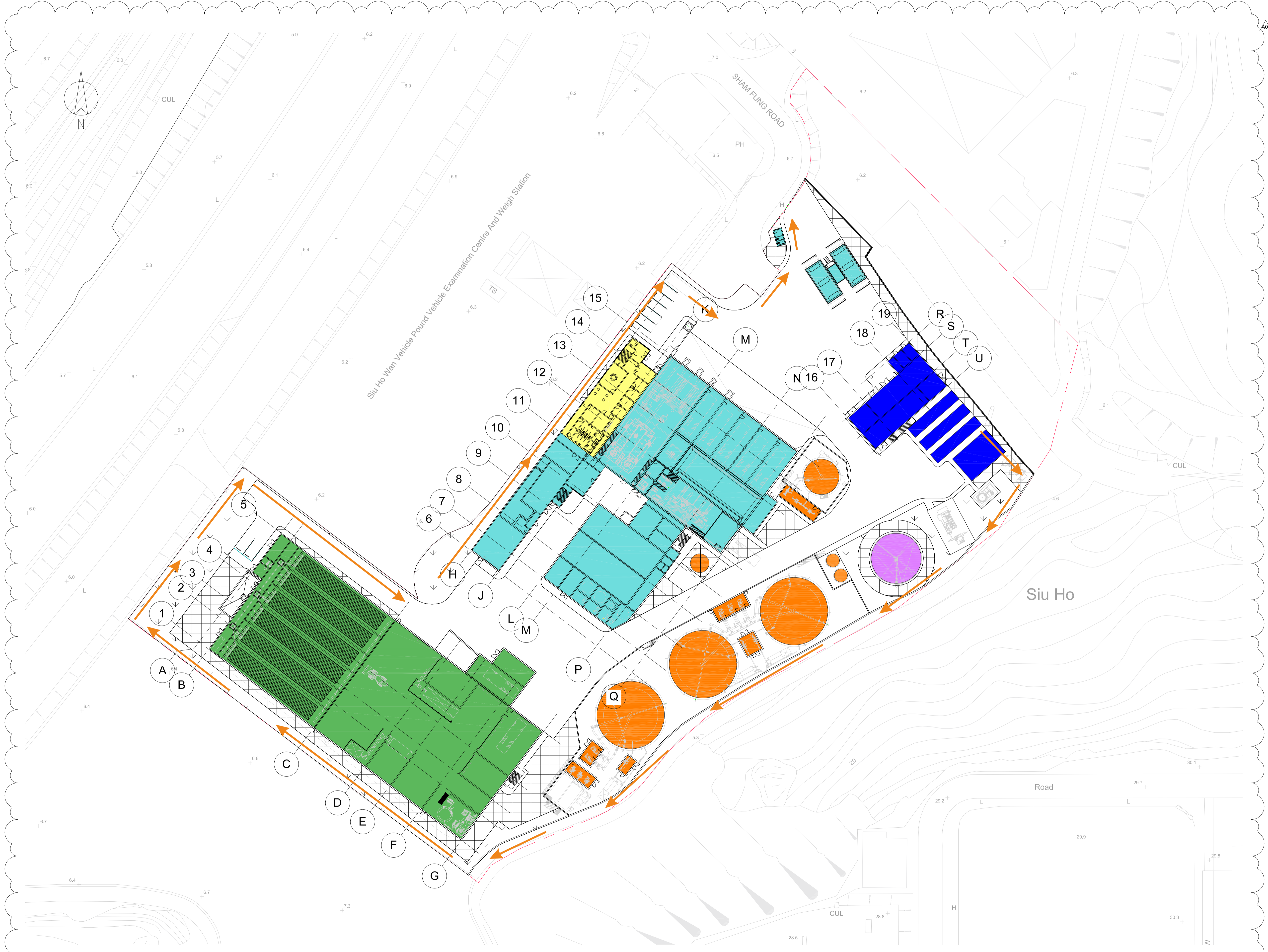
Bi-weekly landscape and visual monitoring were conducted in the reporting period. The necessary landscape and visual mitigation measures recommended in the approved EIA Report were generally implemented by the Contractor.

An incident related to the leakage of treated effluent occurred on 21 May 2019.

No complaint/summon/prosecution was received.

Annex A

Project Layout



Key
 Patrol Route

A01	05/03/15	CW	MB	IMTECH BACKGROUNDS UPDATED
A00	18/02/15	CW	MB	DRAFT ISSUE
REV	DATE	BY	APP	DESCRIPTION

CLIENT
 ENVIRONMENTAL PROTECTION DEPARTMENT
 GOVERNMENT OF THE HKSAR

CLIENT'S CONSULTANT
 **AECOM**
 AECOM ASIA CO. LTD.

CONTRACTOR
  
 OSCAR BIOENERGY JV

LEAD DESIGNER
 **ARUP**
 Ove Arup & Partners Hong Kong Limited

ENVIRONMENTAL TEAM
 **ERM**
 ERM HONG KONG LIMITED

INDEPENDENT CONSULTANTS
 **MEINHARDT**
 Meinhardt Infrastructure and Environment Limited
 邁達基建築環保工程顧問有限公司

PROJECT
 ORGANIC WASTE TREATMENT FACILITIES
 PHASE 1
 EP/SP/61/10

STATUS
 DRAFT ISSUE

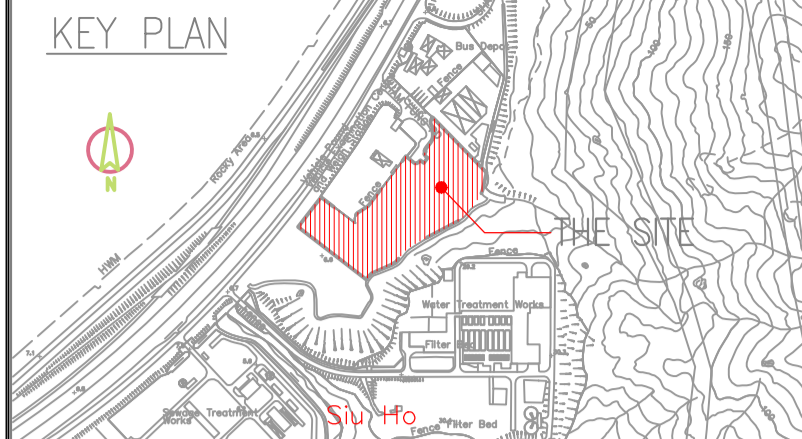
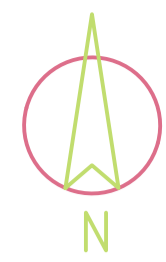
DRAWING TITLE
 SITE LAYOUT

DRAWN CW	CHECKED RS	APPROVED DP
SCALE 1:500@A1 / 1:1000@A3	DATE 12/02/15	
JOB NO. 239956	DRAWING NO. DR-OAP-20-0-CA-1001	REV. A01

Plot Time: 05/03/15 21:20:07
 Plot Location: C:\Users\mathew.brown\Documents\QWTF_Architectural Working Model (Combined) CEH_mathew.brown.rvt

Annex B


Works Location



LEGEND

- SITE BOUNDARY
- T T T T T PROPOSED HOARDING TYPE 1
- +++++ EXISTING CHAIN-LINK FENCE
- ~~~~~ PROPOSED 6 m TYPE II SHEET PILE PLANKING WALL WITH 3 m EXTRUDED ABOVE GROUND
- XXXXX EXISTING FENCE WALL
- - - - DISCHARGE DRAINAGE
- 300mm(W) PROPOSED TEMP. CHANNEL
- 300mm(W) EXISTING U-CHANNEL
- 50/75mm FLEXIBLE DRAIN
- PROPOSED TEMP. CATCH PIT
- PORTABLE WATER PIPE
- TRAFFIC DIRECTION
- REBAR STORAGE AREA AND BENDING YARD
- GENERAL MATERIAL STORAGE AREA
- C & D MATERIAL STORAGE AREA
- VEHICLE WHEEL WASH
- WATER TREATMENT PLANT

REV	DATE	BY	APP	DESCRIPTION
J	01 SEP 2016	LL	JC	REVISED LAYOUT
I	27 APR 2016	LL	JC	REVISED LAYOUT
H	30 DEC 2015	LL	JC	REVISED LAYOUT
G	30 MAY 2015	LL	CL	REVISED LAYOUT

CLIENT
 ENVIRONMENTAL PROTECTION DEPARTMENT
 GOVERNMENT OF THE HKSAR

CLIENT'S CONSULTANT
 **AECOM**
 AECOM ASIA CO. LTD.

CONTRACTOR

OSCAR Bioenergy Joint Venture

LEAD DESIGNER
 **ARUP**
 Ove Arup & Partners Hong Kong Limited

ENVIRONMENTAL TEAM
 **ERM HONG KONG LIMITED**

INDEPENDENT CONSULTANTS
 **MEINHARDT**
 Meinhardt Infrastructure and Environment Limited
 邁達基達環境工程顧問有限公司

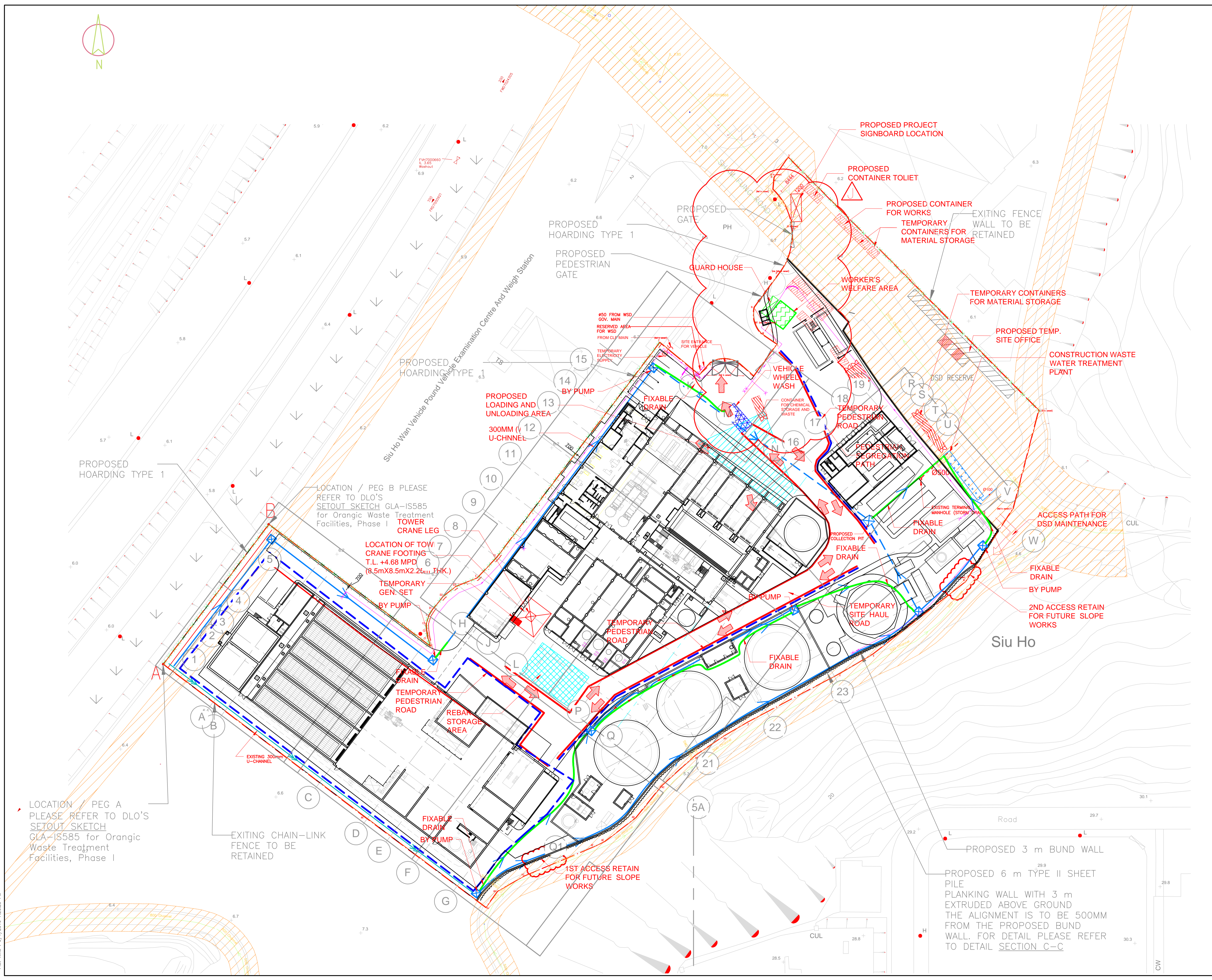
PROJECT
**ORGANIC WASTE TREATMENT FACILITIES
 PHASE I
 EP/SP/61/10**

STATUS
ISSUED FOR COMMENT

DRAWING TITLE
**GENERAL SITE LAYOUT PLAN
 AT PORTION 1**

DRAWN LL	CHECKED JC	APPROVED JC
SCALE 1:500@A1; 1:1000@A3	DATE 01 SEP 2016	
JOB NO. P00424	DRAWING NO. DR-PSC-00-0-CN-1002	REV. J

DR-PSC-00-0-CN-1002



LOCATION / PEG A PLEASE REFER TO DLO'S SETOUT SKETCH GLA-15585 for Organic Waste Treatment Facilities, Phase I

LOCATION / PEG B PLEASE REFER TO DLO'S SETOUT SKETCH GLA-15585 for Organic Waste Treatment Facilities, Phase I

PROPOSED 3 m BUND WALL
 PROPOSED 6 m TYPE II SHEET PILE PLANKING WALL WITH 3 m EXTRUDED ABOVE GROUND THE ALIGNMENT IS TO BE 500MM FROM THE PROPOSED BUND WALL. FOR DETAIL PLEASE REFER TO DETAIL SECTION C-C

Plot By: LeoAM
 Plot Time: 9/7/2016 7:26:29 PM

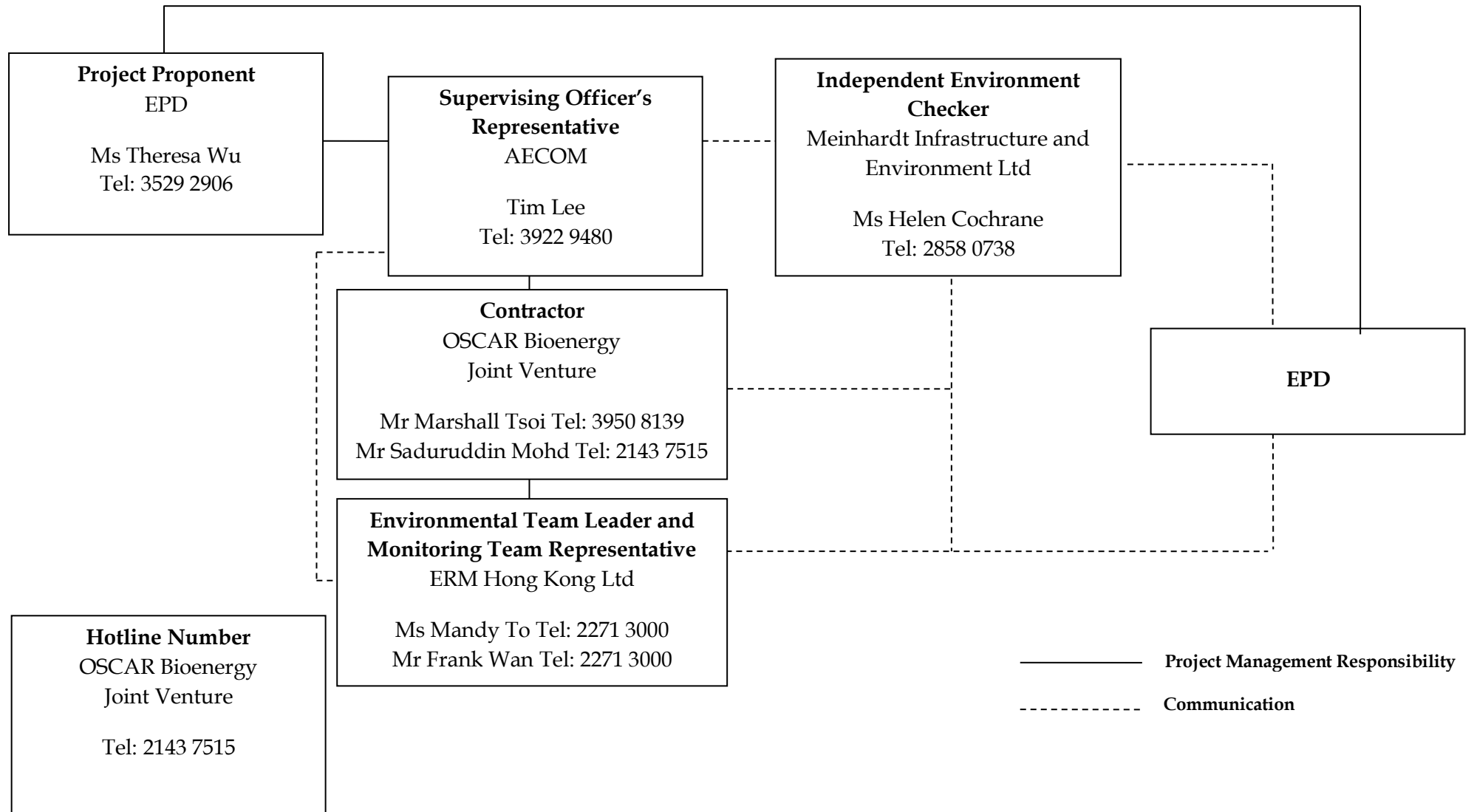
Annex C

Construction Programme of the Project

Annex D

Project Organisation Chart with Contact Details

Project Organization (with contact details)



Annex E

Calibration Certification for
the On-line Stack
Monitoring System

Annex E1

Calibration Certification for the CEMS

(1)

Commissioning Check List 试运行检查项目表 MCS100FT

Customer data 客户资料	
Customer: <u>OSCAR</u>	Plant: <u>OWTF</u>
Location: <u>SHW</u>	

1. Device data 设备资料
Device type 设备类型: <u>MCS100FT (1)</u>
Serial no. 序列号: <u>1607 0493</u>
Sample probe type 取样探头类型: <u>SFU</u>

2. Plant data 电厂资料			
Location 标签编号	Outside 室外 <input type="checkbox"/>	Under cover 有保护罩 <input type="checkbox"/>	Inside 室内 <input checked="" type="checkbox"/>
Orientation of the stack 取样点方向	Horizontal 水平 <input type="checkbox"/>	Vertical 垂直 <input checked="" type="checkbox"/>	
	Horizontal 水平 <input checked="" type="checkbox"/>	Vertical 垂直 <input type="checkbox"/>	
Orientation of sample gas probe 取样探头方向	Horizontal 水平 <input checked="" type="checkbox"/>	Vertical 垂直 <input type="checkbox"/>	
Pressure 压力 <u>1010</u> hpa	Gas temperature 烟气温度 <u>410</u> °C		
Plant operating status 电厂运行情况 <u>Normal</u>			

3. Prerequisite 系统运行条件			
	Y	N	Remarks 备注
3.1. Documentation + Delivery complete 文件+货物是否齐全	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.2. Platform at measurement spot has suitable dimension? 测量点平台的尺寸是否合适?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3. If this measurement location is under legal regulation, has it been acknowledged by an official body? 如果安装位置需要符合法律法规, 此安装位置是否被官方认可?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.4. Customer specific data for parameterization available? 用户对系统参数的特殊要求是否可行?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.5. Cables, tubes and sample line installed but not connected? 电缆、管线和取样管线安装但没有连接?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6. Compressed air station installed and compressed air available? 压缩空气站已安装并且压缩空气可以使用?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

4. Preliminary work 预备工作		Y	N	Remarks 备注
4.1. Mounting of flanges like described in the Operating Instruction? 法兰安装是否按照图纸?	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.2. Check for damage 检查外部损伤	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.3. Check ambient conditions 检查环境条件	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.4. Check mounting conditions 检查安装条件	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.5. Check cables / wires for correct installation 检查电缆/电线及其连接状况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.6. Check main power supply voltage 检查总供电电压	<input checked="" type="checkbox"/>	<input type="checkbox"/>		




5. Periphery 外部设备		Y	N	Remarks 备注
5.1. Check compressed air supply 检查压缩空气供应	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Inlet 入口(5 bar):		6	Bar	

6. Sample probe 取样探头		Y	N	Remarks 备注
6.1. Connect bundle of tubes and cables 管线和电缆的连接	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
6.2. Install probe 探头安装	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

7. MCS100FT		Y	N	Remarks 备注
7.1. Switch on analyzer and wait for warm up 打开分析仪并等待预热	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.2. Check sample conditions 检查样气情况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Flow rate 流量: 230 l/h				
7.3. Check zero conditions 检查零点情况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Flow rate 流量: 160 l/h				
7.4. Perform zero point setting 零点设置	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Test results within specification.
7.5. Perform span test 量程测试	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.6. Parameterize the I/O Module 设置 I/O 模块参数	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.7. Measured values are plausible 测量值是否合理	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.8. Save device data 储存设备数据	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.9. Complete Commissioning Sign-Off Sheet 完成试运行签署表	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.10. Instruct the operator personnel 操作员培训 Hand over the maintenance manual and check lists 移交维护手册和检查表 - Measurement reading 读取测量值 - Perform customer maintenance 演示维护方法 - Read messages 读取信息	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

8. Measured value

Index 编号	Source 信号源	Unit 单位	Range 范围		Reading (actual) 实际读数	Output value 产值
			Start 开始	End 结束		
1	HCL	mg/Nm ³	0	120	60.22 ppm	60.22 ppm
2	HF	mg/Nm ³	0	5	4.34 ppm	4.34 ppm
3	CO	mg/Nm ³	0	1000	128.21 ppm	128.20 ppm
4	NO	mg/Nm ³	0	500	122.01 ppm	122.00 ppm
5	NO ₂	mg/Nm ³	0	200	98.81 ppm	98.80 ppm
6	NO _x	mg/Nm ³	0	500	412.11 mg/m ³	412.12 mg/m ³
7	SO ₂	mg/Nm ³	0	300	83.21 ppm	83.21 ppm
8	CO ₂	Vol o/o	0	25	20.01 o/o	20.01 o/o
9	H ₂ O	Vol o/o	0	40	32.02 o/o	32.01 o/o
10	O ₂	Vol o/o	0	21	20.95 o/o	20.95 o/o
11	TOC	mg/Nm ³	0	300	122.01 ppm	122.01 ppm
12	NH ₃	mg/Nm ³	0	100	53.30 ppm	53.31 ppm
13	CH ₄	mg/Nm ³	0	100	112.01 ppm	112.01 ppm
14						
15						

Remarks 备注	
<p>Date 日期: <u>25/7/2018</u></p> <p>Engineer 工程师: <u></u> </p>	<p>Name 签名</p> <p>Plant personnel 用户代表: <u></u></p>

(2)

Commissioning Check List 试运行检查项目表

MCS100FT

Customer data 客户资料	
Customer: <u>Oscar</u>	Plant: <u>OWTF</u>
Location: <u>SHW</u>	

1. Device data 设备资料
Device type 设备类型: <u>MCS100FT (2)</u>
Serial no. 序列号: <u>1607 0494</u>
Sample probe type 取样探头类型: <u>SFU</u>

2. Plant data 电厂资料			
Location 标签编号	Outside 室外 <input type="checkbox"/>	Under cover 有保护罩 <input type="checkbox"/>	Inside 室内 <input checked="" type="checkbox"/>
Orientation of the stack 取样点 方向	Horizontal 水平 <input type="checkbox"/>	Vertical 垂直 <input checked="" type="checkbox"/>	
Orientation of sample gas probe 取样探头方向	Horizontal 水平 <input checked="" type="checkbox"/>	Vertical 垂直 <input type="checkbox"/>	
Pressure 压力 <u>1010</u> hpa	Gas temperature 烟气温度 <u>410</u> °C		
Plant operating status 电厂运行情况 <u>Normal</u>			

3. Prerequisite 系统运行条件			
	Y	N	Remarks 备注
3.1. Documentation + Delivery complete 文件+货物是否齐全	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.2. Platform at measurement spot has suitable dimension? 测量点平台的尺寸是否合适?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.3. If this measurement location is under legal regulation, has it been acknowledged by an official body? 如果安装位置需要符合法律法规, 此安装 位置是否被官方认可?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.4. Customer specific data for parameterization available? 用户对系统参数的特殊要求是否可行?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.5. Cables, tubes and sample line installed but not connected? 电缆、管线和取样管线安装但没有连接?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.6. Compressed air station installed and compressed air available? 压缩空气站已安装并且压缩空气可以使 用?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

4. Preliminary work 预备工作		Y	N	Remarks 备注
4.1. Mounting of flanges like described in the Operating Instruction? 法兰安装是否按照图纸?	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.2. Check for damage 检查外部损伤	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.3. Check ambient conditions 检查环境条件	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.4. Check mounting conditions 检查安装条件	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.5. Check cables / wires for correct installation 检查电缆/电线及其连接状况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
4.6. Check main power supply voltage 检查总供电电压	<input checked="" type="checkbox"/>	<input type="checkbox"/>		



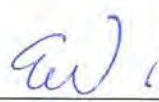
5. Periphery 外部设备		Y	N	Remarks 备注
5.1. Check compressed air supply 检查压缩空气供应	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Inlet 入口(5 bar): 6 Bar				

6. Sample probe 取样探头		Y	N	Remarks 备注
6.1. Connect bundle of tubes and cables 管线和电缆的连接	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
6.2. Install probe 探头安装	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

7. MCS100FT		Y	N	Remarks 备注
7.1. Switch on analyzer and wait for warm up 打开分析仪并等待预热	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.2. Check sample conditions 检查样气情况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Flow rate 流量: 240 l/h				
7.3. Check zero conditions 检查零点情况	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Flow rate 流量: 150 l/h				
7.4. Perform zero point setting 零点设置	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.5. Perform span test 量程测试	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<i>Test results within specification.</i>
7.6. Parameterize the I/O Module 设置 I/O 模块参数	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.7. Measured values are plausible 测量值是否合理	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.8. Save device data 储存设备数据	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.9. Complete Commissioning Sign-Off Sheet 完成试运行签署表	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
7.10. Instruct the operator personnel 操作员培训 Hand over the maintenance manual and check lists 移交维护手册和检查表 - Measurement reading 读取测量值 - Perform customer maintenance 演示维护方法 - Read messages 读取信息	<input checked="" type="checkbox"/>	<input type="checkbox"/>		

8. Measured value

Index 编号	Source 信号源	Unit 单位	Range 范围		Reading (actual) 实际读数	Output value 产值
			Start 开始	End 结束		
1	HCL	mg/Nm ³	0	120	60.21 ppm	60.21 ppm
2	HF	mg/Nm ³	0	5	4.32 ppm	4.32 ppm
3	CO	mg/Nm ³	0	1000	128.20 ppm	128.20 ppm
4	NO	mg/Nm ³	0	500	122.00 ppm	122.00 ppm
5	NO ₂	mg/Nm ³	0	200	98.80 ppm	98.81 ppm
6	NO _x	mg/Nm ³	0	500	412.22 mg/m ³	412.21 mg/m ³
7	SO ₂	mg/Nm ³	0	300	83.21 ppm	83.21 ppm
8	CO ₂	Vol o/o	0	25	20.00 o/o	20.00 o/o
9	H ₂ O	Vol o/o	0	40	32.01 o/o	32.01 o/o
10	O ₂	Vol o/o	0	21	20.95 o/o	20.95 o/o
11	TOC	mg/Nm ³	0	300	122.01 ppm	122.01 ppm
12	NH ₃	mg/Nm ³	0	100	53.30 ppm	53.30 ppm
13	CH ₄	mg/Nm ³	0	100	112.02 ppm	112.02 ppm
14						
15						

Remarks 备注	
<p>Date 日期: <u>25/7/2018</u></p> <p>Engineer 工程师: <u></u> </p>	<p>Name 签名</p> <p>Plant personnel 用户代表: <u></u></p>

Annex E2

Calibration Certification for the CAPCS

Identifikation / identification

Artikel Nr. / Part No.:	1089203	DHSP30-T2V2FPNNNNXXS	
Ident Nr. / Ident no.:	00116	Serien Nr. / Serial no.:	18168223
Firmware Version / Firmware version:	01.02.06 (Feb 27 2018 11:37:54)		
Bootloader Version / Bootloader version:	01.00.02		
Hardware Revision / Hardware version:	1.2		
Geräteausführung / Device version:			
BUS-Adresse / Bus address:	1		

Parameter / Parameter

Sensorantwortzeit	60.0 sec.	Gebläse / Blower:	installiert
Sensor response time			installed

Messgrößen u. Koeffizienten / Measuring variables and coefficients

Streulichtfaktoren / Scattered light coefficients:	Referenzgerät Streulicht DHSP100 Serien-Nr.:		
CC0 (abs.):	-0.3800	Reference measuring device DHSP100 Serial no.:	
CC1 (lin.):	0.6850	SN: 00014 / 08518553	
CC2 (square):	0.0000		
Verstärkungsfaktor, Offset / Gain factor, Offset:	Spantest 70 Laser / 70.00 %		
Gain 0: 10.0000 Offset 0: 0.00045	Span 70 Laser		
Faktoren Analogausgang / Analog Output factors:	Relais 3:	Wartung / Maintenance	
CC0 (abs.):	2.00		
CC1 (lin.):	170.85		
CC2 (square):	0.00		

Koeffizientensätze Messbereich 0 / Coefficient Sets meas. range 0:

Koeff. Satz 1 / Coeff. set 1:		Koeff. Satz 2 / Coeff. set 2:	
CC 0 (abs.):	0.0000	CC 0 (abs.):	0.0000
CC 1 (lin.):	1.0000	CC 1 (lin.):	1.0000
CC 2 (square):	0.0000	CC 2 (square):	0.0000

Messbereich, Grenzwert / Meas. range, limit:

Messbereichsschalter / Meas. range switch:	0 (Software)
Messbereich Wert1 / Meas. range low value:	0.0 mg
Messbereich Wert2 / Meas. range high value:	75.0 mg
Grenzwert / Limit value:	50.0 mg
Gebläse Druck/Blower Pressure:	10.0 mbar

Modbus Schnittstelle / Modbus interface:

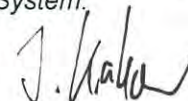
Protokoll / protocol:	RTU
Adresse / address:	1
Baudrate / baudrate:	19200
Datenbits Parität Stopbits / Databits parity stopbits:	8 EVEN 1
Endian Codierung / endian code:	NONE

Das Gerät mit der o.g. Serien-Nr. wurde überprüft und kalibriert nach den Qualitätsstandards der SICK-Gruppe basierend auf einem nach ISO9001 zertifizierten Qualitätssicherungssystem.

This device with the serial no. noted above has been tested and calibrated according to the quality standards of the SICK-Group, which are based on a ISO9001 certified Quality Assurance System.

Ottendorf-Okrilla, 16.04.2018

Unterschrift:
Signature:




Annex F

Implementation Schedule of Mitigation Measures

Annex F1

Implementation Schedule of Mitigation Measures for Construction Phase

Annex F1 Summary of Mitigation Measures Implementation Schedule for Construction Phase

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
<i>Summary of Environmental Mitigation Measures in the EIA and EM&A Manual</i>				
<i>A. Air Quality</i>				
3.73	2.5	<p><u>Air Pollution Control (Construction Dust) Regulation & Good Site Practices</u></p> <ul style="list-style-type: none"> • Use of regular watering, with complete coverage, to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather. • Use of frequent watering for particularly dusty construction areas and areas close to ASRs. • Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering should be applied to aggregate fines. • Open stockpiles should be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs. • Tarpaulin covering of all dusty vehicle loads transported to, from and between site locations. • Establishment and use of vehicle wheel and body washing facilities at the exit points of the site. • Provision of wind shield and dust extraction units or similar dust mitigation measures at the loading points, and use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry seasons/ periods. • Imposition of speed controls for vehicles on unpaved site roads. 8 kilometers per hour is the recommended limit. • Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from ASRs. • Every stock of more than 20 bags of cement or dry pulverised fuel ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides. • Cement or dry PFA delivered in bulk should be stored in a closed silo fitted with an audible high level alarm which is interlocked with the material filling line and no overfilling is allowed. • Loading, unloading, transfer, handling or storage of bulk cement or dry PFA should be carried out in a totally enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air pollution control system. 	Construction Site / During Construction Period	√
<i>B. Hazard to Life</i>				
4.102	3.3	<p><u>Construction Phase</u></p> <ul style="list-style-type: none"> • The number of workers on site during construction stage should be kept at the same level as 	Construction Site / During Construction Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>the assessment.</p> <ul style="list-style-type: none"> • Construction works should be suspended when delivery of chlorine takes place. • 3m high fence should be constructed along the boundary facing the SHWWTW. • Emergency evacuation procedures should be formulated and the Contractor should ensure all workers on site should be familiar with these procedures as well as the route to escape in case of gas release incident. Relevant Departments, such as Fire Services Department (FSD), should be consulted during the development of Emergency procedures. Diagram showing the escape routes to a safe place should be posted in the site notice boards and at the entrance/exit of site. A copy of the latest version emergency procedures should be dispatched to Tung Chung Fire Station for reference once available. • The emergency procedures should specify means of providing a rapid and direct warning (e.g. Siren and Flashing Light) to construction workers in the event of chlorine gas release in the SHWWTW. • The Contractor should establish a communication channel with the SHWWTW operation personnel and FSD during construction stage. In case of any hazardous incidents in the treatment works, operation personnel of SHWWTW should advise the Contractor to inform construction workers to proceed with emergency procedure. The Contractor should appoint a Liaison Officer to communicate with FSD Incident Commander on site in case of emergency. • Introduction training should be provided to any staff before carryout construction works at the Project site. • Periodic drills should be coordinated and conducted to ensure all construction personnel are familiar with the emergency procedures. Upon completion of the drills, a review on every step taken should be conducted to identify area of improvement. Prior notice of periodic drills should be given to Station Commander of Tung Chung Fire Station. Joint operational exercise with FSD and SHWWTW is recommended. 		
<i>C. Water Quality</i>				
5.44	4.5	<p><u>Construction site run-off and general construction activities:</u> The mitigation measures as outlined in the ProPECC PN 1/94 Construction Site Drainage should be adopted where applicable.</p>	Construction Site / During Construction Period	√
5.45	4.5	<p><u>Excavation of Soil Materials</u> The construction programme should be properly planned to minimise soil excavation, if any, in rainy seasons. This prevents soil erosion from exposed soil surfaces. Any exposed soil surfaces should also be properly protected to minimise dust emission. In areas where a large amount of exposed soils exist, earth bunds or sand bags should be provided. Exposed stockpiles should be covered with tarpaulin or impervious sheets at all times. The stockpiles of materials should be</p>	Construction Site / During Construction Period	N/A

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		placed at locations away from any stream courses so as to avoid releasing materials into the water bodies. Final surfaces of earthworks should be compacted and protected by permanent work.		
5.46	4.5	<u>Accidental spillage of chemicals:</u> Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.	Construction Site / During Construction Period	√
5.47	4.5	Maintenance of vehicles and equipments involving activities with potential for leakage and spillage should only be undertaken within the areas which appropriately equipped to control these discharges.	Construction Site / During Construction Period	√
5.48	4.5	Oils and fuels should only be used and stored in designated areas which have pollution prevention facilities. All fuel tanks and storage areas should be sited on sealed areas in order to prevent spillage of fuels and solvents to the nearby watercourses. All waste oils and fuels should be collected in designated tanks prior to disposal.	Construction Site / During Construction Period	N/A
5.49	4.5	Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows: <ul style="list-style-type: none"> • Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport. • Chemical waste containers should be suitably labeled, to notify and warn the personnel who are handling the wastes, to avoid accidents. • Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area. 	Construction Site / During Construction Period	√
5.50	4.5	Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid entering to the nearby watercourses. Stockpiles of cement and other construction materials should be kept covered when not being used. Rubbish and litter from construction sites should also be collected to prevent spreading of rubbish and litter from the site area. It is recommended to clean the construction sites on a regular basis.	Construction Site / During Construction Period	√
5.51	4.5	<u>Sewage Effluent</u>	Work site/During the	N/A

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		The presence of construction workers generates sewage. It is recommended to provide sufficient chemical toilets in the works areas. The toilet facilities should be more than 30m from any watercourse. A licensed waste collector should be deployed to clean the chemical toilets on a regular basis.	construction period	
5.52	4.5	Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the project. Regular environmental audit on the construction site can provide an effective control of any malpractices and can achieve continual improvement of environmental performance on site.	Work Site / During Construction Period	√
5.53	4.5	<p><u>Nullah Decking</u></p> <p>To minimize the potential water quality impacts from the nullah reconstruction works, the practices outlined below should be adopted where applicable:</p> <ul style="list-style-type: none"> • The proposed works should be carried out within the dry season between October and March when the flow in the open nullah is low. • The use of less or smaller construction plants may be specified to reduce the disturbance to the nullah bed. • Temporary storage of materials (e.g. equipment, filling materials, chemicals and fuel) and temporary stockpile of construction materials should be located well away from the nullah and any water courses during carrying out of the construction works. • Stockpiling of construction materials and dusty materials should be covered and located away from the nullah any water courses. • Construction debris and spoil should be covered up and/or disposed of as soon as possible to avoid being washed into the nullah and nearby water receivers. • Construction activities, which generate large amount of wastewater, should be carried out in a distance away from the nullah, where practicable. • Construction effluent, site run-off and sewage should be properly collected and/or treated. • Any works site inside the nullah should be temporarily isolated, such as by placing of sandbags or silt curtains with lead edge at bottom and properly supported props to prevent adverse impact on the water quality. • Proper shoring may need to be erected in order to prevent soil/mud from slipping into the nullah and nearby watercourse. • Supervisory staff should be assigned to station 	Work Site / During Construction Period	N/A
<i>D. Waste Management</i>				
6.41	5.4	<u>Good Site Practices</u>	Work Site / During	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>Recommendations for good site practices during the construction phase would include:</p> <ul style="list-style-type: none"> • Obtain relevant waste disposal permits from appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354) and subsidiary Regulations and the Land (Miscellaneous Provisions) Ordinance (Cap. 28); • Provide staff training for proper waste management and chemical handling procedures; • Provide sufficient waste disposal points and regular waste collection; • Provide appropriate measures to minimize windblown litter and dust during transportation of waste by either covering trucks or by transporting wastes in enclosed containers; • Carry out regular cleaning and maintenance programme for drainage systems, sumps and oil interceptors; • Separate chemical wastes for special handling and disposed of to licensed facility for treatment; and • Employ licensed waste collector to collect waste. 	Construction Period	
6.42	5.5	<p><u>Waste Reduction Measures</u></p> <p>Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Recommendations to achieve waste reduction include:</p> <ul style="list-style-type: none"> • Design foundation works that could minimise the amount of excavated material to be generated; • Provide training to workers on the importance of site cleanliness and appropriate waste management procedures, including waste reduction, reuse and recycling; • Sort out demolition debris and excavated materials from demolition works to recover reusable/ recyclable portions (i.e. soil, broken concrete, metal etc.); • Segregate and store different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal; • Encourage the collection of aluminium cans by providing separate labelled bins to enable this waste to be segregated from other general refuse generated by the workforce; and • Plan and stock construction materials carefully to minimize the amount of waste to be generated and to avoid unnecessary generation of waste. 	Work Site/ During Design & Construction Period	√
6.44	5.7	<p><u>Excavated and C&D Materials</u></p> <p>In order to minimise the impact resulting from collection and transportation of C&D material for off-site disposal, the excavated material arising from site formation and foundation works should be reused on-site as backfilling material and for landscaping works as far as practicable. Other mitigation requirements are listed below:</p> <ul style="list-style-type: none"> • A WMP, which becomes part of the Environmental Management Plan (EMP), should be prepared in accordance with ETWB TCW No.19/2005; 	Work Site/ During Design & Construction Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> • A recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites) should be adopted for easy tracking; and • In order to monitor the disposal of excavated and C&D material at public filling facilities and landfills and to control fly-tipping, a trip-ticket system should be adopted (refer to ETWB TCW No. 31/2004). 		
6.45 – 6.46	5.8 – 5.9	<p>An EMP should be prepared and implemented in accordance with ETWB TCW No. 19/2005 which describes the arrangements for avoidance, reuse, recovery, recycling, storage, collection, treatment and disposal of different categories of waste to be generated from construction activities. The EMP should be submitted to the Supervising Officer (SO) and Supervising Officer's Representative (SOR) for approval. The EMP should be reviewed regularly and updated, preferably on a monthly basis.</p> <p>A system should be devised to work for on-site sorting of excavated and C&D materials and promptly removing all sorted and process materials arising from the construction activities to minimize temporary stockpiling on-site. The system should be included in the EMP identifying the source of generation, estimated quantity, arrangement for on-site sorting, collection, temporary storage areas and frequency of collection by recycling Contractors or frequency of removal off-site.</p>	Work Site/During Design & Construction Period	√
6.47	5.10	<p><u>Chemical Waste</u> Should chemical wastes be produced at the construction site, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used, and incompatible chemicals should be stored separately. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste (such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive). The Contractor should employ a licensed collector to transport and dispose of the chemical wastes, to either the CWTC in Tsing Yi, or any other licensed facilities, in accordance with the Waste Disposal (Chemical Waste) General Regulation.</p>	Work Site / During Construction Period	√
6.48	5.11	<p><u>General Refuse</u> General refuse should be stored in enclosed bins or compaction units separated from C&D material. A licensed waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. Preferably an enclosed and covered area should be provided to reduce the occurrence of 'wind blown' light material.</p>	Work Site / During Construction Period	√
<i>E. Landscape and Visual</i>				
7.99 & Table 7.7	Table 6.1	<p><u>Construction Phase</u> Topsoil, where identified, should be stripped and stored for re-use in the construction of the</p>	Work Site / During Construction Period	N/A

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		soft landscape works, where practical <ul style="list-style-type: none"> • Compensatory tree planting should be provided to compensate for felled trees. - Compensation tree species shall be chosen from both indigenous and ornamental species - Compensatory tree planting quantities shall be as per DLO approved requirement. • Control of night-time lighting • Erection of decorative screen hoarding compatible with the surrounding setting 		
<i>F. Noise</i>				
8.25	7.3	Good Site Practice: <ul style="list-style-type: none"> • Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction program; • Mobile plant, if any, should be sited as far from noise sensitive receivers (NSRs) as possible; • Machines and plant (such as trucks) that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; • Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the nearby NSRs; and • Material stockpiles and other structures should be effectively utilized, wherever practicable, in screening noise from on-site construction activities. 	Work site/ During Design & Construction Stages	<>

Remark:

- √ Compliance of Mitigation Measures
- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by OSCAR Bioenergy JV
- Δ Deficiency of Mitigation Measures but rectified by OSCAR Bioenergy JV
- N/A Not Applicable in Reporting Period

Annex F2

Implementation Schedule of Mitigation Measures for Operation Phase

Annex F2 Summary of Mitigation Measures Implementation Schedule for Operation Phase

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
<i>Summary of Environmental Mitigation Measures in the EIA and EM&A Manual</i>				
<i>A. Air Quality</i>				
3.78	2.7 & 2.13 – 2.19	<u>Air Pollution Control (Construction Dust) Regulation & Good Site Practices</u> <ul style="list-style-type: none"> Commissioning tests shall be conducted to confirm the centralized air pollution control unit, the cogen units, the standby flaring unit and ASP against the design emission levels as stated in Tables 2.2 - 2.5. Odour monitoring shall be conducted at the stack exhaust of the centralized air pollution control unit weekly in the first month of the commissioning stage. 	OWTF Stacks/ During Commissioning Stage	√
3.78	2.7-2.12	<u>Air Pollution Control and Stack Monitoring</u> <ul style="list-style-type: none"> Stack monitoring shall be installed for the centralized air pollution control unit, cogen units and ASP of OWTF to ensure that the air emissions from OWTF would meet the design emission limits as well as EPD criteria. 	During Operation	√
3.78	2.20- 2.28	<ul style="list-style-type: none"> Odour Patrol at site boundary of OWTF 	OWTF Site Boundary/ During Operation (The need to continue the odour patrol after the end of the 2-year monitoring period would depend on the monitoring results and should be agreed with EPD)	N/A
<i>B. Hazard to Life</i>				
4.103	3.4	<u>Operation Phase</u> <ul style="list-style-type: none"> 3m high fence should be constructed along the boundary facing the SHWWTW Emergency evacuation procedures should be formulated and the Contractor should ensure on site staff should be familiar with these procedures. Diagram showing the escape routes to a safe place should be posted in the site notice boards and at the entrance/exit of site. A copy of the latest version emergency procedures should be dispatched to Tung Chung Fire Station for reference once available. The emergency procedures should specify means of providing a rapid and direct warning (e.g. Siren and Flashing Light) to personnel on site in the event of chlorine gas release in the SHWWTW. The Contractor should establish a communication channel with the SHWWTW operation personnel and FSD. In case of any hazardous incidents in the treatment works, operation personnel of SHWWTW should advise the Contractor to inform personnel on site to proceed 	Work Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>with emergency procedure. The Contractor should appoint a Liaison Officer to communicate with FSD Incident Commander on site in case of emergency.</p> <ul style="list-style-type: none"> • Periodic drills should be coordinated and conducted to ensure all on site personnel are familiar with the emergency procedures. Upon completion of the drills, a review on every step taken should be conducted to identify area of improvement. Prior notice of periodic drills should be given to Station Commander of Tung Chung Fire Station. Joint operational exercise with FSD and SHWWTW is recommended. 		
<i>C. Water Quality</i>				
5.44	4.5	<p><u>Wastewater from Organic Waste Treatment Process</u></p> <p>The Project site will be equipped with an adequately sized wastewater treatment plant. A high rate type of active sludge system specifically designed for the removal of nitrogen components from the wastewater in combination with conversion of residual BOD and COD would be deployed. The wastewater treatment plant would also be incorporated with SHARON or annamox technology or equivalent to achieve high total overall nitrogen removal. Wastewater generated from the OWTF (including wastewater from dewatering process, leachate from waste reception area, condensate from biogas handling, wastewater from scrubber of air treatment system and any surplus water from truck washing facility) will be diverted to the wastewater treatment plant. Treated effluent will then be stored temporarily in order to be used as process water within the plants. The storage volume would be around 20 m³. Overflow from the tank will be discharged to foul sewers. The polluting parameters in effluent shall be in compliance with the requirements specified in the TM- DSS. The design, installation and operation of the wastewater treatment plant shall be licensed under the Waste Disposal Ordinance and subject to the effluent monitoring as required under the WPCO which is under the ambit of regional office (RO) of EPD. To ensure that wastewater can be adequately treated and effluent from treatment plant can meet the standards listed in TM- DSS, the following mitigation measure should be conducted.</p> <ul style="list-style-type: none"> • Cleaning and maintenance of treatment facilities should be conducted on a regular basis to ensure that removal rate of each treatment facility would not be reduced. • Cleaning and maintenance of pipelines should be carried out on a regular basis to prevent block of pipeline and leaching of wastewater, and therefore prevent overflowed or leached wastewater discharging into nearby drainages and water streams. • Regular site inspection should be conducted to ensure that no wastewater can be directly discharged into nearby water streams. 	Work Site / During Design & Operation Period	√
5.55	4.5	<p>In the scrubber, spraying water should be re-circulated to minimize the need for external water. The spraying water would be collected at the bottom of the scrubber. Excess water would be discharged to the wastewater treatment plant as described in Section 5.54.</p>	Work Site / During Design & Operation Period	√
5.56	4.5	<p>The waste reception, treatment facilities and compost storages of OWTF should be located in</p>	Work Site / During Design &	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		enclosed buildings to prevent generation of contaminated rain runoff. All surface runoff such as washed water generated in the treatment processes areas should be properly collected and diverted to the on-site wastewater treatment plant as described in Section 5.54.	Operation Period	
5.57	4.5	All drainage system for collection and transferring wastewater generated in the OWTF to the on-site wastewater treatment plant as described in Section 5.54 should be capable of preventing clogging and easy maintenance and cleaning.	Work Site / During Design & Operation Period	Δ
<i>D. Waste Management</i>				
6.50	5.12	<p><u>Good Site Practices</u></p> <p>Good operational practices should be adopted to Minimize waste management impacts:</p> <ul style="list-style-type: none"> • Obtain the necessary waste disposal permits from the appropriate authorities, in accordance with the Waste Disposal Ordinance (Cap. 354), Waste Disposal (Chemical Waste) (General) Regulation and the Land (Miscellaneous Provision) Ordinance (Cap. 28); • Nomination of an approved person to be responsible for good site practice, arrangements for collection and effective disposal to an appropriate facility of all wastes generated at the site; • Use of a waste haulier licensed to collect specific category of waste; • A trip-ticket system should be included as one of the contractual requirements and implemented by the Environmental Team to monitor the disposal of solid wastes at public filling facilities and landfills, and to control fly tipping. Reference should be made to ETWB TCW No. 31/2004. • Training of site personnel in proper waste management and chemical waste handling procedures; • Separation of chemical wastes for special handling and appropriate treatment at a licensed facility; • Routine cleaning and maintenance programme for drainage systems, sumps and oil interceptors; • Provision of sufficient waste disposal points and regular collection for disposal; • Adoption of appropriate measures to minimize windblown litter and dust during transportation of waste, such as covering trucks or transporting wastes in enclosed containers; and • Implementation of a recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites). 	During Operation Period	√
6.51	5.13	<p><u>Waste Reduction Measures</u></p> <p>Good management and control can prevent the generation of significant amounts of waste. It is recommended that the following good operational practices should be adopted to ensure waste reduction:</p> <ul style="list-style-type: none"> • Segregation and storage of different types of waste in different containers, skips or stockpiles to enhance reuse or recycling of materials and their proper disposal; 	During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> Encourage collection of aluminum cans, plastic bottles and packaging material (e.g. carton boxes) and office paper by individual collectors. Separate labelled bins should be provided to help segregate this waste from other general refuse generated by the work force; and Any unused chemicals or those with remaining functional capacity should be reused as far as practicable. 		
6.52	5.14	<p><u>Wastes Generated from Pre-Treatment Process</u></p> <p>Wastes generated from pre-treatment process should be recycled as far as possible. Wastes generated from pre-treatment process should also be separated from any chemical waste and stored in covered skips. The recyclables should be collected by licensed collectors, while the rest of the waste should be removed from the site on a daily basis to minimize odour, pest and litter impacts. Open burning must be strictly prohibited.</p>	Pre-Treatment Process/ During Operation Period	√
6.53-6.56	5.15-5.18	<p><u>Chemical Wastes</u></p> <ul style="list-style-type: none"> Chemical waste generated from machinery maintenance and servicing should be managed in accordance with Code of Practice on the Packaging, Labelling and storage of Chemical Wastes under the provisions of Waste Disposal (Chemical Waste) (General) Regulation. The chemical waste should be collected by drum-type containers and removed by licensed chemical waste contractors. Plant / equipment maintenance schedules should be planned in order to minimize the generation of chemical waste. Non-recyclable chemical wastes and lubricants should be disposed of at appropriate facilities, such as CWTC. Copies or counterfoils from collection receipts issued by the licensed waste collector should be kept for recording purpose. Recyclable chemical waste will be transported off-site for treatment by a licensed collector. The Contractor will need to register with EPD as a chemical waste producer. Where possible, chemical wastes (e.g. waste lubricants) would be recycled at appropriate facilities, such as Dunwell's oil re-refinery. 	Whole Site / During Operation Period	√
6.57-6.58	5.19-5.20	<p><u>General Refuse</u></p> <ul style="list-style-type: none"> Waste generated in offices should be reduced through segregation and collection of recyclables. To promote the recycling of wastes such as used paper, aluminum cans and plastic bottles, it is recommended that recycling bins should be clearly labelled and placed at locations with easy access. For the collection of recyclable materials, they should be collected by licensed collectors. General refuse, other than segregated recyclable wastes, should be separated from any chemical waste and stored in covered skips. The general refuse should be removed from the site on a daily basis to minimize odour, pest and litter impacts. Also, open burning of refuse must be strictly prohibited. 	Whole Site / During Operation Period	√
E. Proposed Land Contamination Preventive Measures				

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
6.65	5.21 (i)	<u>Fuel Oil Containers</u> <ul style="list-style-type: none"> • Fuel oil should be stored in suitable containers. • All fuel oil containers should be securely closed. • Appropriate labels showing the name of fuel oil should be posted on the containers. • Drip trays should be provided for all containers. 	Fuel Oil Storage Containers /During Operation Period	√
6.65	5.21 (ii)	<u>Storage Area</u> <ul style="list-style-type: none"> • Distance between the fuel oil refuelling points and the fuel oil containers should be minimized. • The storage area should be used for fuel oil storage only. • No surface water drains or foul sewers should be connected to the storage area. • The storage area should be enclosed by three sides by a wall and have an impermeable floor or surface. 	Fuel Oil Storage Area /During Operation Period	√
6.65	5.21 (iii)	<u>Fuel Oil Spillage Response</u> An Oil Spill Response Plan should be prepared by the operator to document the appropriate response procedures for oil spillage incident in detail. General procedures to be taken in case of fuel oil spillage are presented below. <ul style="list-style-type: none"> • <u>Training</u> Training on oil spill response actions should be given to relevant staff. The training should cover the followings: <ul style="list-style-type: none"> - Tools & resources to combat oil spillage and fire, e.g. locations of oil spill handling equipment and firefighting equipment; - General methods to deal with oil spillage and fire incidents; - Procedures for emergency drills in the event of oil spills and fire; and - Regular drills should be carried out. • <u>Communication</u> Establish communication channel with the Fire Services Department (FSD) and EPD to report any oil spillage incident so that necessary assistance from relevant department could be quickly sought. • <u>Response Procedure</u> Any fuel oil spillage within the Project Site should be immediately reported to the Site Manager with necessary details including location, source, possible cause and extent of the spillage Site Manager should immediately attend to the spillage and initiate any appropriate action to confine and clean up the spillage. The response procedures should include the following: <ul style="list-style-type: none"> - Identify and isolate the source of spillage as soon as possible. - Contain the oil spillage and avoid infiltration into soil / groundwater and 	Whole Site / During Operation Phase	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<p>discharge to storm water channels.</p> <ul style="list-style-type: none"> - Remove the oil spillage. - Clean up the contaminated area. - If the oil spillage occurs during refuelling, the refuelling operation should immediately be stopped. - Recovered contaminated fuel oil and the associated material to remove the spilled oil should be considered as chemical waste. The handling and disposal procedures for chemical wastes are discussed in the following paragraphs. 		
6.66	5.22 (i)	<p><u>Chemicals and Chemical Wastes Handling & Storage</u></p> <ul style="list-style-type: none"> • Chemicals and chemical wastes should only be stored in suitable containers in purpose-built areas. • The storage of chemical wastes should comply with the requirements of the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. • The storage areas for chemicals and chemical wastes should have an impermeable floor or surface. The impermeable floor I surface should possess the following properties: <ul style="list-style-type: none"> - Not liable to chemically react with the materials and their containers to be stored. - Able to withstand normal loading and physical damage caused by container handling - The integrity and condition of the impermeable floor or surface should be inspected at regular intervals to ensure that it is satisfactorily maintained • For liquid chemicals and chemical wastes storage, the storage area should be bonded to contain at least 110% of the storage capacity of the largest containers or 20% of the total quantity of the chemicals/chemical wastes stored, whichever is the greater. • Storage container should be checked at regular intervals for their structural integrity and to ensure that the caps or fill points are tightly closed. • Chemical handling should be conducted by trained workers under supervision. 	Whole Site / During Operation Period	<>
6.66	5.22 (ii)	<p><u>Chemicals and Chemical Wastes Spillage Response</u></p> <p>A Chemicals and / or Chemical Wastes Spillage Response Plan should be prepared by the operator to document in detail the appropriate response procedures for chemicals or chemical wastes spillage incidents. General procedures to be undertaken in case of chemicals I chemical waste spillages are presented below</p> <ul style="list-style-type: none"> • Training • Training on spill response actions should be given to relevant staff. The training should cover the followings: 	Whole Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<ul style="list-style-type: none"> - Tools & resources to handle spillage, e.g. locations of spill handling equipment; - General methods to deal with spillage; and - Procedures for emergency drills in the event of spills. <ul style="list-style-type: none"> • Communication Establish communication channel with Fire Services Department (FSD) and EPD to report the spillage incident so that necessary assistance from relevant department could be quickly sought. • Response Procedures Any spillage within OWTF site should be reported to the Site Manager. Site Manager shall attend to the spillage and initiate any appropriate actions needed to confine and clean up the spillage. The response procedures should include the followings: <ul style="list-style-type: none"> - Identify and isolate the source of spillage as soon as possible; - Contain the spillage and avoid infiltration into soil / groundwater and discharge to storm water channels (in case the spillage occurs at locations out of the designated storage areas); - Remove the spillage; the removal method / procedures documented in the Material Safety Data Sheet (MSDS) of the chemicals spilled should be observed; - Clean up the contaminated area (in case the spillage occurs at locations out of the designated storage areas); and - The waste arising from the cleanup operation should be considered as chemical wastes. 		
6.67 - 6.69	5.23- 5.25	<p><u>Incident Record</u></p> <ul style="list-style-type: none"> • After any spillage, an incident report should be prepared by the Site Manager. The incident report should contain details of the incident including the cause of the incident, the material spilled and estimated spillage amount, and also the response actions undertaken. The incident record should be kept carefully and able to be retrieved when necessary. • The incident report should provide sufficient details for the evaluation of any environmental impacts due to the spillage and assessment of the effectiveness of measures taken. • In case any spillage or accidents results in significant land contamination, EPD should be informed immediately and the Project operator should be responsible for the cleanup of the affected area. The responses procedures described in Sections 6.65 - 6.66 of the EIA Report should be followed accordingly together with the land contamination assessment and remediation guidelines stipulated in the <i>Guidance</i> 	Whole Site / During Operation Period	√

EIA Ref.	EM&A Log Ref.	Environmental Protection Measures	Location/ Timing	Status
		<i>Manual for Use of Risk-based Remediation Goals for Contaminated Land Management and the Guidance Note for Contaminated Land Assessment and Remediation.</i>		
<i>F. Landscape and Visual</i>				
7.98 & Table 7.8	Table 6.2	<u>Operation Phase</u> <ul style="list-style-type: none"> • Aesthetic design of the facade, including its colour theme, pattern, texture , materials, finishing and associated structures to harmonize with the surrounding settings • Grass / groundcover planting to soften the roof • Heavy standard tree planting to screen proposed associated structures • Grasscrete paving to soften the harshness of large paved surface areas wherever possible 	Within Project Area / During Design & Operation Stages	√

Remark:

- √ Compliance of Mitigation Measures
- <> Compliance of Mitigation but need improvement
- x Non-compliance of Mitigation Measures
- ▲ Non-compliance of Mitigation Measures but rectified by OSCAR Bioenergy JV
- Δ Deficiency of Mitigation Measures but rectified by OSCAR Bioenergy JV
- N/A Not Applicable in Reporting Period

Annex G

Laboratory Results for NMVOCs



STACK GAS SAMPLING AND LABORATORY TESTING REPORT

Location: Organic Resources Recovery Centre Phase 1 (ORRC1)

Sampling Period: 3rd May, 2019

Stack ID: CHP-1

ALS Work Order No: HK1918585B

Report Issue Date: 10th May, 2019

CLIENT:
Oscar Bioenergy Joint Venture
No. 5, Sham Fung Road,
Siu Ho Wan, Lantau Island, NT
Hong Kong

PREPARED BY:

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This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

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1. Summary of Work

The document is the final report for the stack gas sampling and testing event for Oscar Bioenergy Joint Venture in Siu Ho Wan, North Lantau Island.

Sampling Period: 3rd May, 2019
Location of Stack: ORRC1, Siu Ho Wan
No. of Stack: 1
Name of Stack: CHP-1

Methods for Stack Sampling and Analysis:

Parameter	Method Reference	Sampling Time (minutes)
Volatile Organic Compounds (VOCs) ^[1]	US EPA Method 18	60

Note:

[1]: Results expressed as carbon.

2. Sampling Summary

Volatile Organic Compounds (VOCs)

Sample gas was collected by using a stainless steel sampling probe, from the centroid of the stack, into the Tedlar bag by passive sampling technique.

The measurement of total volatile organic compounds (VOCs) content in the sample was conducted in references to BS EN 12619. VOCs content was determined by measuring the methane and non-methane volatile organic compounds of the sample by Gas Chromatograph-Flame Ionisation Detector (GC-FID).

VOCs was reported as the sum of methane and non-methane organics content in the sample.

3. Sampling Period

Test Parameters	Sampling Period
Volatile Organic Compounds (VOCs)	3 May 2019 13:02 - 14:02



4. Stack Parameter

Test Parameter	Sampling Volume (m ³) [1]	Carbon Dioxide Content (%) [1]	Oxygen Content (%) [1]	Moisture Content (%)
VOCs	-	11.7	8.3	13.4

Note:

[1]: Expressed as at dry, 0 deg. C, 101.325 kilopascal pressure conditions.

5. Result

Parameter	Unit	Reporting Limit	Result
Gaseous & vaporous organic substances (VOCs) [2]	mg/m ³ [1]	0.7	658
	kg/hr	0.003	2.25
Methane (CH ₄) [2]	mg/m ³ [1]	0.5	652
	kg/hr	0.002	2.23
Non-Methane Organic Carbon (NMOC) [2]	mg/m ³ [1]	0.2	5.7
	kg/hr	0.001	0.02

Note:

[1]: Results expressed as dry, at 0 degree Celsius temperature, 101.325 kilopascal pressure and 6% O₂ content conditions.

[2]: Results expressed as carbon.



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STACK GAS SAMPLING AND LABORATORY TESTING REPORT

Location: Organic Resources Recovery Centre Phase 1 (ORRC1)

Sampling Period: 14th May, 2019

Stack ID: CHP-3

ALS Work Order No: HK1919461B

Report Issue Date: 24th May, 2019

CLIENT:

Oscar Bioenergy Joint Venture
No. 5, Sham Fung Road,
Siu Ho Wan, Lantau Island, NT,
Hong Kong

PREPARED BY:

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Manager

Mr Fung Lim Chee, Richard
Managing Director, Hong Kong

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

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1. Summary of Work

The document is the final report for the stack gas sampling and testing event for Oscar Bioenergy Joint Venture at Siu Ho Wan, North Lantau Island.

Sampling Period: 14th May, 2019
Location of Stack: ORRC1, Siu Ho Wan
No. of Stack: 1
Name of Stack: CHP-3

Methods for Stack Sampling and Analysis:

Parameter	Method Reference	Sampling Time (minutes)
Volatile Organic Compounds (VOCs) ^[1]	US EPA Method 18	60

Note:

[1]: Results expressed as carbon.

2. Sampling Summary

Volatile Organic Compounds (VOCs)

Sample gas was collected by using a stainless steel sampling probe, from the centroid of the stack, into the Tedlar bag by passive sampling technique.

The measurement of total volatile organic compounds (VOCs) content in the sample was conducted in references to BS EN 12619. VOCs content was determined by measuring the methane and non-methane volatile organic compounds of the sample by Gas Chromatograph-Flame Ionisation Detector (GC-FID).

VOCs was reported as the sum of methane and non-methane organics content in the sample.

3. Sampling Period

Test Parameters	Sampling Period
Volatile Organic Compounds (VOCs)	14 May 2019 10:56 - 11.56



4. Stack Parameter

Test Parameter	Sampling Volume (m ³) [1]	Carbon Dioxide Content (%) [1]	Oxygen Content (%) [1]	Moisture Content (%)
VOCs	-	11.6	8.2	14.3

Note:

[1] Expressed as at dry, 0 deg. C, 101.325 kilopascal pressure conditions.

5. Result

Parameter	Unit	Reporting Limit	Result
Gaseous & vaporous organic substances (VOCs) [3]	mg/m ³ [1]	0.7	781
	kg/hr	0.003	2.796
Methane (CH ₄) [3]	mg/m ³ [1]	0.5	776
	kg/hr	0.002	2.778
Non-Methane Organic Carbon (NMOC) [3]	mg/m ³ [1]	0.2	5.2
	kg/hr	0.001	0.019

Note:

[1] Results expressed as dry, at 0 degree Celsius temperature, 101.325 kilopascal pressure and 6% O₂ content conditions.

[2] Results expressed as carbon.

CERTIFICATE OF ANALYSIS

CLIENT:	Oscar Bioenergy Joint Venture	WORK ORDER:	HK1922259
CONTACT:	Mr Edwin wong	LABORATORY:	Hong Kong
ADDRESS:	No. 5, Sham Fung Road, Siu Ho Wan, Lantau Island, NT, Hong Kong	SUB-BATCH:	0
PROJECT:	Stack Gas Sampling	DATE RECEIVED:	24 May, 2019
SITE:	ORRC1, Siu Ho Wan, Lantau Island	DATE OF ISSUE:	3 Jun, 2019
PO: ---		SAMPLE TYPE:	Air
		NO OF SAMPLES:	1

COMMENTS

One (1) stack gas sample was collected by ALS Technichem (HK) staff on 24th May, 2019 at the Organic Resources Recovery Centre (Phase 1) in Lantau Island.

The sample(s) were analysed and reported on an as received basis.

NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

Richard Fung
Managing Director - Hong Kong



1. Summary of Work

The document is the final report for the stack gas sampling and testing event for Oscar Bioenergy Joint Venture at Siu Ho Wan, North Lantau Island.

Sampling Period: 24th May, 2019
Location of Stack: ORRC1, Siu Ho Wan
No. of Stack: 1
Name of Stack: CHP-1

Methods for Stack Sampling and Analysis:

Parameter	Method Reference	Sampling Time (minutes)
Volatile Organic Compounds (VOCs) ^[1]	US EPA Method 18	60
Non-Methane Volatile Organic Compounds (NMCOCs) ^[1]	US EPA Method 18	60

Note:

[1]: Results expressed as carbon

2. Sampling Summary

Volatile Organic Compounds (VOCs)

Sample gas was collected by using a stainless steel sampling probe, from the centroid of the stack, into the Tedlar bag by passive sampling technique.

The measurement of total volatile organic compounds (VOCs) content in the sample was conducted in references to BS EN 12619. VOCs content was determined by measuring the methane and non-methane volatile organic compounds of the sample by Gas Chromatograph-Flame Ionisation Detector (GC-FID).

VOCs was reported as the sum of methane and non-methane organics content in the sample.

3. Sampling Period

Test Parameters	Sampling Period
Volatile Organic Compounds (VOCs)	24 May 2019 10:40 – 11:40



4. Result

Parameter	Unit	Reporting Limit	Result ^[1]
Gaseous & vaporous organic substances (VOCs) ^[2]	mg/m ³	0.7	876
Methane (CH ₄) ^[2]	mg/m ³	0.5	871
Non-Methane Organic Carbon (NMOC) ^[2]	mg/m ³	0.2	5.0

Note:

[1]: Results expressed as dry, at 0 degree Celsius temperature, 101.325 kilopascal pressure and 6% O₂ content conditions.

[2]: Results expressed as carbon.

[3]: The average Oxygen content in the flue gas was 9.1% during the sampling period.

Annex H

Waste Flow Table

Annex H1

Construction Phase Waste Flow Table

No. EP/SP/61/10 of Organic Resources Recovery Centre (Phase I)
Monthly Summary Waste Flow Table

Month	Actual Quantities of Inert C&D Materials Generated					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
May 2015	29.58	0.00	0.00	0.00	29.58	0.00	0.00	0.00	0.00	0.00
June 2015	2226.90	0.00	0.00	0.00	2226.90	0.00	0.00	0.00	0.00	9.66
July 2015	2832.27	0.00	0.00	0.00	2832.27	0.00	0.00	0.00	0.00	33.68
August 2015	6657.25	0.00	0.00	0.00	6657.25	0.00	20.00	0.00	0.00	55.06
September 2015	5467.05	0.00	0.00	0.00	5467.05	3480.00	0.00	0.00	0.00	83.81
October 2015	5419.04	0.00	0.00	0.00	5419.04	18710.00	0.00	0.00	0.00	20.45
November 2015	1375.26	0.00	0.00	0.00	1375.26	21610.00	0.00	0.00	0.00	17.38
December 2015	2199.56	75.28	0.00	0.00	2124.28	0.00	41.00	0.00	0.00	21.83
January 2016	4601.43	0.00	0.00	0.00	4601.43	18140.00	50.00	0.00	640.00	20.86
February 2016	4167.01	0.00	0.00	0.00	4167.01	510.00	79.00	0.00	0.00	16.57
March 2016	299.92	41.28	0.00	0.00	258.64	22320.00	75.00	0.00	0.00	22.69
April 2016	3186.37	98.37	0.00	0.00	3088.00	60690.00	77.00	0.00	255.00	37.63
May 2016	1612.33	63.41	0.00	0.00	1548.92	13490.00	35000.00	0.00	0.00	40.76
June 2016	1144.73	30.43	0.00	0.00	1114.30	14600.00	120.00	0.00	0.00	58.34
July 2016	662.76	0.00	0.00	0.00	662.76	13370.00	0.00	0.00	0.00	40.48
August 2016	391.88	0.00	0.00	0.00	391.88	18660.00	84.00	0.00	0.00	61.91
September 2016	324.35	0.00	0.00	0.00	324.35	56800.00	2780.00	0.00	0.00	138.25
October 2016	1561.82	39.00	0.00	0.00	1522.82	40000	9.30	0.00	700.00	114.47
November 2016	897.23	507.94	00.00	0.00	389.76	0.00	123.00	0.00	0.00	154.22
December 2016	2477.95	489.00	0.00	0.00	1988.95	2960.00	93.00	0.00	0.00	136.80
January 2017	2150.92	503.60	0.00	0.00	1647.32	31240.00	21051.00	3630.00	0.00	127.43

Month	Actual Quantities of Inert C&D Materials Generated					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
February 2017	553.80	440.00	0.00	0.00	113.80	14940.00	18820.00	2880.00	460.00	83.46
March 2017	665.93	460.00	0.00	0.00	205.93	11660.00	29370.00	4400.00	660.00	99.59
April 2017	553.41	220.00	0.00	0.00	333.41	8600.00	25610.00	520.00	700.00	81.83
May 2017	388.82	211.00	0.00	0.00	177.82	1090.00	64.00	0.00	0.00	109.10
June 2017	352.12	104.00	0.00	0.00	248.12	1800.00	16400.00	12030.00	700.00	70.58
July 2017	400.72	165.00	0.00	0.00	235.72	6500.00	12330.00	4690.00	0.00	52.20
August 2017	589.89	202.00	0.00	0.00	387.89	23330.00	27079.00	5220.00	700.00	69.52
September 2017	3347.18	1364.00	0.00	0.00	1983.18	33379.00	29426.00	3990.00	0.00	62.82
October 2017	2384.86	984.00	0.00	0.00	1400.86	11842.00	34071.00	5230.00	0.00	74.13
November 2017	797.42	384.18	0.00	0.00	413.24	20210.00	25225.00	4030.00	0.00	163.03
December 2017	106.32	51.00	0.00	0.00	55.32	17650.00	19520.00	3210.00	0.00	82.23
January 2018	283.65	125.83	0.00	0.00	157.82	12900.00	15600.00	12330.00	0.00	30.93
February 2018	122.31	55.70	0.00	0.00	66.61	10950.00	13260.00	6570.00	0.00	16.95
March 2018	217.06	99.80	0.00	0.00	117.26	12260.00	12120.00	5960.00	0.00	32.53
April 2018	1118.36	460.58	0.00	0.00	657.78	16320.00	12590.00	6280.00	0.00	33.90
May 2018	475.54	198.85	0.00	0.00	276.69	15230.00	11024.00	0.00	0.00	40.02
June 2018	684.10	256.50	0.00	0.00	427.60	14320.00	10260.00	2630.00	0.00	43.01
July 2018	93.99	42.00	0.00	0.00	51.99	11220.00	6200.00	0.00	0.00	59.77
August 2018	528.56	225.00	0.00	0.00	303.56	13620.00	33400.00	26760.00	0.00	44.50
September 2018	765.70	325.00	0.00	0.00	440.70	10600.00	4500.00	0.00	0.00	41.82
October 2018	0.00	0.00	0.00	0.00	0.00	0.00	2330.00	0.00	0.00	109.49
November 2018	77.71	0.00	0.00	0.00	77.71	0.00	0.00	0.00	0.00	30.18
December 2018	88.43	0.00	0.00	0.00	88.43	0.00	0.00	0.00	0.00	5.72
January 2019	21.13	0.00	0.00	0.00	21.13	0.00	0.00	0.00	1880.00	4.55

Month	Actual Quantities of Inert C&D Materials Generated					Actual Quantities of Non-inert C&D Materials (Construction Waste) Generated				
	Total Quantity Generated	Reused in the Contract	Reused in other Projects	Hard Rocks & Large Broken Concrete	Disposed as Public Fill	Metals (see Note 1)	Paper/ cardboard packaging (see Note 1)	Plastics (see Note 2)	Chemical Waste	Others, e.g. general refuse (see Note 3)
	tonne	tonne	tonne	tonne	tonne	kilogram	kilogram	kilogram	Litre	tonne
February 2019	326.44	0.00	0.00	0.00	326.44	0.00	0.00	0.00	0.00	26.69
March 2019	190.4	0.00	0.00	0.00	190.40	0.00	0.00	0.00	0.00	16.45
April 2019	199.71	0.00	0.00	0.00	199.71	0.00	0.00	0.00	0.00	2.92
May 2019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.16
Total	65036.55	8222.28	0.00	0.00	56814.27	605001.00	418801.30	110360.00	6695.00	2704.36

- Notes: (1) Metal and paper/cardboard packaging were collected by recycler for recycling.
(2) Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material collected by recycler for recycling.
(3) General refuse was disposed of at NENT by subcontractors.

Annex H2

Operation Phase Waste Flow Table

**No. EP/SP/61/10 of Organic Resources Recovery Centre (Phase 1)
Monthly Summary Waste Flow Table**

Month	Chemical Waste	Waste Generated from Pretreatment Process				General Refuse							
		Disposed of at Landfill (see Note 1)	Metals (see Note 2)	Paper/ cardboard packaging (see Note 2)	Plastics (see Note 3)	Disposed of at Landfill (see Note 1 & 4)		Metals (see Note 2)		Paper/ cardboard packaging (see Note 2)		Plastics (see Note 3)	
	Litre	tonne	kilogram	kilogram	kilogram	No. of collection	tonne	No. of collection	kilogram	No. of collection	kilogram	No. of collection	kilogram
March 2019	1,200	477.08	0	0	0	26	1.50	0	0	0	0	0	0
April 2019	0	455.60	0	0	0	22	1.27	0	0	0	0	0	0
May 2019	1,000	528.22	0	0	0	25	2.88	0	0	0	0	1	390
Total	2,200	1,460.91	0	0	0	48	2.76	0	0	0	0	1	390

Notes:

1. General refuse was disposed of at NENT by subcontractors.
2. Metal and paper/cardboard packaging were collected by recycler for recycling.
3. Plastics refer to plastic bottles/containers, plastic sheets/foam from packaging material collected by recycler for recycling.
4. It was assumed that four 240-litre bins filled with 80% of general refuse were collected at each collection. The general refuse density was assumed to be around 0.15 kg/L.

Annex I

Environmental Complaint,
Environmental Summons
and Persecution Log

Annex I Cumulative Complaint and Summons/Prosecutions Log

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
May 2015	0	0
June 2015	0	0
July 2015	0	0
August 2015	0	0
September 2015	0	0
October 2015	0	0
November 2015	0	0
December 2015	0	0
January 2016	0	0
February 2016	0	0
March 2016	0	0
April 2016	0	0
May 2016	0	0
June 2016	0	0
July 2016	0	0
August 2016	0	0
September 2016	0	0
October 2016	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
November 2016	0	0
December 2016	0	0
January 2017	0	0
February 2017	0	0
March 2017	0	0
April 2017	0	0
May 2017	0	0
June 2017	0	0
July 2017	0	0
August 2017	0	0
September 2017	0	0
October 2017	0	0
November 2017	0	0
December 2017	0	0
January 2018	0	0
February 2018	0	0
March 2018	0	0
April 2018	0	0
May 2018	0	0
June 2018	0	0

Reporting Month	Number of Complaints in Reporting Month	Number of Summons/Prosecutions in Reporting Month
July 2018	0	0
August 2018	0	0
September 2018	1	0
October 2018	0	0
November 2018	0	0
December 2018	0	0
January 2019	0	0
February 2019	0	0
March 2019	0	0
April 2019	0	0
May 2019	0	0
Overall Total	1	0

Annex J

Investigation Report

Investigation Report of CEMS Exceedances

Date	1 – 31 May 2019
Time	Continuous monitoring throughout May 2019
Monitoring Location	Continuous Environmental Monitoring System (CEMS)
Parameter	Various emission parameters of the Cogeneration Units (CHP) and Ammonia Stripping Plan (ASP)
Exceedance Description	<ol style="list-style-type: none"> 1. Continuous monitoring was carried out for CAPCS, CHP and ASP throughout the reporting period using the CEMS. According to the EM&A Manual, exceedance is considered if the emission concentration of the concerned pollutants is higher than the emission limits stated in Tables 2.2, 2.3 and 2.5 of the EM&A Manual (Version E) for CAPCS, CHP and ASP respectively. The concentration of the concerned air pollutants were monitored on-line by the CEMS. Exceedances of various emission parameters were recorded on the CEMS including: <ul style="list-style-type: none"> • NO_x and SO₂ in the CHP; and • Dust, CO, NO_x, SO₂, VOCs, NH₃ and HF in the ASP. 2. According to the Contractor, the plant was receiving around 100 tonnes of SSOW daily and was operated normally. 3. CHP setting was undergoing fine-tuning for performance optimisation which leads to the ineffective removal of NO_x at a certain period of time. 4. According to the Contractor, the SO₂ exceedances recorded in the CHP could be due to the tripping of the desulphurisation column resulting in the incomplete desulphurisation of biogas in previous process. 5. The Contractor explained that the exceedances recorded in Dust, CO, NO_x, SO₂, VOCs, NH₃ and HF in the ASP was because the thermal combustion unit of the ASP still require tuning to optimise the combustion efficiency. In addition, the Contractor reported that the tuning of the thermal combustion unit took longer than anticipated resulting in the many exceedances recorded during the reporting period.
Action Taken / Action to be Taken	<ul style="list-style-type: none"> • Continuous optimisation of CHP and re-adjustment of NO_x control for CHP has been carried out. • Continuous monitoring and routine maintenance of the desulphurisation column to reduce the duration of desulphurisation column tripping. • Tuning of the thermal combustion unit was carried out to optimise the combustion efficiency in order to remove the pollutants in the biogas.
Remedial Works and Follow-up Actions	The Contractor is recommended to closely monitor the processes, including the desulphurisation process, and

	combustion of biogas in the ASP to avoid the reoccurrence of similar problems. MT will carry out follow-up audit regarding the progress next month.
--	---

Prepared by: Bonia Leung, MT Representative

Date: 10 June 2019

Investigation Report of Treated Effluent Leakage

Date	21 May 2019
Time	15:30
Monitoring Location	ORRC1 Treated Effluent Pump Room
Parameter	Treated Effluent
Description	<ol style="list-style-type: none"> 1. Wastewater generated from plant operation is treated onsite and stored in treated effluent tank before its discharge to the public sewage system. The treated effluent pump room is equipped with discharge pumps to discharge the treated effluent to the sewage system or back to the plant as process recycled water. 2. At 15:30 on 21 May 2019, brown liquid was found leaking out of the treated effluent pump room by the staff of the maintenance team (MT). Staff of the operation team (OPS) was informed immediately. MT and OPS checked the pump room and found the brown liquid was leaked from a treated effluent discharge pump. 3. It was identified that the brown liquid was treated effluent. The leaked treated effluent entered the nearby storm water channel and was found in the nullah.
Action Taken / Action to be Taken	<ul style="list-style-type: none"> • The teams stopped the pump and isolated the valves before and after the leaked pump. • Sandbags were put in the storm water channel to block the treated effluent leakage to the nullah. • The means cleaned up the remaining treated effluent in the storm water system using an interceptor. The remaining treated effluent was pumped back to the the plant’s wastewater treatment system. • It was identified that the gasket on the pump was damaged. The damaged gasket was replaced on 21 May 2019. • After the clean-up and the replacement of the gasket, no brown liquid was found at the discharge outlet and the nullah.
Remedial Works and Follow-up Actions	The Contractor is recommended to arrange routine preventative maintenance on discharge pumps to avoid damage of gasket; regular patrol of treated effluent pump room to closely monitor the situation; and put sandbags inside the pump room for easy access.

Prepared by: Bonia Leung, MT Representative
 Date: 21 October 2019

Extract of the Incident Notification Form on Treated Effluent Leakage Prepared by the Contractor

Description of the Process

Wastewater generated from plant operation is treated before discharge to Drainage Service Department (DSD) sewage system. Treated wastewater/ Treated Effluent is temporary stored inside treated effluent tank. Treated effluent pump room is equipped with discharged pumps to discharge the treated effluent to DSD or discharge back to the plant as process recycle water.

Description of the Incident

On 21st May 2019 around 15:30, brown water was found leaked out from the treated effluent pump room by maintenance team (MT) technician. Operation team (OPS) was immediately informed. MT and OPS immediate checked the pump room inside and found that the brown water was leaked from a treated effluent discharge pump (5084PS601). The team immediate stopped the pump and also isolated the valves before and after the pump.

The brown water was treated effluent and was leaked to nearby storm water channel. The teams also immediate put sandbags to block the leakage. A small amount of treated effluent was found leak to the nullah.

The teams then opened the petrol interceptor to clean up the residue treated effluent in the storm waste system and pump back to the plant's wastewater system. A water sample was also taken by on-site EPD representatives at the outlet and preliminary measured result was pH 7.

Figure.1 Brown water was found leak from treated effluent pump room



Figure.2 Leakage Location (photo was taken after the incident)

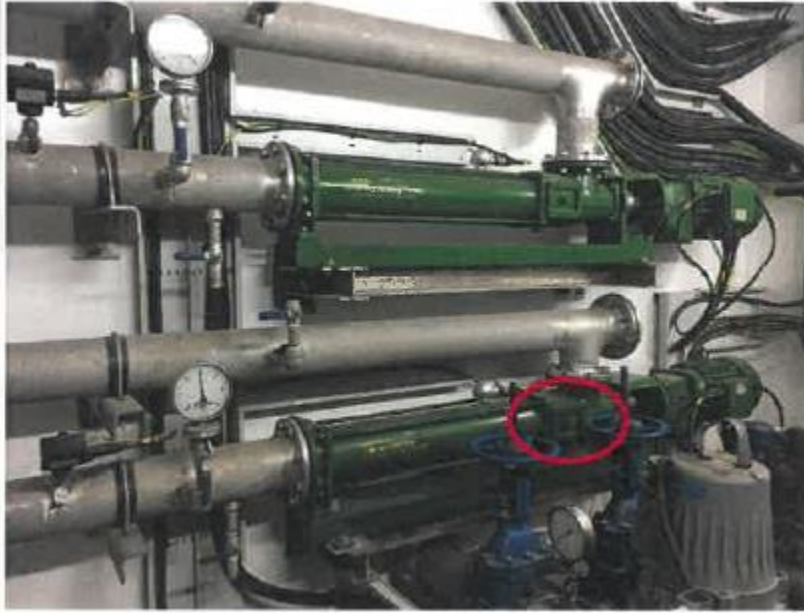


Figure.3 Sandbags were placed at the nearby storm water channel



Figure.4 Brown water was found on the stormwater outlet of the plant



Figure.5 Sample was taken at the discharge outlet



It was found that a gasket on the pump was damaged. MT was then arranged to replace the gasket and the system was resumed to normal on the same day.

There was no brown water found at the discharge outlet and the nullah after the cleanup work completed on the same day.

Root Cause Analysis

1. The gasket on the pump was found damaged.
2. The treated effluent was leaked from the damaged gasket.

Description of Corrective Actions ⁽¹⁾

1. Stopped the discharged pump
2. Isolated the pump by closing the valves before and after the pump
3. Placed sandbags in the storm water channel to block the treated effluent leak to nullah
4. Cleaned up the remaining treated effluent inside the storm water system and pump back to plant's wastewater treatment system

Description of Preventive Actions ⁽²⁾

1. Arrange routine preventive maintenance on the discharge pumps
2. Arrange routine patrol at treated effluent pump room
3. Prepare sandbags inside the pump room in order to have a faster response

(1) The corrective actions have been closed on 21 May 2019

(2) The preventive actions have been closed on 31 May 2019