Asset Management
Asset Standard
Odour Management Plan

Oxford STW

OXFOS1ZZ

Document Reference	AM-OMP Oxford STW	
Issue Date/Version	July 2023	Version: 6.1
Data Owner	Asset Standards Manager	
Document Author	[redacted]	
Approved By	[redacted]	
Document Location	SharePoint and On Site	
Reason for Issue	New Sludge Treatment Centre Permit Application	
Next Review	July 2024	

0 Document Control & Procedures

Figures and Tables

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It is a business requirement to comply with standards. Compliance issues will be escalated to the relevant governance group for further action as appropriate.

For further information/advice, please e-mail: am.standards@thameswater.co.uk

Owner Review Requirements

Document to be reviewed when any changes are made to the site or processes

Local Review Requirements

Site Manager should be informed when handwritten amendments are made to this document

Revision No	Reason for Revision	Prepared by	Approved by	Date
1	Conversion and validation of OMP into new standard format	[redacted]	[redacted]	September 2014
2	Annual review and update with THP process handover from contractors.	[redacted]	[redacted]	January 2017
3	Amendments following internal audit Feb 17, including OIP and annual review	[redacted]	[redacted]	February 2018
4	Annual review and new THP performance manager	[redacted]	[redacted]	April 2019
5	Annual review and new THP Performance Manager	[redacted]	[redacted]	June 2020
6	New Sludge Treatment Centre Permit Application	[redacted]	[redacted]	September 2022

6.1	Sludge Treatment Centre Permit Application Resubmission	[redacted]	[redacted]	July 2023

0.3 Sign Off

Area Operations Manager	[redacted]	Date: July 2023
Performance Manager	[redacted]	Date: July 2023
Performance Manager	[redacted]	Date: July 2023
Performance Manager THP	[redacted]	Date: July 2023

0.4 Glossary of Terms

TERM	DESCRIPTION
AD	Anaerobic Digestion
BNR	Biological Nutrient Removal
CHP	Combined Heat and Power
CSM	Customer and Stakeholder manager
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EHO	Environmental Health Officer
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016
FFT	Flow to Full Treatment
H4	Environment Agency - How to comply with your permit – H4 Odour Management, March 2011
ICA	Instrumentation Control & Automation
IED	Industrial Emissions Directive
OCU	Odour Control Unit
OMC	Operational Management Centre
OMP	Odour Management Plan
PFT	Picket Fence Thickener
PM	Process Manager
PS	Pumping Station
PST	Primary Settlement Tank
Receptors	Sensitive receptors are any fixed buildings or installations where odour annoyance may occur, such as residential homes, schools, hospital, offices, shops or garden centres. Open areas such as playgrounds and public footpaths should also be listed where these are known to have been affected by odour
SAP	Thames Water's enterprise resource and planning system
SCADA	Supervisory Control and Data Acquisition

SOM	Site Operating Manual
STC	Sludge Treatment Centre
STW	Sewage Treatment Works
TCM	Technically Competent Manager
TM	Team Manager
UWWTD	Urban Waste Water Treatment Directive

1 Introduction

This Odour Management Plan (OMP) forms part of Oxford Sewage Treatment Works (STW) Best Operating Practice and is a constituent part of the Environmental Management System (EMS). A key related document is the Site Operating Manual (SOM) – this document can be found as a hard copy in the Oxford STW administration building and on Thames Water's database SharePoint, within the EMS pages.

The purpose of this OMP is to define how the potential and actual sources of odour from Oxford STW are identified, and how, as far as is reasonably practicable, they are controlled and recorded. It is primarily a management guide; detailed operational procedures are contained within the SOM referred to above.

Changes to OMP procedures are captured in the SOM as part of the periodic reviews of this document.

The effectiveness of the odour control measures will be reviewed annually or sooner if any of the following occur:

- If the site in question acquires any other permitted activity with the potential to increase the risk of odour off site.
- When significant changes are made to the site which may affect odour, e.g., capital spend.
- As a result of a change in pattern of odour complaints, increase in public concern and as soon as possible after a significant incident.
- When the site management changes.
- If there is a material change in relevant regulations or guidance.
- If there is an odour release incident
- If a contingency measure is trigger

This OMP is an operational document that has been developed following a review of the potential risk areas for odour release. It details operational and control measures appropriate to the reduction or elimination of the impact of odours from wastewater treatment works. It provides detail to allow operators and maintenance staff to understand the operational procedures for both normal and abnormal conditions.

This OMP was updated in 2022 to incorporate appropriate odour control measures for activities that will be newly regulated under an Environmental Permit issued under the Environmental Permitting (England and Wales) Regulations 2016 (EPR), following the principles transposed through the Industrial Emissions Directive. This follows the reinterpretation of the Industrial Emissions Directive in exclusion of Urban Waste Water Treatment Directive (UWWTD) activities - meaning that anaerobic digestion (AD) on a Sewage Treatment works now needs an Environmental Permit.

The odour management plan has been structured to distinguish between the two regulatory regimes, which are fully described in the Site Information chapter. The wastewater treatment process is covered by the UWWTD. The Environmental Permit for the Sludge Treatment Centre (STC) covers various process including but not limited to, the AD process, combustion of biogas in the CHP plant and the storage of resulting sludge. This OMP responds to odour risks from both UWWTD and STC permitted processes (referred to as the Sludge Treatment Centre Permit).

This OMP is stored electronically on SharePoint within the EMS page. A hard copy is kept on site within the Site Operating Manual.

1.1 Relevant Guidance

Where this Odour Management Plan relates to STW activities regulated under the UWWTD this OMP may still draw upon elements of best practice taken from H4 but this should not be inferred as H4 being applicable to these activities.

The following guidance has been used to inform the contents of the OMP where it relates to activities regulated under EPR through the Sludge Treatment Centre Permit. This guidance does not apply to UWWTD activities:

- Environment Agency - How to comply with your permit – H4 Odour Management', March 2011 (H4)
- Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (Waste Treatment BAT Conclusions)
- Environment Agency, Appropriate measures for the biological treatment of waste, Consultation draft July 2020.

The OMP format used is in line with that adopted for other Thames Water sites.

2 Site Information

2.1 Location and Receptors

Site Address:

Oxford STW
Grenoble Road
Sandford-on-Thames
Oxford
OX4 4XU
What 3 words ref: ///busy.busy.rods
EPR Permit number to be included when issued

The Oxford STW site is located approximately 5km south-east of the centre if Oxford and less than 1km south of Littlemore. To the north of the site, there is Grenoble Road, with a commercial estate on the other side. To the east of the site, there is an area of farmland with a small stream from the Littlemore Brook, followed by another commercial estate and residential area. The area south of the site is made up of farmland. West of the site is made up of small areas of woodland and shrubs, with a caravan site and residential area following this, as well as more commercial estates. To reach the site turn off the A4074 and travel along Grenoble Road towards Oxford United Football Stadium.

Oxford STW collects sewage from the city of Oxford and outlying villages via over 40 Sewage Pumping Stations. The significant trade waste in the catchment is from the Cowley car plant and Laboratory waste, but this is not believed to cause process problems.

The works serves a Population Equivalent of approx. 250,000.

Receptors

The nearest receptors are given in Table 2.1 and have been marked on site location map in Figure A of Appendix 4.

Table 2.1. Location of potentially sensitive odour receptors

Receptor Number	Receptor Address	Receptor type	Approximate distance to the nearest site boundary	Direction from the site	Receptor Sensitivity
1	Mobile Home Park south of Kiln Cl, Oxford	Residential	50m	West	High
2	Oxford Science Park, Grenoble Rd, Oxford	Commercial	100m	North	Medium
3	Hampton by Hilton Oxford, Grenoble Rd, Oxford	Hotel	250m	North	Medium
4	Kassam Stadium & complex, Grenoble Rd, Oxford	Sports and recreational	300m	North-East	High
5	Holiday Inn Express Oxford, Grenoble Rd, Oxford	Hotel	400m	North-East	Medium
6	Recreation centre in Littlemore, Grenoble Rd, Oxford (Hollywood Bowl, Vue Cinema Oxford and others)	Recreational	400m	North	Low

7	Orion Academy, Knights Road, Oxford	Education	500m	North-East	High
8	Greater Leys residential area between Grenoble Rd and Northfield Brook	Residential	550m	East	High
9	Sandford on Thames residential area, between road A4074 and River Thames	Residential	600m	West	High
10	Littlemore residential area between Eastern Bypass Rd, Blackbird Leys Rd and Littlemore Brook	Residential	750m	North-West	High
11	Blackbird Leys residential area between Northfield Brook, Eastern Bypass Rd and Watlington Rd	Residential	800m	North-East	High
12	The Oxford Academy, Sandy Ln W, Littlemore, Oxford	Education	850m	North	High
13	Windale Primary School, Windale Ave, Oxford	Education	950m	North-East	High
14	Littlemore Mental Health Centre, Sandford Rd, Littlemore, Oxford	Health centre	1000m	North-West	High
15	voco Oxford Thames, an IHG Hotel, Henley Rd, Sandford-on-Thames, Oxford	Hotel	1000m	West	Medium
16	City of Oxford Collage, Blackbird Leys Campus, Cuddesdon Way, Oxford	Education	1100m	North-East	High
17	Cowley residential area, between Easter Bypass Rd, Rose Hill/Henley Av and Boundary Brook	Residential	1200m	North	High
18	Wesley Green Middle School, Wesley Cl, Oxford	Education	1200m	North-East	High
19	Orchard Meadow Primary School, Wesley Cl, Oxford	Education	1200m	North-East	High
20	Mabel Prichard School, St. Nicholas Rd, Littlemore, Oxford	Education	1200m	North-East	High
21	Sainsbury's store in Littlemore, Heyford Hill Roundabout, Oxford	Commercial	1400m	North-West	Low
22	Rose Hill residential area, between Southern and Eastern Bypass Rd, Rose Hill/Henley Av and Donnington Bridge Rd	Residential	1400m	North-West	High
23	Pegasus Primary School, Field Ave, Oxford	Education	1500m	North-East	High
24	Oxford Stadium, Sandy Lane, Oxford	Sports	1600m	North-East	High
25	Shopping Mall at Ambassador Av (Tesco, M&S, Sports Direct)	Commercial	1600m	North-East	Low

26	Kennington residential area, between the River Thames and The Avenue	Residential	1600m	West	High
27	Rose Hill Primary School, The Oval, Oxford	Education	1700m	North-West	High

2.2 Off-site sources of odour

In the vicinity of Oxford STW the following potential off-site sources of odour:

1. Farms south of the site (due to fertilisation and chemicals applied for plant cultivation).

2.3 Wind Rose and Weather Monitoring

RAF Benson meteorological station (approximate location NGR E 462586 N 191079) is located approximately 13.7 km southeast of the site and is considered the closest most representative meteorological monitoring station to the site. Data is recorded at the meteorological station in hourly measurements and the figure below presents the relationship between the frequency and speed of wind from compass point directions for the combined years 2016 – 2020. The figure illustrates the predominant wind direction to be southerly, which means receptors north of the site would have the highest probability of experiencing potential increases in odour emissions.

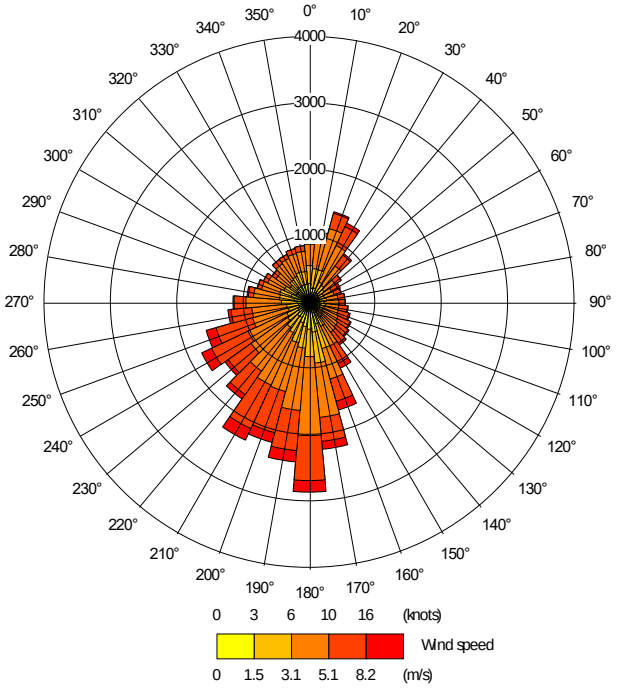

Figure 2.1. Benson Wind Rose, 2016-2020

There is no on-site weather station at Oxford. Weather on site can be reviewed if complaints are received or during periods of abnormal operations. The internal 'Weather' SharePoint site provides adverse weather information, and the UK Met Office website can also be used.

2.4 Site Layout and Treatment Processes

For site plans, see appendix 4. Further details of the site layout and treatment processes are given in the following sections of the Site Operating Manual and are therefore only given summary attention in this OMP:

Section	Description
1	Governance & Control
2	Location, key layout plans and diagrams. Site services, including power, water, drainage, SCADA and ICA. Consent details, process overview, chemical and waste handling.
3	Detailed description of each treatment process, including sludge and odour control.
4	Maintenance
5	Plant control, monitoring, and logging.

2.5 Process Description

The following sections describe the processes of wastewater and sludge treatment and should be read in conjunction with the site plan and process flow diagram given in Figures B and D in Appendix 4.

2.5.1 UWWTD activities

Preliminary Treatment

- Flow enters the site from 6 x sewage pumping stations through 9 x rising mains.
- The rising mains are divided between the inlet works and a covered balancing tank that feeds into the Inlet Works.
- Cess tankers can discharge through a logger into a covered section of the Inlet Works.
- The covered balancing tank is vented to an odour control unit (OCU 1)
- There are 3 x Longwood 6 mm step Screens.
- The screenings are treated in 2 x combi-wash units before being deposited in a skip for off-site disposal.
- The Flow to Treatment is controlled by a hydrobrake.
- Grit is removed by 1 x Jones & Attwood detritor and deposited in a skip for off-site disposal.
- The flow passes along 2 x channels that are each fitted with an open channel flow meter.

Storm Water

- There are 3 x rectangular Storm tanks
- Storm water enters storm tank no. 1 and then overspills and sequentially fills storm tank no's 2 & 3. Further flow overspills from weirs at the rear of these tanks to the storm water overflow.
- The storm water emerges at a storm water chamber, located by the site road next to the Final settlement tanks, which contains the storm discharge float alarm.
- There are 2 mixing systems located in storm tank no 1 that are operated on level and help maintain the solids in suspension. An ultrasonic level instrument measures the level in the tank.
- The pumps in the storm return pumping station well are automatically controlled and start when the flow to treatment drops below a user defined level and will continue until the storm tanks have emptied or the flow to treatment rises above a maximum user defined level.

Primary Treatment

- There are 3 x treatment streams labelled work no's 1, 2 & 3.
- The screened sewage is split and goes to primary treatment, approx. 50% to works no 1 and the remainder to works no's 2 & 3.
- There is facility to change this operation with hand stops.
- Works no 1 has 8 x circular PSTs, and Works No's 2 & 3 have 3 x rectangular.
- Ferric sulphate is dosed into the screened sewage for phosphorus removal.

Secondary Treatment

- The settled sewage from the rectangular PSTs splits to feed the effluent stream to works no's 2 & 3 (50:50).
- The settled sewage for works no 1, 2, & 3 is treated in 3 x diffused air activated sludge plants.
- Each activated sludge plant has its own blower house and returned activated sludge pumping station.
- There are 6 x final settlement tanks for works no 1; 3 x final settlement tanks for works no 2; and 3 x final settlement tanks for works no 3.

Final Effluent

- The final effluent combines into a single channel and the outfall discharges to the 'Pottery stream', located outside the works on the opposite site of the roundabout.

2.5.2 Sludge Treatment Centre Permit Activities

Sludge Handling

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW, which passes to the primary settlement tanks and through the aerobic treatment process under the UWWTD. Imports of sludge from other works is delivered to a sludge offloading point via tankers, is screened and pumped to the Sludge buffer Tank. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance.

There is a second offloading point at the STC for permitted imported tankered wastes toward the south. This waste arrives at the site via tanker vehicles, is passed to the inlet where it joins the main works flow and via screens to the aerobic treatment at the works, via the UWWTD.

Sludge Pre-Treatment

- **Sludge from the PSTs** is thickened in 2 x primary picket fence thickeners (PFTs).
- Thickened sludge from the PSTs is screened in 2x elevated strain presses; the sludge then feeds into 2x PFTs and then into 2x sludge blending tanks. The screenings are collected in a skip for off-site disposal.
- **Surplus Activated Sludge** is thickened by 2 x Simon Hartley belt thickeners. The sludge is then fed to the Sludge buffer tank.
- **Imported raw liquid sludge** is received at a liquid sludge reception facility from where it is pumped to the Sludge Buffer Tank.
- The Sludge buffer tank is covered and vented to an odour control unit (OCU 3)
- The combined sludges in the Sludge buffer tank is mixed and fed to 2 x strain presses from where it is transferred to the sludge blending tank. The screenings are collected in a skip for off-site disposal.
- The sludge blending tank has an air mixing system. An odour control unit (OCU 2) takes foul air from the headspace above the PFT and the Sludge Blending Tank.

Sludge Treatment

- **Sludge dewatering**
    - Sludge from the Sludge Blending Tank is pumped to 3 x Belt Presses.
    - Dewatered cake is pumped to the 2 x THP feed silos. There is an in-line monitoring system which monitors the % dry solids (DS) of the cake; this controls an in-line dilution system which reduces the solids content to 22% DS.
    - Cake from the hopper in the cake import facility is transferred using cake dilution pumps whereby this cake is also diluted to 22% DS using an in-line dosing system.
    - Transferred cake is stored in 2 x THP feed silos.
    - An odour control unit (OCU 4) receives foul air from the cake import facility, pre THP belt dewaterers and THP feed silos, liquor treatment plant balance tank and liquor transfer pumping station.

Thermal Hydrolysis Process THP

- Sludge is processed in 3 pairs of THP reactors.

- The 2 x THP feed pumps transfer the cake to the reactors at 40°C: this is achieved by the addition of hot water in-line at 90°C.
- Steam is injected to the reactors at 6 bar pressure, where it is treated in a 150 minute cycle at 140-170°C.
- The sludge is then transferred to the hydrolysed sludge buffer tank (or 'flash' tank) where final effluent is added to reduce the temperature to 80°C. Many of the gases are condensed at this temperature.
- After the flash tank the sludge is pumped to 2 x coolers which are heat exchangers where the temperature is brought down to 45°C.
- The treated sludge then passes into the digester recirculation feed line. This sludge provides the heat source for the digesters, retaining an operating temperature of 41°C.
- The off-gas from the flash tank passes through a condenser and from there it is pumped into the treated sludge feed line to the digesters.

- **Digestion**
  - There are 2 x fixed roof and 2 x gas bag roof mesophilic anaerobic digesters. Digester no's 1 & 2 (gas bag roof) are of a concrete construction and digester no's 3 & 4 (fixed roof) are frost protected glass-coated steel construction.
  - The sludge fed from the THP plant is the sole source of heating for the digesters.
  - External pumps are used to mix the contents of the digesters.
  - Displaced sludge discharges through the limpet chambers to the digested sludge buffer tank "half tank". There is the ability for the half tank to overflow to its own separate half tank during emergencies.
  - Digester gas is stored in 1 gas bag and in the gas bag roof of digesters 1/2 from which the gas is used to power the Combined Heat and Power (CHP) engines that run off the site digester gas. A waste gas burner is used to flare off any excess.
- **Sludge Dewatering**
  - Digested sludge is transferred from the post digestion storage tank to 2 sludge buffer tanks upstream of the Bucher press house.
  - There are 4 x Bucher presses which operate with a cycle time of up to 2 hours, producing a 40% dry solids cake. This is conveyed to the cake storage bay, housed in the barn adjacent to the building.
  - Management of the product is dealt with by the Thames Water biosolids recycling team.
  - Liquors from the press house are fed into a filtrate tank, which in turn feeds a liquid treatment plant employing an activated sludge process. The filtrate tank is covered and vented to an odour control unit (OCU 5). Liquors from the pre-THP presses are fed into the outlet of liquor treatment plant and then pumped into the works inlet.

- **Emergency Storage - Lagoon**
  In the event of a process failure, the on-site lagoon can be used as emergency storage. The lagoon is managed by returning contents through the process when possible.

Imported raw sludge cake is received on site from a number of outlying sludge centres. Covered trucks are driven into the cake import facility where the contents are discharged into a hopper.The cake import facilityis strictly controlled; the doors are kept closed except for vehicle access, spillages are carefully managed and the ventilation system fed into an odour control unit No 4.

Thames Water imports treated sludge cake from other works, for temporary storage on the cake pad, pending offsite recovery. This is a new waste activity. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS.

Imported treated sludge cake is offloaded into a dedicated cake pad, so as to be stored separately to indigenous sludge cake, and visually checked. The waste stream is the same as that arising from the treatment of sludge within the Oxford STC with the same characteristics, composition and eventual end use – application to land. As such, the infrastructure which is acceptable for use for site cake is appropriate for the imported material.

All imported cake is stored on an impermeable cake pad, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

3 Site Management Responsibilities and Procedures

3.1 Site Roles

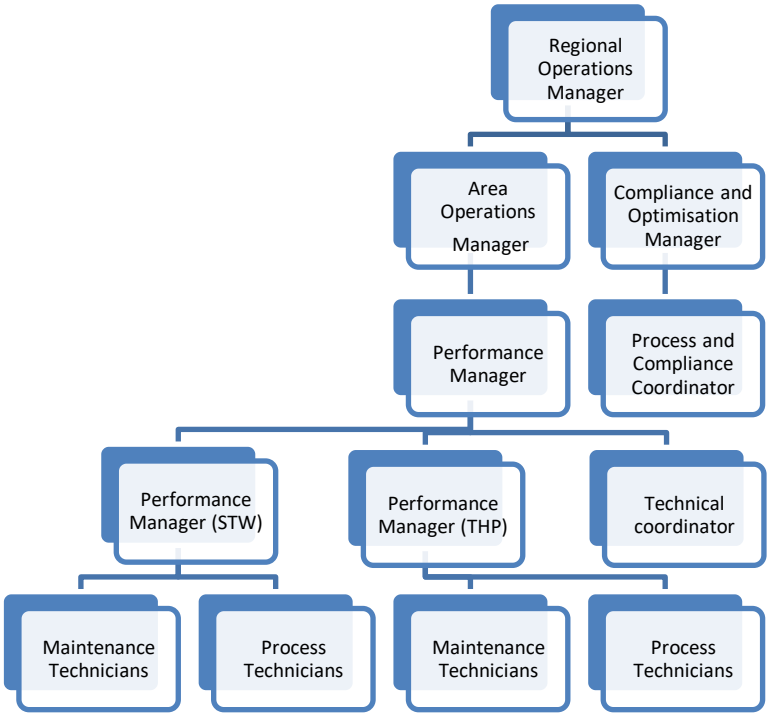

Figure 3.1. Site Roles

Table 3.1. Tasks and Responsibilities

Role	Tasks and Responsibilities
Head of Area	Responsible for the overall performance of STW in this region
Area Operations Manager	Responsible for overall performance of the STW in the area, including assessing the scope of, and updating the OMP as it is implemented.
Performance Manager (COP)	Responsible for overall performance of the STW and THP and will be responsible for • odour control and management at the site • • day to day implementation of the OMP • assessing the scope of, and updating, the OMP as it is implemented. • dealing with customer complaints • day-to-day operation of the STW Ensuring Thames Water staff undergo appropriate training
Performance Manager STW	Responsible for overall performance of the STW
Performance Manager THP	Responsible for overall performance of the THP
Technically Competent Manager	Hold the required WAMITAB qualification to support the activities on site under EPR, ensuring permit conditions are complied with.

Role	Tasks and Responsibilities
Maintenance and Process Technicians	Day to day duties include maintaining and operating process equipment. Responsible for routine checks and maintenance tasks, highlighting any issues to the performance manager.
Customer and Stakeholder Manager (CSM)	Responsible for managing liaison with all external customers and stakeholders in liaison with customer centre, escalation team, local govt. liaison team etc.
Compliance and Optimisation Manager	Responsible for process investigations and technical assistance.
Process Compliance Coordinator	Reports to Compliance and Optimisation Manager. Responsible for process monitoring, improvement and troubleshooting.
Duty Manager	The duty manager is centrally based (off-site) and is responsible for event management across the business.
Customer Centre	Responsible for receiving all customer calls, logging them and passing them to the appropriate operational departments.

The site is manned during normal working hours (07:30-15:30) Monday to Friday and can be attended by standby staff out of working hours.

3.2 Key Contacts

Role	Name	Email address	Phone Number
Area Operations Manager	[redacted]	[redacted]	[redacted]
Performance Manager	[redacted]	[redacted]	[redacted]
Performance Manager STW	[redacted]	[redacted]	[redacted]
Performance Manager THP	[redacted]	[redacted]	[redacted]
Technically Competent Manager	[redacted]	[redacted]	[redacted]
Customer and Stakeholder Manager	[redacted]	[redacted]	[redacted]
Compliance and Optimisation Manager	[redacted]	[redacted]	[redacted]
Customer Centre	Oxford STW	customer.feedback@thameswater.co.uk	0800 316 9800

3.3 Operator Training

Staff working on site undergo a site induction that is carried out by the Performance Manager. The site induction includes direction to the presence and location of the various operational procedures which include the SOM and the OMP. In addition, Site Tech 1's undergo a specific programme of training which covers management of activities on site.

All training records are currently held on Learning on Tap where they are accessible by the site Performance Manager and individual members of staff.

4 Odour Critical Plant Operation, Monitoring and Management Procedures

Odour prevention and reduction is achieved at Oxford through at least an annual review, or sooneras mentioned in Section 1, of the Odour Risk Assessment, Odour Improvement Plan and Odour Management Plan. In combination with the maintenance and monitoring carried out on site mentioned in sections 4 and 5.

Through our Odour Management Plans and maintenance procedures, the primary focus is on effective process control to minimise the risk of off-site odour nuisance. Similarly, our site-based frontline Wastewater Treatment Operations team are focussed on effectively managing the on-site process.

4.1 Odour Sources, Critical Issues and History

The site has historically received complaints from Science Park close to the site entrance. Complaints have also been received from the mobile home park near to the inlet works. Below are the number of formally recorded odour complaints received over a period of 5 years.

Site	2018	2019	2020	2021	2022
Oxford	11	12	14	13	9

An odour risk assessment of the activities at Oxford and mitigation under normal and abnormal conditions is given in Appendix 1.

An Odour Improvement Plan is included (where applicable) as Appendix 2.

Critical odour issues, emergency response and mitigation measures are summarised in Tables 4.3 to 4.7.

4.2 Identification of Odour Critical Plant

4.2.1 Odour Risk Assessment

An odour Risk Assessment has been carried out and a copy is included in Appendix 1. The odour Risk Assessment is not a ‘one-off’ exercise but an on-going process. It is constructed in the following manner:

- Each part of the treatment process is considered under different operating modes – e.g. normal, failure, abnormal: system overload, summer conditions, maintenance etc.
- The nearest customers to the particular odour source are identified.
- The likely frequency and duration of occurrence for each eventuality is identified.
- A score is assigned to the severity (0 – 5) of odour under each operating mode.
- A score is assigned to the probability (0 – 5) of causing an odour nuisance for each operating mode.
- Multiplying the severity of odour and probability of causing an odour nuisance generates a ‘current odour emission risk’ score. Between 0 (zero risk) and 25 (maximum risk), this is used to decide where mitigation should be applied in the short term and determine where in the longer term enhanced improvement measures are required. Where improvements are identified as necessary (i.e., where suitable mitigation measures are not already in place), entries are made onto the Odour Improvement Plan.

- The need for operational mitigation, enhanced measures and customer communication is stated and brief details given.

Items scored in the Odour Risk Assessment with a risk score greater than 10, are classified as Odour Critial Plant, and where existing operational mitigation measures are not sufficiently robust, will have Improvement Plans generated to address the odour issues. The Odour Improvement Plan for Oxford STW is included in Appendix 2.

4.2.2 Potential Odour sources

The following list of potential UWWTD odour sources been identified during the risk assessment:

- Balancing tank
- Incoming sewers & reception wet well
- Cess reception, discharge, wash down & drainage
- Storm & balancing tanks
- Screens & screening conditioning, drainage & rag skip management
- Grit removal equipment, drainage & grit skip management
- Flow & distribution to primary settlement tanks
- Primary settlement tanks
- Fats, oil & grease scum removal system
- Primary raw desludge pumping
- Flow & distribution to secondary treatment
- Activated sludge plant lanes & zones
- Flow & distribution to secondary settlement
- Final settlement tanks
- Scum removal system
- RAS chambers & pumping
- SAS chambers & pumping
- Odour control unit

The following list of potential Sludge Treatment Centre odour sources have been identified during the risk assessment:

- Liquid sludge reception point
- Cess Reception, discharger, wash down & drainage
- Primary raw sludge thickening (2x PFTs)
- Primary sludge screens
- Skip management
- SAS thickening & pumping (2x Aquabelts)
- Sludge Buffer Tank
- SAS & Imported Sludge Screening
- Sludge blending x 2 & mixing tanks (concrete tank)
- Raw sludge dewatering, pre-THP presses
- Raw sludge dewatering liquors
- Cake import facility
- Cake dilution pumps
- THP feed silo
- THP reactors
- THP flash tanks
- Treated sludge transfer & heat exchanger
- Off-gas condenser & transfer
- Digester feed pumps
- Primary digestion
- Digested sludge buffer tank
- Buffer tank
- Liquor treatment plant
- Cake barn

- Cake pad
- Vehicle movements & wash down
- Biogas storage
- CHP
- Boilers
- Waste gas burner
- Standby generators
- Odour control units
- Emergency secondary digester
- Emergency lagoon

4.2.3 Waste Storage for Sludge Treatment Centre Permit

Waste is not stored on site prior to treatment through the UWWTD or AD process. A list of the main tanks relating to the sludge treatment process and their associated volumes and retention times is shown below in Table 4.1.

Table 4.1. Sludge Treatment Centre Permit Tank Inventory

Tank Purpose	Number	Operational Volume (m^3)	Construction	Average Retention Time
Primary Picket Fence Thickeners	2	400	Steel	1-2 days
Sludge Buffer tank	1	170	Steel	1-2 days
Screened Sludge Holding Tank	1	600	Steel	1-2 days
Sludge Blending Tank	1	249	Steel	1-2 days
	1	214	n/a	3-7 days
Pre THP-Dewatering Feed Buffer Tank	1	36	Steel	< 24 hours
(Pre-THP) Feed Silos	2	300	Steel	1-2 days
THP Reactors	6	22	Steel	< 24 hours
THP Flash Tanks	2	30.3	Steel	< 24 hours
Primary Digester Tank	4	Primary Digester Tank1&2 2,365 x 2 Primary Digester Tank 3&4 1,696 x 2	Concrete Steel	15 days
Digested Sludge Buffer Tank	1 half tank 1 full sized tank	700 1,830	Concrete	1-2 days
Digested Sludge Buffer feed Tanks	2	395	Concrete	1-2 days
Pre-dewatering feed tank	1	65	steel	<24 hours
Liquor Treatment Plant Balancing Tank	1	810	Concrete	3-7 days
Liquor Treatment Plant	1 (2 lanes)	1,480 x 2	Concrete	3-7 days
Liquor treatment plant decant chamber	1	515	Concrete	<1 day
Pre-THP Polymer Silo	1	35 tonnes	Steel	
Digested Sludge Polymer Silo	1	35 tonnes	Steel	

Diesel for the emergency standby generators (THP)	1	35,000 litres	Steel
Diesel for the emergency standby generators (LTP)	1	20,000 litres	Steel

An inventory of potential odorous materials relating to the Sludge Treatment Centre Permit is shown in Table 4.2 below. Air Emission Points are listed, and the locations shown on the site plan in Figure C of Appendix 4.

Table 4.2. Odorous materials for Sludge Treatment Centre Permit

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
Cake (including digested imports)	Cake Barn/Pad	4000	90 days	19 06 06	Diffuse	Low
Undigested Cake imports	Cake import facility/Cake Pad	1000	90 days	19 02 06	Point Source (see OCU entry)	Low/Medium
Biogas	PRV/Whessoe valve releases; gas storage vessel, unburnt methane from CHP engine. See emission point plan.	Gas bag capacity 1150 m^3.	Continuous operation	n/a	Point Source	Low
Liquor	Site drainage	Liquor is continuously pumped to the head of works	Continuous pumping of liquors from liquor return pumping well.	16 10 02	Diffuse	Low
Raw imported sludge	Works Inlet, Sludge Buffer Tank	Refer to Table 4.1 Site Tank Inventory	Retention times for each stage of the	19 08 05	Point Source (See OCU entry)	Medium/High

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
			process are detailed in Table 4.1			
Primary Sludge	PFTs	Refer to Table 4.1 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.1	19 08 05	Point Source (See OCU entry)	Medium/High
Thickened sludge import	Sludge Buffer Tank	Refer to Table 4.1 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.1	19 02 06	Point Source (See OCU entry)	Medium/High
Surplus Activated Sludge	SAS Dewatering Feed Tank	Refer to Table 4.1 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.1	19 08 05	Diffuse	Medium/High
Blended Sludge	Sludge Blending Tank,	Refer to Table 4.1 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.1	-	Point source (see OCU entry)	Medium/High
Sludge Screenings	Located below strain presses.	4 Skips	30 days	19 08 01	Diffuse	Low
Releases from Odour Control Units	See 5.1.2	Variable throughput specific	Continuous operation	NA	Point Source	Low

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
		to each OCU				

Table 4.2 Odorous raw materials for Sludge Treatment Centre Permit

Raw Material	Odorous	Storage	Mitigation	Odour Risk
Polymer 1. Flopam F04650 2. F04698XXR 3. F04698XXR	Not odorous	1) 5,000L stored on portable bunds in 1,000L IBCs 2) 35 tonnes in bunded silos 3) 35 tonnes in bunded silo	Contained with lid	Low
Sodium hydroxide Brenntag 47% sodium hydroxide solution	Not odorous	200L (25 L drums on portable bunds)	Contained with lid	Low
Hydrogen peroxide Brenntag 35% sodium peroxide solution	Not odorous	160 kg (20 Kg drums on portable bunds)	Contained with lid	Low
Phosphoric acid Brenntag 75% phosphoric acid solution	Not odorous	180 kg (20kg drums on portable bunds)	Contained with lid	Low
Sodium chloride salt pebbles Brenntag/British salt aquasol	Not odorous	300 kg stored in 25kg bags within a building, then dosed into 400L bunded brine tanks	Stored within a building	Low
Sodium Chloride Brenntag/British salt <=100%	Not odorous	10 tonnes bunded tank, then dosed into 400L bunded brine tank	Contained with lid	Low
Sodium bisulphite Nalco 77211	Sulphurous	400L bunded drums, then dosed into 400L bunded brine tank in boiler rooms	Stored within a building	Low
Sodium hydroxide (caustic soda) Nalco 77224	Not odorous	$00L bunded drums	Contained with lid	Low
Phosphate polymer Nalco Nexguard 22310	Normally not odorous, residual ammonia may be present in headspace of newly opened containers	400L bunded drums	Contained with lid	Low

Sodium hydroxide flocculant B-A1-S	Solvent (mild)	8 x 5.4 Kg bottles stored on portable bunds	Contained with lid	Low
Nitrogen BOC Nitrogen (gas)	Not odorous	5 x 75kg cylinders located within THP building	Stored within a building	Low
Sodium hydroxide (caustic soda) Brenntag 47%	Not odorous	63,000L tank located in concrete bund	Contained with lid	Low
Anti-foam FloFoam D60F	Not odorous	6,000L stord in 2x 1,000L IBCs in a bunded dosing kiosk and 4x 1,000L IBCs on portable bund	Contained with lid	Low
Lubricating oils Mobil Pegasus 705 Mobil Pegasus 60 Ultra 40	Solvent	5,000L in doubled skinned tanks 2,500L in doubled skinned tanks	Contained with lid	Low
Glycol coolant Texaco Delo XLCPremixed 40/60	Solvent	3,000L stored in 3x 1,000L IBCS bunded	Contained with lid	Low
Diesel WP White diesel	Petroleum	35,000L (THP) 20,000L (LT) bunded fuel tanks	Contained with lid	Low

Low odour raw materials are chosen for use, as far as practicable.

4.2.3 Odour Critical Plant

The following are classified as odour critical plant:

Works Inlet

- Balancing Tanks, incoming sewers and wet well and Reception wet well.
- In an event of a failure of the OCU issue with odours.
- Odours can be released when tankers ‘blow back’ when delivering cess.

Storm Separation

- During wet weather these can remain full for extended periods, allowing the contents to turn septic.

Preliminary Settlement

- Screenings build-up downstream causing blockages and process issues.
- Rising sludge due to THP reduced throughput.

Sludge Imports

- This is normal activity when discharging and the odour is high.

Sludge Conditioning

- Much of this process area is covered and dependent on the OCUs to reduce odours.
- Good skip management is required.

Cake Import Facility

- Failure of the roller shutter doors could lead to release of odours.

THP Process (Reactors and Flash Tanks)

- Failure of the THP reactors and flash tank will lead to release of odours.

Treated Sludge Transfer & Heat exchanger

- Odours could be released as a result of spillage or during maintenance.

Off-Gas Condenser

- Odours could be released as a result of spillage or during maintenance.

Digester Feed Pumps

- Odours could be released as a result of spillage or during maintenance.

Sludge/Cake storage and movements

- Too much cake production, or storing cake on the cake pad, will cause odours. Consider OCU sprays.

Odour Control Units

- Odours could be released as a result of plant failure. Consider OCU sprays.

4.3 Odour Control Measures

The SOM referred to above complies with Thames Water's asset standards – operating standards. It states the operational procedures to be followed in order to maintain and operate plant to agreed company standards. These standards include, where appropriate, procedures for ensuring that generation of odour is kept to a minimum. Refer to risk assessment in Appendix 1 where these measures are summarised 'normal mitigations'.

4.3.1 Odour Control Units

There are 5 x odour control units.

- Odour control unit no.1 (OCU1)
  - Situated at the Inlet Works area and takes its foul air from the Balancing Tank and the Rising Main discharge point at the Inlet Works.
  - The Balancing Tank and the Rising Main discharge point have both been covered.
- Odour control unit no2 (OCU2) - A23
  - Takes its foul air from the primary digester and storage area: Primary Picket fence thickeners and sludge Blending Tank
  - operated by a timer in the main control panel.
- Odour control unit no. 3 (OCU3) - A24
  - Takes foul air from the Sludge buffer tank and the screened sludge holding tank and pass it through the bio-scrubber before venting it off to atmosphere.
- Odour control unit no 4 (OCU4) – A25
  - This takes foul air from THP processes and cake import facility
- Odour control unit no 5 (OCU5) - A26
  - This takes foul air from the liquor treatment plant (LTP) and the LTP balancing tank which is feed by the Bucher presses and pre-THP dewatering belt presses.

4.3.2 Site Specific Measures and abnormal events

H4 has been used to guide the preparation of this OMP where it relates to activities regulated under the Sludge Treatment Centre Permit. As this guidance does not apply to UWWTD activities, where reference to H4 is made within this document this should not be inferred as H4 being applicable to UWWTD activities. Specific tasks and measures taken in intermittent, abnormal, and emergency events associated with the control of odours at Oxford STW are summarised in the tables below.

The routine operational tasks carried out at Oxford STW to specifically mitigate against generation of odour are also listed in the tables below.

Tables 4.3-4.7 - Summary of Critical Odour Issues, Emergency Response and Mitigation Measures

The purpose of Table 4.3-4.7 shall be to identify site specific emergency response procedures and mitigation measures relating to site odour generation and release. They include:

- Generic odour issues and mitigation measures relating to site-specific process stages; and,
- Additional site-specific odour issues and mitigation measures associated with process stages identified under the site Odour Risk Assessment.

Daily and weekly Site Round and Sludge Round checks are also carried out on each part of the process to ensure correct operation, these are shown in Appendix 5 and 6.

Table 4.3. Summary of routine odour mitigation tasks for assets under UWWTD

Odour source	Specific odour management tasks	Responsibility	Monitoring	Monitoring Frequency	Trigger for Action	Remedial Action and Timescale
General	Ensure site is kept clean and tidy	Site Tech 1s Team Manager	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible and no later than the end of the day
	Any spillages to be cleaned up as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible and no later than the end of the day
	Site odour acceptability checked during site walkaround.	Site Tech 1s	Qualitative assessment	Daily	Elevated odour on site identified.	Reports to Performance Manager at team huddle/SAP Plus entry where corrective action identified. For a spillage; immediate/asap resolution
Balancing Tank	Covered and vented to OCU 1	Performance Manager	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible.
Incoming sewers & reception wet well	Any spillages to be cleaned up as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible.
Cess Reception, Discharge, Wash down & Drainage Linked tasks specified in Section 2.1 of appendix 6	Discharged to inlet works through close coupled connector – ensure tankers are coupled correctly. Discharge point is mostly covered. Any leakages and spillages are washed into the site drainage at time. Covered area is vented to OCU	Site Tech 1s / CoTC holder / tanker drivers / contractors	Discharge logged by tanker driver using swipe card. Records and accounts are managed by TW Commercial and checked by CoTC holder for the site. OCU Monthly Monitoring, see section 5.1.3	Monthly	Spillage identified	Clean up as soon as possible.
Storm & Balancing Tanks Linked tasks specified in 2.6 of appendix 5	Storm tank flows automatically return to the inlet when the inlet flow rates permit. Cleaning of the storm tanks is achieved by a fully automated mixing system in tank 1. Manual intervention by the use of tankers is brought in as necessary.	Performance Manager	Visual Inspection	As required	Collected debris in storm tanks indicating attention to tank cleaning system needed, especially	Manual interventions to debris clearance are of high priority and the four storm tanks would be emptied

					sensors and/or presence of debris outside of storm events.	and cleaned as soon as practicable after a storm. Any attention to sensors is through site tech 1 site round and within 8 hours.
Screens & Screening Conditioning, Drainage & Rag Skip Management Linked tasks specified in 2.3,2.4 and 2.5 of appendix 5	Ensure screenings washed and dewatered before discharge to skip	Site Tech 1s	Visual Inspection	Daily	Wash water system not operating to full efficiency	Clean spray nozzles/remove any obstructions blinding/hair pinning); check angle/coverage of delivery; check lubrication. High priority for effective function so timescales would be within 2 working days on identification. Replacement of parts could be up to 6 weeks depending on spares availability.
	Any blockage to be cleared and service resumed as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Impaired screen function for any reason	Attention to blocked screens is immediate/asap on detection since will have significant impact on subsequent process. Timescales of remedial tasks such as repairs to screen brushes would be 2 to 8 hours; full replacement over 6 weeks duration. Screens replaced according to wear but within every 7 years typical.

	Ensure skips are covered and removed from site as soon as practicable. Full skips are not to be stored on site	Site Tech 1s	Visual Inspection	As required	Skip identified that is not covered or not watertight. Skips over two thirds full are always prioritised for emptying given potential for odour.	Covers to be fitted at point of identification. Full skips aim to be removed within 1 week by Biffa.
	Screenings area should be kept clean and tidy	Site Tech 1s	Visual Inspection	Daily	Hard standing has loose screenings outside of skip.	Clearance of any screenings outside of skip is made throughout operational hours given generation of screenings is continuous (potential source of pests as well odour). Skip location will be adjusted slightly in any cases where capture is not sufficient.
Grit Removal Equipment, Drainage & Grit Skip Management Linked tasks specified in section 2.5 of appendix	Ensure skips are removed from site as soon as practicable. Full skips are not to be stored on site	Site Tech 1s	Visual Inspection	As required	Skips over two thirds full are always prioritised for emptying given potential for odour.	Removal of grit removal skips follows approach for screenings (although odour potential can be proportionally less). Proactive interventions are also made earlier in the process, such as removal of grit build up in the inlet channels; attention to blockages in the wash water system; rag removal from baffles/mechanical equipment are regular tasks completed weekly.

Flow & Distribution to Primary Settlement Tanks	Ferric sulphate dosing point, for ASP load reduction.	Site Tech 1s	Visual Inspection	Daily	Spillage/blockage identified	Clean up/remove as soon as possible.
Primary Settlement Tanks Linked tasks specified in section 3 of appendix 5	Scrapers should be regularly checked and maintained to ensure they are working effectively, and any blockages cleared. If scraper fails, follow procedures in SOM.	Site Tech 1s	Visual Inspection	As required	Scraper blade damaged; detached or failed. Fault with PST Scraper Fail Alarm.	If scraper operation impaired remedial action is manually desludge the tank by the Tech 1 within 2 working days. Attention to scraper fail alarm will be addressed within 1 working day and if cannot be resolved a job raised on SAP for M/E to resolve in 1 working day. Tanks may require cleaning or emptying which may take up to 3 months to complete. Funding to support scaffolding and cleaning may be required.
	Ensure there is appropriate scum removal in place and working correctly	Site Tech 1s	Visual Inspection	Daily	Scum board function compromised by excess material.	Removal of accumulated material in scum boards within 3 working days – if mechanical or blockage, a tanker/jetter will be needed and this should be done on a weekly basis
	Ensure fat traps are regularly cleaned and blockages removed	Site Tech 1s	Visual Inspection	As required	Traps identified as having cracks, breaks or blockages	Removal of accumulated material in traps to timescales as above.

	Monitor sludge blanket depths. If levels exceeded report to Team Manager and desludge affected tank	Site Tech 1s	Manual Blanket level detector dipped	Daily	Lifting puts more load on biological process. Need to keep below 0.5m to keep solids feeds to drum thickener between 1 and 2%.	De-sludge affected tank and report to Site Manager. Manually dip on daily basis. After consultation, decision to increase de-sludging or take out of service and drain would be made within 2 weeks.
	Check auto desludging operational	Site Tech 1s	Visual Inspection	Daily	Levels in Sludge buffer tank and flows on de-sludging line.	Check operation of pump and auto desludging valves within 3 working days.
	Identify any gassing or septicity issues by regular monitoring and prevention of the build-up of solids.	Site Tech 1s	Visual Inspection	Daily	. Site can be affected by blocked desludging valves or failed desludging pumps and this will result in increased sludge blanket and rising sludge	Site Manager to investigate with solutions within days/a few weeks depending on whether repairs or replacements.
	Ensure any tank drained down is hosed out as soon as practicable to remove any sludge	Site Tech 1s	Visual Inspection	As required	Residual sludge identified after tank drain down	Manual clearance by hose following identification
Fats, Oil & Grease Scum Removal System	Any spillages to be cleaned up as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Clean up as soon as possible and no later than the end of the day
Primary Raw Desludge Pumping	Regularly check the pumps condition	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Clean as soon as possible
Flow & Distribution to Secondary Treatment	Check for flow disruptions	Site Tech 1s	Visual Inspection	Daily	Spillage/blockage identified	Clean up/remove as soon as possible.

Activated Sludge Plant Lanes & Zones Linked tasks specified in section 4.1 of appendix	Checked for failure of mixers & scum build-up in the anoxic zone	Site Tech 1s	Visual Inspection	Daily	Rotation mixers not functioning correctly	Investigate root cause; most likely corrective action is tripped motor, and a job needs to be raised on SAP for M/E within 5 working days.
	Ensure dissolved oxygen maintained at the correct levels in the aerobic zone	Site Tech 1s	Continuous recording on SCADA plus daily spot measurement	Daily	Low DO alarm within 60 minutes of any problem with blowers which would generate an immediate call out to the tech 1.	If could not be resolved immediately escalation call to M/E. Spare blower would cut in but funding for refurbishment would be needed within 90 days.
Flow & Distribution to Secondary Settlement	Check for flow disruptions	Site Tech 1s	Visual Inspection	Daily	Spillage/blockage identified	Clean up/remove as soon as possible.
Final Settlement Tanks Linked tasks specified in section 5 of appendix 5	The FSTs are equipped with a scum removal system, fitted with a scraper and automatically desludged under normal operations.	Site Tech 1s	Continuous monitoring via the SCADA system.	Daily	Scraper not working properly	Repair scraper
Scum Removal System	Any spillages to be cleaned up as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Scum accumulation	Repair scum removal system. Clean up as soon as possible and no later than the end of the day
RAS Chambers & Pumping	Regularly check the pumps condition	Site Tech 1s	Visual Inspection	Daily	Spillage identified	Repair/maintain pumps
OCU 1 inlet works	Monthly performance checks by specialist Framework agreed contractors.	Site Tech 1s/Contractor	Monthly Monitoring, see section 5.1.3	Monthly	Odour release from the OCU	Control OCU performance, identify reasons for odour release.

Table 4.4. Summary of routine odour mitigation tasks for assets under Sludge Treatment Centre Permit

Odour source	Odour and offensiveness L/M/H	Specific odour management tasks	Responsibility	Monitoring	Monitoring Frequency	Trigger for action	Remedial Action & Timescale (Important: For all issues/incidents, at first point of identification, check the permit conditions to establish if a Schedule 5A Notification is required)	Odour risk if measures fail
Liquid Sludge Reception Point Linked tasks specified in section 1 and 2 of appendix 6	Sludge (H)	Imported sludge discharged to a covered tank through close coupled connector. Ensure tankers are coupled correctly. Covered tank vented to OCU. Any leakages and spillages are washed into the site drainage at time.	Tanker Driver / TW Biorecycling / Contractor	Discharge logged by tanker driver using swipe card. Records and accounts are managed by TW Biorecycling. OCU Monthly Monitoring, see section 5.1.3	Daily/Monthly	Spillages identified; tanker seen discharging in an inappropriate manner.	Stop operation and contact the responsible company. Clean up as soon as possible	High
Cess Reception, Discharge,	Strong Sewage (M)	Discharged to inlet works through close coupled	Site Tech 1s / CoTC holder / tanker drivers / contractors	Discharge logged by tanker driver	Monthly	Spillage identified	Clean up as soon as possible.	Medium

Wash down & Drainage Linked tasks specified in Section 2.1 of appendix 6		connector – ensure tankers are coupled correctly. Discharge point is mostly covered. Any leakages and spillages are washed into the site drainage at time. Covered area is vented to OCU		using swipe card. Records and accounts are managed by TW Commercial and checked by CoTC holder for the site. OCU Monthly Monitoring, see section 5.1.3				
Primary Raw Sludge Thickening (2x PFTs) Linked tasks specified in section 8.2 of appendix 5	Sludge (L)	Covered, vented to OCU 2.	Site Tech 1s/Contractor	Visual Inspection / See section 5.1.3	Daily, monitored by SCADA / Monthly	OCU failure	Repair OCU as soon as possible.	Medium
Primary Sludge Screens Linked tasks specified in section 2 of appendix 6	Sludge (L)	Enclosed.	Site Tech 1s	Visual Inspection.	Daily	Blockages or sludge build ups at the screens identified	Clear immediately if safe to do so. For significant blockages and build ups report to Site Manager.	Medium

Skip Management	Sludge (L)	Good skip management on site.	Site Tech 1s	Visual inspection	Daily	Filled up skips	Act before the skips get full, constant monitoring required.	Medium
SAS Thickening & Pumping (2x Aquabelts) Linked tasks specified in section 4 of appendix 6	Earthy (L)	Inside building.	Site Tech 1s	Visual inspection	Daily	Pump failure	Repair pump as soon as possible	Low
SAS & Imported Sludge Tank (Green Tank)	Sludge. (L)	Covered, vented to OCU 3.	Site Tech 1s/Contractor	Visual Inspection / See section 5.1.3	Daily, monitored by SCADA / Monthly	OCU failure	Repair OCU as soon as possible.	Medium
SAS & Imported Sludge Screening Linked tasks specified in section 2 of appendix 6	Sludge (L)	Screenings held in skip. Full skips removed from site. Spillages cleaned to drain which returns the liquid to the head of the works for processing. Screenings are washed before discharge to skip prior to removal from site. Full skips are removed from site. Enclosed.	Site Tech 1s	Visual inspection	Daily	Filled up skips, Blockages or sludge build ups at the screens identified	Act before the skips get full, constant monitoring required. Clear screens immediately if safe to do so.	Medium

Sludge Blending x 2 & Mixing Tanks (concrete tank) Linked tasks specified in section 3 of appendix 6	Sludge L)	2 x covered blending tanks vented to OCU 2. Concrete tank vented to OCU 3	Site Tech 1s/Contractor	Visual Inspection / Monthly Monitoring, see section 5.1.3	Daily/Monthly	OCU failure	Repair OCU as soon as possible.	Medium
Return Liquors	Sludge (M)	PST scum to covered well vented to OCU 2. General Purpose Sump takes liquors from SAS, PFT, all sludge screenings; covered, no OCU.	Site Tech 1s	Visual inspection	Daily	OCU failure	Repair OCU as soon as possible.	Medium
Raw Sludge Dewatering, Pre THP presses	Sludge (L)	Covered units.	Site Tech 1s	Visual inspection	Daily	Spillages identified	Clean immediately when safe to do so.	Medium
Raw Sludge Dewatering Liquors	Sludge (L)	Covered well.	Site Tech 1s	Visual inspection	Daily	Spillages identified	Clean immediately when safe to do so.	Medium

Cake import facility (undigested cake imports) Linked tasks specified in section 17 of appendix 6	Sludge (M)	Enclosed building; vented to OCU 4. Doors security controlled and doors automated. Sludge delivered in covered wagons into odour controlled building. Close door whilst unloading. No additional turning or handling during cake storage. Subject to pre acceptance checks	Tanker driver / TW Biorecycling / Contactor	Discharge logged by tanker driver using swipe card. Records and accounts to be managed by TW Biorecycling. OCU Monthly Monitoring, see section 5.1.3	Daily/Monthly	Tanker seen discharging in an inappropriate manner. OCU failure	Stop operation and contact the contractor. Clean up as soon as possible if safe to do so. Repair OCU as soon as possible in case of failure.	High
Cake Dilution Pumps	Sludge (L)	Enclosed.	Site Tech 1s	Visual inspection	Daily	Spillages identified	Clean immediately when safe to do so.	Medium
THP Feed Silo & Pumps	Sludge (L)	Enclosed building; vented to OCU 4.	Site Tech 1s/Contractor	Visual Inspection / Monthly Monitoring, see section 5.1.3	Daily/Monthly	Failure of silo. Spillage from pump	Clean up. Repair pump	Medium
THP Reactors	Burnt coffee (L)	Enclosed vessel. Process checked on auto before each cycle.	Site Tech 1s	Visual inspection	Daily	n/a	n/a	High
THP flashTanks	Foul (L)	Closed container.	Site Tech 1s	Visual inspection	Daily	n/a	n/a	High

Treated Sludge Transfer & Heat Exchanger	Foul (L)	Closed container.	Site Tech 1s	Visual inspection	Daily	n/a	n/a	medium
Off-gas Condenser & Transfer	Foul (L)	Closed container.	Site Tech 1s	Visual inspection	Daily	n/a	n/a	Medium
Digester Feed Pumps	Foul (L)	Sludge contained within pressure vessels and pipework.	Site Tech 1s	Visual inspection	Daily	Spillages identified. Pump failure.	Clean immediately when safe to do so. Repair pump as soon as possible.	Medium
Primary Digestion Linked tasks specified in section 6 of appendix 6	Earthy (L)	Enclosed.	Site Tech 1s	Visual inspection	Daily	OCU failure	Repair OCU as soon as possible.	Low
Digested Sludge Transfer Tank & Pumping Linked tasks specified in section 4 of appendix 6	Earthy (L)	-	Site Tech 1s	Visual inspection	Daily	OCU failure	Repair OCU as soon as possible.	Low
Buffer Tank	Earthy (L)	Inside building.	Site Tech 1s	Visual inspection	Daily	OCU failure	Repair OCU as soon as possible.	Low

Dewatering Press (Bucher Press) Linked tasks specified in section 12 of appendix 6	Earthy (L)	Odour contained within building	Site Tech 1s	Visual inspection	Daily	OCU failure	Repair OCU as soon as possible.	Low
Liquor Treatment Plant	Earthy (L)	Vented to OCU 5	Site Tech 1s/Contractor	Visual Inspection / Monthly Monitoring, see section 5.1.3	Daily/Monthly	OCU failure	Repair OCU as soon as possible.	Low/
Cake Barn Linked tasks specified in section 17 of appendix 6	Earthy (M)	Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage Roof provides wind barrier. Drop height less than 2m	Site Tech 1s	Visual inspection	Daily	Cake reception failure	Consider storing raw cake in bins and /or on the cake pad and OCU sprays to reduce odours.	High

Cake Pad (undigested cake import) Linked tasks specified in section 17 of appendix 6	Earthy (M)	No additional turning or handling during cake storage. Subject to pre acceptance checks. Tipper truck drop height less than 2m. Recessed cake pad provides wind barrier. Subject to pre acceptance checks	Site Tech 1s	Visual inspection	Daily	Spillage	Abnormal event – cake would be in bins providing extra odour mitigation Clear up ASAP	Medium
Cake Pad (digested Cake imports) Linked tasks specified in section 17 of appendix 6	Earthy (M)	Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage. Subject to pre acceptance checks. Tipper truck drop height less than 2m. recessed cake pad provides wind barrier	Site Tech 1s	Visual inspection	Daily	Spillage	Clear up ASAP	Medium
Vehicle Movements & Wash Down	Earthy (L)	Cover trucks when leaving site. Use of wheelwash.	Tech 1	Visual	As required	Uncovered or not wheelwashed truck noticed	Turn back the truck to wheelwash or fully cover the load	Medium

Biogas Storage Linked tasks specified in section 8 of appendix 6	Biogas (L)	Enclosed	Performance Manager	Visual inspection, process monitoring via SCADA and Cockpit.	As required	Biogas leak identified	Remove leakage as soon as possible taking necessary dafty measures.	Medium
CHP Linked tasks specified in section 9 of appendix 6	Oily (L)	Flare biogas	Maintenance TM	Visual	As required	Flare failure	Repair flare for biogas system	Low
Boilers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Waste Gas Burner	Biogas (L)	Check for leakages before burning	Performance Manager	Handheld equipment	As required	Biogas leak identified	Remove leakage as soon as possible taking necessary safety measures.	Medium
Standby Generators	Diesel engine smell (L)	Minimize usage of standby generators	Performance Manager	Routine maintenance	As required	Faulty engine	Repair	Low
Odour control units (OCUs 2, 3, 4 & 5) Linked tasks specified in	Residual odours (L) and Earthly odours (L)	Monthly performance checks by specialist Framework agreed contractors.	Site Tech 1s/Contractor	Monthly Monitoring, see section 5.1.3	Monthly	Odour release from the OCU	Control OCU performance, identify reasons for odour release.	Medium

section 9 of appendix 5		Check fan operational. On failure notify team leader for notification of maintenance team. Standby fan available.	Site Tech 1s	Visual Inspection	Daily	Fan failure	Repair fan as soon as possible.	Medium
		Check outlet H2S. On failure notify team leader for notification of maintenance team.	Site Tech 1s/team leader	Handheld equipment	Monthly	H2S flow issue	Identify and eliminate H2S release source as soon as possible.	High
		Routine check of washwater spray system, airflow, condition of drive, pH of drainage water, drain, surface of media, water filter	Site Tech 1s	As described in SOM	Monthly	Deviations from typical operation conditions noticed	Identification of factors responsible for performance deviations.	Medium
		Media is replaced as per TWUL asset standards.	Site Tech 1s	As described in Equipment Maintenance Standard	As required	Decrease in the performance of the OCU	Odourless media replacement	Low
Emergency Secondary digester	Earthy (M)	Routine check of the emergency secondary digester	Site Tech 1s	Visual inspection	As required	Process failure	Bring process back	Medium
Emergency lagoon	Water (L)	Routine check of the emergency lagoon	Site Tech 1s	Visual inspection	As required	Process failure	Bring process back	Low

Table 4.5. Intermittent (Int), abnormal (Ab), and emergency (E) events for assets under UWWTD

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Balancing Tank	Septic discharge	Ab	None	**Ab:** Control septic discharge to avoid spillages	Medium
	Failure of OCU1	Ab	Repair OCU. Should the atmosphere around the inlet area become a serious nuisance due to the failure of OCU 1, then the option of bringing into use a masking spray can be considered	**Ab:** Maintain OCUs to avoid failures.	Medium
Incoming Sewers & Reception Wet Well	Septic discharge	Ab	Masking spray may be only option to reduce odours. We will deploy these if required	**Ab:** Failure of a storm or dry weather pump would require utilisation of rolling critical spares. Up to 3 days to replace reflecting use of on-site crane. Limited odour risk from pump failure.	Medium
Cess Reception, Discharge, Wash down & Drainage	Septic discharge	Ab	Clean up. Masking spray application if needed	**Ab:** Control septic discharge to avoid spillages	Medium
Storm & Balancing Tanks	Tanks remain filled	Ab	Increase rate of return to treatment, when we are able without affecting the process	**Ab:** Keep minimum reserve volume for the returning sewage	Medium
	Empty tanks; build-up of sludge	Ab	Implement tank cleaning	**Ab:** Constantly monitor the tank fill-up	Low
	Spillage. Skip filled.	Ab	Clean up. Replace filled skips	2 rag skips and 2 roll on/roll off grit skips	Medium

Screens & Screening Conditioning, Drainage & Rag Skip Management				present**. Ab**: Skips only accumulate due to presence of liquids. Ramps and tankering used as appropriate. Coverings used	
	Carry-over, bypassing	Int	Clean up. Replace filled skips	Same as above	Medium
Grit Removal Equipment, Drainage & Grit Skip Management	None identified	n/a	n/a	n/a	n/a
Flow & Distribution to Primary Settlement Tanks	Dosing system failed	Ab	Reinstate	Ab: Maintain dosing system	Low
Primary Settlement Tanks	Rising sludge. Failed scraper	Ab	Repair. Take out of service. Due to the hydraulic constraints on the plant, in the event of the failure of a scraper, it is considered preferable to keep a tank in service until repairs can be carried out rather than take it out for any longer that the minimum. If PST becomes septic, use of manual odour control spray units will be used	**Ab:** operational response from couplings and motor issues within 2 weeks turnaround. **E** operation would be loss of 2 of the 3 PSTs. Response would be to manually de-sludge with increased export; 1 to 2 weeks to empty and then contractor support for up to 4 months if complicated repair with use of crane. Scraper failure referenced in Table 4.3.	Medium
	Rising sludge due to THP reduced throughput	Ab	Strategic spares on site	Same as above	Medium
Fats, Oil & Grease Scum Removal System	Blockages. Scum build-up.	Int	Unblock	**Ab:** Constantly monitor the scum build-up to avoid failures	Medium

Primary Raw Desludge Pumping	Failure of desludging.	Ab	Repair. Take out of service	**Ab:** Constantly monitor desludging system to avoid failures	Medium
Flow & Distribution to Primary Settlement Treatment	None identified	n/a	n/a	n/a	n/a
Activated Sludge Plant Lanes & Zones	Build-up of scum/ crust on surface.	Ab	Monitor	**Ab:** Constantly monitor scum and crust build-up to avoid failures	Low
	Blower failure		Change over blowers	**Ab:** Sufficient blower stand by capacity.	Low
Biological Filters	n/a	n/a	n/a	n/a	n/a
Flow & Distribution to Secondary Settlement	Overtopping	Ab	Hose down	**Ab:** Check for flow disruptions to avoid overtoppings	Low
Final Settlement Tanks	Flooding	Ab	Inspection. Divert the flow to other working final settlement tanks	**Ab:** Check forecast to be prepared for accepting increased flows	Low
Scum Removal System	Failure of mallards. Scraper failure.	Ab	Repair. Take out of service	**Ab:** Constantly monitor scum removal system to avoid failures	Low
RAS Chambers & Pumping	Pump failure	Ab	Overpump	**Ab:** Maintain pumps to avoid sudden failures	Low
OCU 1 inlet works	Fault with pumping or media	Ab	Standby fan. On failure notify team leader for notification of maintenance team. If failure, consider OCU spray deployment. Odour control units are subject to regular preventative maintenance, checked on a monthly basis monthly by specialist Framework contractors - ERG.	**E**: Complete failure the (primary) sludge OCU bigger odour risk relative to cake & liquors OCUs as **Int/Ab.** Consider temporary odour suppressant sprays for sludge OCU if cannot be re-started.	Medium-High

			Media is replaced as per TWUL asset standards		

Table 4.6. Intermittent (Int), abnormal (Ab), and emergency (E) events for assets under Sludge Treatment Centre Permit

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Liquid Sludge Reception Point	Spillage	Ab	Clean up as soon as possible – see section 4.3.3	**Ab**: Permanent spillage control and removal needed	Medium
Primary Raw Sludge Thickening (2x PFTs)	Failure of OCU2	Ab	Maintain and repair	Failure of the units impacts manually on upstream processes. **Int:** re-set unit. **Ab**: would be operational team re-setting or replacement. If mechanical/electrical part failure, a job raised within next working day to examine. **E:** If extended for more than c. 1 week consider supplementing process through exports. This issue would manifest itself in blanket levels which at c. 1m+ of sludge depth consider tankering out. Limited odour risk present from dismantling thickener; more potential for odour from emptying and cleaning tank or if septicity present	Medium
Primary Sludge Screens	Unit open for maintenance	P	Minimise downtime	Blockages dealt with on identification. **Ab/E:** Loss of 2 (3) of the four screens would be significant for process operations. As within building, not particularly odorous but	Medium

				potential odour risk from screening handling present on tanker use.	
Skip Management	Skips overfilled or left too long. Poor quality screenings	Ab	Replace filled skips	2 rag skips and 2 roll on/roll off grit skips present**. Ab**: Skips only accumulate due to presence of liquids. Ramps and tankering used as appropriate. Coverings used.	Medium
SAS Thickening & Pumping (2x Aquabelts)	Failure	Ab	Find cause and resolve	**Ab**: Maintain pump to avoid failure	Low
SAS & Imported Sludge Tank (Green Tank)	Cover opened/damaged	Ab	Cover tank. Repair cover	**Ab:** Monitor if the cover is working correctly	Medium
	Failure of OCU2	Ab	Repair OCU	**Ab:** Monitor the OCU performance to predict possible failure	Medium
SAS & Imported Sludge Screening	Vented for maintenance	P	Clean down	**P:** Minimise time open	Medium
Sludge Blending x 2 & Mixing Tanks (concrete tank)	Failure of OCU3 spillage	Ab	Repair Clean ASAP	**Ab:** Monitor the OCU performance to predict possible failure	Medium
Return Liquors	Can vent on occasions	Ab	Short-lived	**Ab:** Monitor for short-lived odours	Low
Raw Sludge Dewatering, Pre THP presses	Spillage. Covers open	Ab	Clean up. Replace cover	**Ab**: Monitor the cover status	Medium
Raw Sludge Dewatering Liquors	Spillage	Ab	House-keeping. Shutdown liquors as necessary	**Ab:** Check for leaking spots	Medium
Cake import facility	Fault with door interlock. Building fabric damaged	Ab	Manual intervention. Consider stopping imports. Consider odour sprays. Spares on site.	**Ab:** Consider stopping imports. Consider odour sprays. Spares on site	High
Cake Dilution Pumps	Spillage	Ab	Switch pumps. Clean up	**Ab:** Check for leaking spots	Medium
THP Feed Silo & Pumps	Failure of silo	Ab	Clean up. Repair silo/pump	**Ab:** Maintain THP equipment to avoid sudden failures	Medium
THP Reactors	Bursting disk failure, relief valve blowing	Ab	Clean up.	**Ab:** Consider taking out of service till repairs completed	High

	Vessel vented when taken out for service/ cleaning. Statutory inspections every 2 years	P	Flushing system employed prior to being vented. Installation of odour spray required before cleaning of vessels is carried out.	**Ab:** Consideration of time of day this activity is carried out	High
THP flash Tanks	Bursting disk failure, relief valve blowing	Ab	Clean up.	**Ab:** Taken out of service till repairs completed	High
	Vessel vented when taken out for service/ cleaning. Statutory inspections every 2 years	P	Flushing system employed prior to being vented.	**Ab:** Consideration of time of day this activity is carried out	High
Treated Sludge Transfer & Heat Exchanger	Blockage	Ab	Blockage clearance process requires the installation and start up of the odour spray before openings and cleaning the blockage.	Same as above	Medium
	Taken out for maintenance	P	Flushing system installed.	Same as above	Medium
Off-gas Condenser & Transfer	Spillage	Ab	Clean up. Repair	**Ab:** Check for leaking spots	Medium
Digester feed pumps	Taken out for maintenance	P	Flushing system installed.	**Ab/E**: pH is key for process mgt control; monitored on daily basis. If pH drops below a trigger of c. 6.6 tank feed would be reduced & supplemented by tankering in instances of backing up. Temperatures are relatively stable (38-43 degrees as digester average) which minimises the definition of an **Int** event. An **Ab** event might constitute over-feeding of the digesters. **E:** risk of odour at below 6.6 pH would be responded to by ceasing feeding and likely need to re-seed.	Low
Primary Digestion	Spillage	Ab	Clean up and repair	Same as above	Low
Digested Sludge Transfer Tank & Pumping	Tank goes high	Ab	Catch up, increase flows to Buchers	Same as above	Low

Buffer Tank	Spillage	Ab	Clean up	**Ab:** Check for leaking spots	Low
Dewatering Press (Bucher Press)	n/a	n/a	n/a	n/a	n/a
Liquor Treatment Plant	Spillage	Ab	Clean up	**Ab:** Check for leaking spots	Low
Cake Pad/Barn (including cake import)	Cake export restricted	Ab	Spray OCU to be deployed. Consider stopping imports.	**Ab:** Consider storing raw cake in bins and OCU sprays to reduce odours	high
	Door failure	Ab	Increase mechanical ventilation	**Ab:** If failure of doors, look at the option of masking sprays	High
Vehicle Movements & Wash Down	Wheelwash not used. Uncovered truck	Ab	Use of wheelwash, cover trucks	**Ab:** Monitor the state of trucks leaving the facility	Medium
Biogas Storage	Venting. Leakage	Ab	Resolve process issues. Repair	**Int/Ab:** Impaired availability of engine/boilers. **E:** failure of CHP engine &/or ground flare. If repair not possible, response would be recourse to a standby boiler/engine/flare to limit whessoe/PRV releases. Lead in time of c. 4 to 6 weeks. Potential for odour to be present from released biogas.	Medium
CHP	Engine fault	Ab	Service engine	Same as above	Low
CHP	Pptek unit venting cycle	P	Venting in early hours of the morning to minimise impact		Low
Boilers	n/a	n/a	n/a	n/a	n/a
Waste Gas Burner	Gas leak/ or flare state failure	Ab	Turn off and repair	**Int/Ab:** Impaired availability of engine/boilers. **E:** failure of CHP engine &/or ground flare. If repair not possible, response would be	Medium

				recourse to a standby boiler/engine/flare to limit whessoe/PRV releases. Lead in time of c. 4 to 6 weeks. Potential for odour to be present from released biogas.	
Standby Generators	Faulty engine	Ab	Repair.	Same as above	Low
OCU 2, 3, 4 & 5	Fault with pumping or media	Ab	Standby fan. On failure notify team leader for notification of maintenance team. If failure, consider OCU spray deployment. Odour control units are subject to regular preventative maintenance, checked on a monthly basis monthly by specialist Framework contractors - ERG. Media is replaced as per TWUL asset standards	**E**: Complete failure the (primary) sludge OCU bigger odour risk relative to cake & liquors OCUs as **Int/Ab.** Consider temporary odour suppressant sprays for sludge OCU if cannot be re-started.	Medium-High
Emergency Secondary Digester	Process failure	Ab	Bring process back	**Int:** drain line being blocked/grit build up but over extended timescales. **Ab/E:** drain or transfer line blocked requiring jetting. Low risk of odour; possibly short term from jetting. Timescales for arranging jetting at 3 working days through LMC. Lower odour risk from being digested sludge ("earthy")	Medium
Emergency Lagoon	Process failure	Ab	Bring process back	Same as above	Low

Table 4.7. General Intermittent (Int), abnormal (Ab), and emergency (E) events

Incidents and emergencies	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab/E events	Odour risk after mitigation

				For all entries TWUL's incident management response process would be followed including use of Site Incident (SIC) cards.	
Fire	Failure of fans or sludge building	E	Use of SHTs for storage of sludge. Tanker from site	n/a	Low/Medium
Severe weather	Transport of sludge from site inhibited resulting in back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Event unlikely as there is provision for 60days storage on site plus additional storage in the existing sludge holding tanks		Low
Flooding	Flooding causing process or equipment problems	E	Not an identified problem at Oxford. Site incident procedures would be followed	Pumps/tankering arranged through LMC.	Low
Illness/absence of key staff	Accumulation of sludge/loss of odour control etc	E	Task allocation is independent of individual staff	n/a	Low
Power cuts	Loss of power to fan leading to loss of odour control	E	Emergency power generation for critical activities until power restored	Greatest risk in persistent inclement weather where temporary external power outages might constitute the most likely externally generated risk. Recourse to temporary generators.	Low
Other incidents	Transport of sludge to land inhibited for other reasons leading to back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Provision for 60 days storage on site plus additional storage in the existing sludge holding tanks. Transport to other STWs if necessary	n/a	Low

4.3.3 Spillages

Spillages significant enough to cause odorous emissions will be cleared as soon as practicable. The person discovering the spillage will inform site management, who will utilise resources as required to clear it.

Spill response guidance is also available in the Pollution Prevention Essential Standard at Environmental Management System - Pollution Prevention (sharepoint.com).

4.4 Routine Monitoring

Overall plant performance is assessed daily as part of the generic Site and Sludge inspections rounds, which apply to Thames Water large STW sites, and have been included in Appendices 5 and 6, respectively.

The objective of these are to ensure that treatment processes, including odour control, are checked for effective operation as per the SOM. Any of the checks that result in performance of the process outside of the limits defined in the SOM or a fault being detected will require an Operator to change the process to bring the plant back into acceptable limits or the fault needs to be logged and reported for follow up maintenance/repair. A daily check of site odour is also recorded in the E-Logbook.

Various process parameters are monitored using a combination of online instruments (to measure flows, temperatures, pressures, levels); samples that are taken to our UKCAS accredited laboratories, or run through sampling tests at the on-site laboratories (%DS, pH, alkalinity, ammonia).

Where remedial actions are identified from any source these are listed in Tables 4.3 & 4.4 with expected durations accompanying rectification. The timescales given are indicative or illustrative but are informed directly by operational experience. Repairs requiring capital funding will take longer as they are directly informed by complexity and will be bespoke to the issue(s) identified.

The online instruments all have signals that are taken back to the site SCADA system and these ‘alarm’ if the readings are outside pre-set trigger points. Similarly, laboratory analysis samples will have expected ranges, which if outside of these, a notification is sent to the site process controllers.

In all instances that parameters are out of ‘range’, the operational teams will carry out an investigation to understand the cause and initiate corrective actions. If the reasons are not obvious, the process optimisation team is contacted to evaluate further.

Additionally, each week the various recorded parameters are recorded in the site Cockpit reports to look at trends. These are used to establish if there are gradual changes in performance over time so that early intervention can be carried out.

A range of process parameters are subject to routine monitoring or checking to ensure that the digestion process is operating optimally so that the required sewage cake output quality is achieved.

- **pH:** At a THP digestion site such as Oxford the processes are maintained around pH 8 but within the range 7.5-8.6 (this is % dry solids and digester load dependant) for healthy operation.
- **Alkalinity:** Levels dependant on feedstock characteristics (primary sludge: surplus activated sludge (SAS) ratio). Advanced digestion (THP) typically, 5,000 - 10,000mg/litre (target range from 6,000-8,000 mg/litre) but is dependent on % dry solids and digester load.
- **Temperature:** minimum target of 40°C for advanced digestion. This is maintained within the range 36-45°C for THP AD.

- **HRT** (hydraulic retention time): minimum target is 15-days, there is no upper limit. Retention times shall not be less than 12-days during plant outages to keep the product pathogen kill efficiency control.
- **OLR** (organic loading rate): see table 4.8 - this is dependent on the primary/SAS ratio. Oxford fits into the fourth row of table 4.8.
- **Dry solids feed**: see table below, Oxford has a target of 10%DS, but this can vary between 8-14%DS and impacts the HRT.

Table 4.8 Organic loading rate in various digestion types

Type of Digestion	0%- 35% SAS[x]	36%- 45% SAS	46%- 50% SAS	51%- 55% SAS	>55% SAS	Max Feed %DS
MAD* in Conventional Digestion	3.0	2.5	2.0	1.75	n/a	6.0
MAD after Pre-pasteurisation	4.5	4.0	3.5	3.0	n/a	7.0
MAD after Acid Hydrolysis	4.5	4.0	3.5	3.0	n/a	7.0
MAD after Thermal Hydrolysis	7.0	6.5	6.0	5.5	5.5	14.0

* mesophilic anaerobic digestion
X surplus activated sludge, arising from the UWWTD route.

- **VFA** (volatile fatty acid) concentration: There is no specific range for VFAs as it depends on the feedstock. It is used as an indicator of digester health rather than a process control. The production of organic acids depends on the volume of solids fed to the digester. The typical range for VFAs in a Primary Digester Tank is between 50 and 800 mg/L. When VFA concentrations climb above 1000 mg/L, the digester could be overloaded or experiencing other problems.
- **Ammonia** - Ammonia concentrations of 50 to 1000 mg/L are beneficial, but ammonia levels of 1500 to 3000 mg/L (pH greater than 7.4) could be inhibitory but not always. An ammonia concentration higher than 3000 mg/L for prolonged period is toxic.
- **VFA to Alkalinity ratio:** Very important parameter to monitor for digestion process. The VFA to alkalinity ratio of below 0.4 is good and above this threshold value means diminishing alkalinity and low pH i.e. sour digester content. As long as this ratio is maintained higher VFA and alkalinity digester content can be acceptable and the digestion process is deemed healthy. Anaerobic digestion process is always controlled based on holistic parameters based but not based on single parameter.

Odour monitoring is carried out following receipt of an odour complaint. See section 6.3 Investigation a complaint for full details.

We aim to ensure a robust process is in place for investigation of complaints involving non-site based staff (see Section 6 of the OMP). We also ensure regular routine maintenance is undertaken involving site walks to ensure more odorous activity is identified, captured, resolved and logged in the site log book.

Further details of routine monitoring tasks are included in the Site Operating Manual.

4.5 Record Keeping

- Records of routine monitoring, site and sludge inspection rounds and sludge blanket checks are kept in the Site Logbook and recorded electronically via the Cockpit.

- Records of skip management, which collect wastes generated from UWWTD activities, are held in the ELogbook and held by the contractor.
- Any spillages and remedial actions are held in the site diary.
- Raw sludge and imported cess are logged by loggers, Sludge cake removal records are kept by Biorecycling Team
- There is a SCADA system on this site.
- A monthly condition report on the OCUs is sent to the performance manager by the contractor and stored on SharePoint.

4.6 Emergency Response and Incident Response Procedures

Emergencies such as fire, flood and severe weather are managed by Thames Water's Incident Management and Business Resilience team. The processes employed can be found on Thames Water's SharePoint site and are entitled: 'Incident Management Arrangements'. This is a company confidential document and therefore, is not included in the Appendices of this document.

Hazard reporting and accidents are all recorded on the Health and Safety software database SpheraCloud (https://sphera.com) and monitored by Thames Water's Safety, Health & Wellbeing team.

In the event of power failure, the site will run on island mode for critical plant. However, as this doesn't include the odour control units there is a potential temporary risk of odour until power is restored.

Absence of key staff does not affect the running of Oxford STW, as Tech 1s from other sites can be called upon to cover, if required.

Tables 4.3 to 4.7 respond to the identification of relevant triggers and actions to minimize odour. OCU monitoring is also included. Monitoring of odour release to atmosphere for wider sludge treatment assets is constrained by sludge containment (say versus an open composting operation), the lack of a confined emission point and the episodic nature of odour release and exposure.

Irrespective of such constraints, our Operations Team and odour contractor have recommended consideration of the following techniques either proactively (so accompanying planned or reactive works with known odour risk) and in an investigative capacity attached to an incident:

(a) Targeted use of 'Jerome' hydrogen sulphide analysers (already present in Section 6.2 of OMP to investigate customer complaints).
(b) Targeted use of sniff tests ('calibrated nose')
(c)H2S measurements of stored materials where septicity is either present, or the material is at risk of septicity from continued storage especially in the open air, for example, prior to de-watering where measurements of sulphide & dissolved O2 would inform a condition assessment. Quantities and storage times precipitating a need for such assessments. This recommendation is being raised with the Area Process Scientist.
(d) Inclusion of temporary odour suppressants/misting agents (for example, where use is recommended in Table 4.6) and continued access to process critical spares (odour minimisation by early intervention).
(e) Further expansion of odour risk within site incident planning (this is already referenced in Tables 4.5, 4.6 & 4.7 under relevant Intermittent; Abnormal Operation & Emergency scenarios)
(f) For PSTs, asset condition (wear/damage) would consider odour risks where assets are taken offline
(g) Telemetry/alarming of whessoe valve releases – there is an existing phased project within TWUL to enhance this at our sludge locations).

5 Maintenance and Inspection of Plant and Processes

5.1 Routine Maintenance

5.1.1 General Requirements

Site staff have a schedule to ensure routine maintenance for key mechanical items. In addition, a dedicated maintenance team provide additional support for more specialised equipment, e.g. regular calibration of Dissolved Oxygen probes.

In addition to the routine operational tasks, planned preventative and defect maintenance of plant is carried out. Plant which may have an impact on odour release is assigned an appropriate criticality rating to ensure effective performance is maintained. Plant assessed to be odour critical is listed in Section 4.2.3 above.

All maintenance procedures are detailed in the SOM, and when carried out is captured on the corporate system SAP, which generates work requests for the various activities for the treatment process assets at the appropriate frequency.

5.1.2 OCU selection and performance validation

The introduction of new OCUs is informed by a bespoke design brief informed by calculations of the system's capacity, principally flow rate measured in Am3/hr. OCUs can either be direct installs or commissioned under joint venture arrangements where a component part of wider UWWTD/EPR asset replacement and/or refurbishment

OCU 1

UWWTD

Air is drawn from the inlet works and the inlet balance tank to a common duct which splits to feed two fan inlets operating in a duty/duty configuration. The air is pushed from these fans into a sectional tank woodchip biofilter and then discharged to atmosphere via two separate discharge stacks which are integral to the biofilter.

Height x Width x Length	9,700 mm x 4,500 mm x 1,750 mm
Construction Type	Rectangular sectional tank with 2 cells
Materials of Construction	PVC/GRP
Media Type	Woodchip
Local Strainers	Yes
Design Air Flowrate	2,991 m_3/hr
Design H_2S Inlet Load	419 ppm (maximum), 124 ppm (average)
Design Inlet Temperature	20°C
Design Removal Efficiency	98%
Duty/Standby Fan	2 Fans
Fan Flow and Pressure	1,496 m_3/hr
Fan Materials of Construction	PVC
Fan Instrumentation	Air flow switches

Stack Dimensions	2 x Ø300 x 700 mm
Stack Materials of Construction	PVC/GRP
Stack Discharge Velocity	5.9 m/s
Trace Heating	Present
Duty/Standby Extraction	Yes

Design parameters back calculated by ERG

For continuous operational monitoring, system incorporates:

- Fan status identified on SCADA with alarms

For period monitoring:

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

STC

OCU2

Air is drawn from various sources surrounding the primary picket fence thickeners which include sumps, wet wells, supernatant pumps, scum pumps picket fence thickeners and blending tanks. The motive force for this air is two duty/standby fans which are located downstream of a sectional rectangular biofilter which draw the air into the biofilter and then discharged via two separate stacks which are associated

with each fan.

Original manufacturer	Hibernia
Year of Installation	1998
Height x Width x Length	6,000 mm x 4,800 mm x 1,200 mm
Construction Type	Rectangular sectional tank with 2 cells
Materials of Construction	Dewey waters- fibreglass
Media Type	Pumice
Design Air Flowrate	1,497 m_3/hr
Design H_2S Inlet Load	500 ppm (maximum), 150 ppm (average)
Design Inlet Temperature	20°C
Design Removal Efficiency	98%
Duty/Standby Fan	2x Duty/standby Fans
Fan Flow and Pressure	1,497 m_3/hr
Fan Materials of Construction	PVC
Fan Instrumentation	Low flow switches
Stack Dimensions	2 x Ø240 x 3,200 mm

Stack Materials of Construction	PVC/GRP
Stack Discharge Velocity	5.0 m/s
Trace Heating	Present
Duty/Standby Extraction	Yes

Design parameters back calculated by ERG

For continuous operational monitoring, system incorporates:

- Fan status identified on SCADA with alarms

For period monitoring:

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

OCU3

Air is drawn from the screened sludge holding tank and the sludge buffer tank. The motive force for this air is two fans operating in a duty/standbyconfiguration which draw air from the plant and push it into a cylindrical biofilter before being
discharged through short stack located at the top of the biofilter.

Original Manufacturer	ETA
Height x Width x Length	Ø1,100 mm x 5,200 mm
Construction Type	Cylindrical
Materials of Construction	HDPE
Design Air Flowrate	636 m_3/hr
Design H_2S Inlet Load	350 ppm (maximum), 102 ppm (average)
Design Inlet Temperature	20°C
Design Removal Efficiency	98%
Duty/Standby Fan	2 /duty/standby Fans
Fan Flow and Pressure	636 m_3/hr
Fan Materials of Construction	PVC
Fan Instrumentation	Air flow switches
Stack Dimensions	Ø190
Stack Materials of Construction	PVC/GRP
Stack Discharge Velocity	6.2 m/s
Trace Heating	Present
Duty/Standby Extraction	Yes
Duty standby irrigation pumps	Yes

Design parameters back calculated by ERG

For continuous operational monitoring, system incorporates:

- Fan status identified on SCADA with alarms

For period monitoring:

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

OCU4

The mixture of air and malodorous compounds is drawn from the THP processes and the cake import facility into the bio-trickling filter where most of the H2S is removed by passing the air through a packed bed of pumice stones against a downward flow of FFE. After leaving the bio-trickling filter, the air passes through the duty/standby fans and flow into the carbon filter to remove the remaining contaminants. The treated gas leaves the carbon filter and is discharged to atmosphere via the vessel-mounted stack.

Parameter	Value	Units	ACH
Design air flow rate – Sludge cake reception building	1,124	Am^3/hr	3
Design air flow rate – Pre-THP sludge buffer silos	688		1
Design air flow rate – Pre-THP dewatering feed tank	36		3.8
Design air flow rate – Pre-THP dewaterers	54		10
Design air flow rate – Liquor transfer pumping station	20		9
Total design gas flowrate (Note 1)	**4,915**		-
Design temperature	0 to 20	°C	-
Design inlet H_2S concentration (to bio-trickling filter) (**Note 2**)	150	ppm	-
Design inlet H_2S concentration (from sludge cake reception building)	5	ppm	-
Design inlet humidity	70	%RH	-
Design inlet odour (to bio-trickling filter) (**Note 2**)	300,000	ou_E/m^3	-
Design inlet odour (from sludge cake reception building)	10,000	ou_E/m^3	-
Design system H_2S removal efficiency	99.98	%	-
Required outlet odour	<1000	ou_E/m^3	-
Area classification inside duct	Zone 1		
Area classification outside duct (local to Fan)	Zone 2		

Notes:

1. The bio-trickling filter treats 1,543 m^3/hr of air from the Pre-THP sludge buffer silos, dewatering feed tank, dewaterers and liquor transfer pumping station. The treated air from the bio-trickling filter joins with untreated air from the sludge cake reception building making a total of 4,915 m^3/hr of air flowing to the fan and carbon filter.
2. The H_2S and odour concentration from the THP plant to the bio-trickling filter are 150ppm and 300,000 ou_E/m^3 respectively.

Biofilter

Media volume 13 m3

Tank dimension diameter 2.86m height 3.9m

Bed depth 2m

Coarse pumice 75% Fine pumice 25%

Carbon filter
Volume 2.83m3
Size 4mm extruded pellets

For continuous operational monitoring, system incorporates:

- Fan status identified on SCADA with alarms

For period monitoring:

- Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the recommendation section of their inspection report, for example media replacement.
- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

OCU 5

The mixture of air and malodorous compounds is drawn from the LTP plant into the bio-trickling filter where most of the H2S is removed by passing the air through a packed bed of pumice stones against a downward flow of FFE. After leaving the bio-trickling filter, the air passes through the duty/standby fans before being treated in the carbon filter to remove the remaining contaminants. The treated air leaves the carbon filter and is discharged to atmosphere via the vessel-mounted stack.

Parameter	Value	Units
Design air flow rate	1,620	m^3/hr
Design temperature	0 to 20	°C
Design inlet H_2S concentration (**Note 1**)	150	ppm
Design inlet humidity	70	%RH
Design inlet odour	300,000	ou_E/m^3
Design system H_2S removal efficiency	99.98	%
Required outlet odour	<1000	ou_E/m^3
Area classification inside duct	Zone 1	
Area classification outside duct (local to Fan)	Zone 2	

Notes:
1. The average and maximum H_2S concentrations are 150ppm.

Air change rate per hour in the liquor balancing tank is 1

Biofilter

Media volume 13.5 m3

Tank dimension diameter 2.86m height 3.0m

Bed depth 2.1m

Coarse pumice 75% Fine pumice 25%

Carbon filter

Volume 0.9m3

Size 4mm extruded pellets

For continuous operational monitoring, system incorporates:

- Fan status identified on SCADA with alarms

For period monitoring:

Inlet and outlet Hydrogen Sulphide concentrations recorded and assessed for removal efficiency and below maximum designed inlet loading during monthly inspections. Following the monthly inspections, hydrogen sulphide concentrations are trended by ERG which would enable identification of a decrease in H_2S removal. Should this occur, ERG would include this in the recommendation section of their inspection report, for example media replacement.

- System integrity checked during daily site rounds and monthly inspections to confirm extraction points and routes undamaged.

Evidence of the systems continuing ability to treat the input flow are confirmed by monthly inlet and outlet odorous gas (hydrogen sulphide) concentrations. Examples of such reductions are given in 5.1.3 iii) of the OMP

5.1.3 Maintenance and Monitoring of Odour Control Units

Operation and maintenance of OCUs is delivered in accordance with the Company's Asset Standards and Equipment Maintenance Standards. This is either delivered in house by Operations or outsourced to a contractor. Refer to the Odour Control Unit Asset Standard and Site Operating Manual for more information. The scope of this table includes anticipated monitoring requirements of emissions to air from the OCU outlets; TWUL's own site round checks as they pertain to OCUs; followed by a further five key performance indicators reflecting discussion with our specialist OCU inspection contractor as of greatest relevance to Oxford.

Table 5.1 : Performance Monitoring and Maintenance Checks

Parameter	Monitoring Method	Action if red flag identified and Expected timescales	Frequency	Biofilter	Carbon	Chemical scrubber
Performance monitoring						
Gas inlet temperature (5-40C)	Temperature probe	Investigate any anomalies relating to temperature, such as individual process checks	Monthly	X	X	X
Gas outlet temperature (5-40C)	Temperature probe	Investigate any anomalies relating to temperature, such as individual process checks				
Gas inlet flow rate or velocity (6m/sec)	Calibrated velocity meter	Investigate any anomalies relating to flow rates; velocities and pressure drop across the system by measuring the inlet and outlet pressure. Check fan functionality; presence of obstructions; bring forward contractor service. If fan replacement needed c. 2* months minimum typical duration depending on severity of issue/condition of back up fan (*time of order to mobilisation; assumes second duty fan runs; timescale includes time to install replacement and fabrication). If solely an electrical issue, recourse to TWUL ICA Technician mostly likely within a week. Other root causes are usually blocked media; duct and failure of non-return dampers around fan sets.	Monthly	X	X	X
Gas outlet flow rate or velocity (6m/sec)	Calibrated velocity meter					
Gas inlet humidity (Post biofilter humidification > 90% Carbon units <70%)	Hygrometer	Check any preheaters fitted to system before carbon, or check irrigation is working on biofilter.	Monthly	X	X	-
Back pressure (to assess media thatching or media compaction) Typically systems work around 0.5 kPA	Calibrated digital pressure meters	Values above threshold would be 'RAG' banded in the OCU contractor inspection reports. If pressure gauges are over-pressurised to the extent fouling is or has occurred to be treated as high priority. Check for blockages, poor FFE quality/check if media is of a type susceptible to biodegradation.	Monthly	X	X	X

pH of discharge irrigation water (2-3pH)	pH paper	Less than 2 increase irrigation.	Monthly	X	-	-
pH of scrubber liquor (9.2 pH)	Calibrated pH probe (calibrated with standard solutions)	Recalibrate pH probe and check dosing and chemical availability	Continuous	-	-	X
Redox potential of scrubber liquor (700-730 mV)	Calibrated redox probe (calibrated with standard solutions)	Recalibrate redox probe and check dosing and chemical availability	Continuous	-	-	X
Gas inlet/outlet concentrations for hydrogen sulphide (50ppb used for media change out)	Drager Tubes/CEN TS 13649 for sampling NIOSH 6013 for analysis OR US EPA M11*	Check functionality of odour control unit. If repair or replacement media required raise a job on SAP or APS risk and arrange for contractor repair. Timescale Bespoke to root cause/see later entries. Arrange re-test post remedial work. Major repairs up to 6 months depending on complexity	Monthly/ 6 monthly	X	X	X
Gas inlet/outlet concentrations for ammonia (20mg/m3)	Drager Tubes/EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis*	Check functionality of odour control unit. If repair or replacement media required raise a job on SAP or APS risk and arrange for contractor repair. Timescale Bespoke to root cause/see later entries. Arrange re-test post remedial work. Major repairs up to 6 months depending on complexity	Quarterly/ 6 monthly	X	X	X
Gas inlet/outlet concentrations VOCs and RSH	RSH – Drager tubes VOC – PID as isobutylene		Quarterly	x	x	x
Outlet gas streams TVOCs HCl	 EN 12619* EN 1911*	6 monthly IF identified as relevant in wastes gas stream characterisation				
Maintenance checks and inspections						
Check integrity of tank covers for damage and ensure access hatches are closed		Close hatches ASAP	Daily	X	X	X
Check building & door integrity for damage or leakage; doors closed (if required)		Closed doors ASAP	Daily	X	X	X

Check damper positions on ductwork are in the correct positions	Correct positioning	Daily	X	X	X
Check irrigation and humidification systems are functioning	Turn on systems or investigate malfunction.	Daily	X	-	-
Check for free discharge of effluent from drain	Investigate blockage	Daily	X	-	-
Check irrigation water supply is working at required rate	Visual check on flow gauge, investigate if required.	Monthly[1]	X	-	-
Check condensate removal points for free flow of liquid	Visual check	Daily/Monthly[1]	X	X	X
Check OCU condition for signs of damage or leaks	Call specialist contractor if identified	Daily / Monthly[1]	X	X	X
Check general ductwork for signs of damage or leaks	Condition of ductwork would be 'RAG' banded in the OCU contractor inspection reports. If broken, then odours not being conveyed to OCU and can be indicated by low inlet load. Worst case the ductwork is disconnected ('sucking air') such that odour removal is not taking place.	Daily / Monthly[1]	X	X	X
Check spray pattern from irrigation nozzles and clean nozzles as required	Adjust spray pattern, clean the strainer and unblock nozzles or replace as deemed necessary. Timescale durations of c. 2 weeks where just irrigation required.	Daily / Monthly[1]	X	-	X
Check flexi joints between fans and ductwork for leaks	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	X	X
Check fans for excessive vibration or noise, belt tension and bearing temperature	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	X	X

Check irrigation water pH	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	-	-
Check irrigation pumps condition and operation	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	X	-	
Check chemical reagent levels and supply	Order when required. Ensure no low-level alarms.	Weekly	-	-	X
Check chemical dosing and blow down pump condition and operation	If outside pH levels, investigate. Initiates blow down to correct level.	Daily/Monthly	-	-	X
Check blow down rate is within correct range	If outside pH levels, investigate. Initiates blow down to correct level.	Monthly	-	-	X
Check ph and Redox probes are working and in calibration	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)	Monthly	-	-	X
Check recirculating liquor strainer and replace if necessary	Flows recorded on SCADA	Monthly	-	-	X
Check water softener is working correctly (if installed)	Water hardener test papers used to check water quality.	Monthly	-	-	X
Check dampers are operational and in good condition	Swap over duty fan to stand by fan and record flow volumes to identify issue.	Monthly	X	X	X
Inspect electrical control panel and check for faults and alarms	Visual inspection by monhtly contractor and investigation any alarm conditions.	Monthly	X	X	X
Simulate duty / standby fan and pump changeover	Contractor inspection reports 'RAG' band these issues with a level of detail to then inform the maintenance response. Timescale	Monthly	X	X	X

	durations of 1 to 2 months typical depending on complexity (time of order to mobilisation)				
Check H_2S meter is functioning and calibrated (if installed)	Check calibration is still in date during monthly contractor inspection.	Monthly	X	X	X

*Only required on STC OCUs

Condition of the media in the OCU is monitored by performance checks and by additional testing as required.

The OCUs at Oxford STW are covered by a service and maintenance contract with a specialist Contractor. They are inspected on a monthly basis and reports are sent to site management. Figure 5.1 below highlights the scope of work required from our OCU Maintenance Contractors through their monthly visits. Monitoring during the visits is as follows:

- Monthly – flow (m^3/h), differential pressure (kPa) and hydrogen sulphide(ppm) at both the inlet and outlet. Where applicable, monitoring may also include fan hours run and removal efficiency of hydrogen sulphide.
- Quarterly – VOC (ppm) and mercaptans(ppm) at the inlet and outlet.

Condition of the media in the OCUs is monitored by performance checks and by additional testing as required. >50ppb hydrogen sulphide will be used as a threshold value for media change out.

The OCU biofilters and carbon units are specifically designed to minimise the release of odour, bioaerosols and microorganisms.

Optimum flow rates; trigger levels; odorous components/concentrations in the gas stream and associated physical properties are all important to OCU function and are described below:

(i)Optimum flow rate through the system to allow for effective treatment.

A '**Maximum velocity in duct work'**; rather than volume; is the key design aspect informing effective treatment for new/existing OCUs. Not exceeding 10m/second in a piece of ductwork will avoid noise break out; the industry benchmark for new plant being 8m/second. Given velocity is directly related to the volume; the specification is +/- 20% to reflect instrumentation variation; and therefore all OCUs are checked to see ***if they can meet 6m/second*** with escalation in monthly contractor inspection reports where this value is not reached. This is a good indicator of functionality, appropriate sizing, and system health.

ii) The trigger levels/ranges for action if processes monitoring parameters are breached/ outside optimal parameters.

All OCUs, irrespective of media type, *will stipulate a minimum of 30 seconds* ***retention time***, for a biofilter to achieve a minimum of 95% removal efficiency and a minimum of 2-3 seconds retention time for Carbon filter.

H2S readings are reported in the monthly service reports which inform odour equivalents (OEs). The accepted OEs for H2S at 1 part per million is equivalent to 2,000 odour units. A "red action" would be raised for any value 33 parts per million on the discharge from a biofilter (before the carbon filter) and 1 parts per million off the subsequent carbon filter . A "red action" would be raised for any value 1 parts per million on the discharge from a biofilter, regardless of the removal efficiency being met.

Trigger levels are more difficult to identify for other parameters, such as mercaptans and ammonia since the design assumptions for OCUs are informed by H2S removal. Removal for these parameters is therefore limited. For Total VOCs, *in respect to methane rather than small chain VOCs*, there is no removal.

From a qualitative value, from visual inspections, 'red flags;' would include if irrigation pipework to the biofilter is broken (no water entry to media); neither extraction fan running; broken ductwork leading to the OCU sucking in atmospheric air.

On identification of such red flags, such that the effective function of the OCU is at risk of being compromised, the following actions would be taken:

(i) For significant issues relating to any aspect of 'condition monitoring' - including effective function of the biofilters - impacting upon parameter reductions at the inlet/out; differential pressures or irrigation volumes – the Performance Manager would urgently contact Head of Maintenance at ERG to book in reactive maintenance attention. Timescales would be of highest priority but response times/duration dependent on the issue identified

(ii) For issues relating to housekeeping (leaks) or issues relating to OCU power supply (electrics) – for example, impacting either fan operation - these would be referred to a TWUL Electrician for assessment and either rectified by the area operational team or escalated to an external contractor where repairs are more complex. Timescale for expectation of resolution would typically be within 24 hours.

For either (i) and (ii) if any significant pollution risk (odour) was identified the Performance Manager would contact TWUL's incident help desk. A supporting risk would be recorded in APS (risk assessment software) to support funding where a need for remedial works was identified.

iii) Odorous components in the gas stream and concentrations of emissions

The monthly contractor inspections of each OCU provide data for H2S; VOC; Mercaptans (RsH). The sampling methodology being Drager (gas analysis) tube for c. 30 seconds to 2 minutes duration.

To achieve an appropriate level of surveillance on OCU performance, outside of the contractor monthly inspections, there is additional oversight from the Operations Management Team through:

- Visibility using local SCADA control panels for OCUs , which records fan status
- Daily site rounds by Thames Water technicians. These are Psion based checks using SAP Plus for escalations including, for example, internal MANDAT tickets or identifying a need for contractor support. The tasks in the daily checks mirror the numbered tasks in the contractor 'Monthly Health Checks'. See appendix 7 and section 9 in Appendix 5 in the OMP. There is connectivity between the site rounds and SCADA, for example, if excessive noise is recorded this could relate to an operational fault in an OCU, and in turn, is visualised on the local SCADA screens.

iv) Physical properties of the air stream at point of control i.e., humidity, optimum temp, pH for effective odour control

For **humidity**, *the gas is humidified before being received by a biofilter,* so this parameter has less relevance. Biofilters post humidification standard being > 90%. Carbon units humidity standard should be set at <70%.

For **temperature**, this is fairly constant throughout the year as this is informed by the need to achieve fairly constant temperatures in the digestion process. A range of 20 to 40^{o}C being standard.

pH will be slightly variable depending on the H2S that is there from the condensing air stream contributing to SO2 formation. This tends not to be an issue at the biofilter itself since the active component of the biofilter will in itself produce SO2 as a waste product from converting the H2S.

pH off a bio-scrubber is checked on the quarterly inspections since it might suggest an issue with the active component of the biofilter being impacted by the accumulation of its waste product thereby making the lower part of the bed inactive. A pH of 2 to 3 would be expected as a theoretical upper limit to liquor discharged from the biofilter but recorded values are significantly less; pH 4 to 5 being typical (reflecting the logarithmic scale). Note if efficiency of the process is being impacted; pH would also be part of the investigative checks (i.e., more than quarterly).

5.1.4 Records

Maintenance history records are kept electronically on SAP or the company's SharePoint system. Specialist contractor reports are saved centrally.

5.2 Fault Reporting

Faults identified during routine inspections are reported to the Performance Manager who assesses criticality before entering the task into the job scheduling system for allocation to an appropriate person to a timescale appropriate to the criticality.

5.3 Emergency Repairs

24-hour maintenance cover is available at the discretion of the Performance Manager, Duty Manager, or Out of Hours Coordinator (OHC) with planned follow up.

Less urgent repairs are assessed for criticality and dealt with during normal working hours.

6 Customer Communications

6.1 Customer Odour Complaints Process

Customer contacts regarding Oxford STW will be made via the Customer Services Centre, Operations will investigate and take appropriate action. Complaints may also be received from the local council and Environment Agency.

Customers / residents are encouraged to communicate with local Thames Water Operations via the Customer Centre to report if they are noticing odour from Oxford STW, to ensure that all contacts are recorded and actioned. Customers have 3 main options to report complaints to Thames Water:

1. Thames Water Website – "Report A Problem" at https://www.thameswater.co.uk/contact-us/report-a-problem/report-a-problem-online.

2. Email - customer.feedback@thameswater.co.uk with the subject 'Oxford Sewage Treatment Works'

3. Telephone - Customer Services 0800 316 9800

If the customer / resident would prefer to contact either the Local authorities Oxford City Council or South Oxfordshire District Council or the Environment Agency, their contact details are as follows:

Oxford City Council
Email dacreman@oxford.gov.uk
Direct Line: 01865 252435 Mobile 07901 662672

EHO for South & Vale District Council:
Simon Hill or Charles Packham
Tel: 01235 422 104
Email: simon.hill@southandvale.gov.uk or Charles.packham@southandvale.gov.uk

Environment Agency
Incident hotline: 0800 80 70 60
Email: incident_communications_service@environment-agency.gov.uk

Other contacts we need to communicate with proactively are:
The Oxford Science Park
Magdalen Centre
Robert Robinson Avenue
Oxford OX4 4GA
tel: +44 (0) 1865 784 000
direct: +44 (0) 1865 784 025
elodie.siney@oxfordsp.com
Oxford science park security: ospsecurity@gmail.com

Kassam Stadium

Email: mdoyle@thekassamstadium.com

Customer contacts regarding Oxford STW that are received directly on site are responded to by the local Operations team. The Performance Manager, at the earliest opportunity, will inform the Customer and Stakeholder Manager (CSM) of the contact details in order that they can ensure the complaint is captured and recorded at the customer centre.

Complaints received via Customer Services Centre:

- Complaint information is logged electronically by the Customer Services Centre.
- An action is raised to Waste Operations Control Centre (WOCC) who contact the CSM by telephone and email the complaint information to both the CSM and Performance Manager
- The Performance Manager and CSM will review the complaint and take action to investigate (see section 6.3)
- The CSM is responsible for contacting the customer and updating them on the outcome of the investigation.
- Any problems are noted and remedial work actioned. An update of action taken and feedback given to the customer is emailed to the WOCC by the CSM.
- The WOCC update the electronic complaint report and it is closed down.

Complaints received via email or post:

- Complaint information is logged electronically by Customer Relations and allocated a Case Manager.
- The complaint is emailed to the CSM who reviews the complaint and investigates with the Performance Manager (see section 6.3).
- Actions taken are emailed back to the case manager who updates the electronic system and updates the customer.

Complaints received via Customer Centre out of normal working hours

- For a large number of calls, or serious concerns, the out of hours coordinator will be contacted to respond.
- For all other calls Oxford STW site management will investigate and respond the next working day.

6.2 Customer Communication Plan

The customer communication plan in Appendix 3 identifies how and when contact will be made with customers and stakeholders in relation to stable, abnormal and emergency site operation. We operate a proactive communication plan with any issues that arise on site.

6.3 Investigating a complaint

Upon receiving a complaint Thames Water have 24 working hours to respond to the customer with an update. Within these 24 hours, the Customer & Stakeholder Manager will contact to the Performance Manager who will carry out an investigation to determine whether the odour source is coming from the Thames Water site. If the odour is decided to be from the Thames Water site, then the root cause is investigated.

Should the source of the odour be confirmed as coming from the Thames Water Operations then the Performance Manager will review all activities currently taking place on site, including any maintenance, cleaning, and non-standard activities to identify the root cause, and ensure appropriate mitigation measures are in place.

If the Performance Manager cannot identify the source of the odour, but complaints persist, the CSM will ensure the customer who made the complaint is contacted and obtain further details. These details include their address in relation to the site location, the time of occurrence and for how long. If odour problems continue to persist, Thames Water may even ask the customer to keep a detailed odour diary to ensure their issue can be fully addressed.

The root cause investigation may include site walkaround checks, which look for irregularities such as spillages / open doors and hatches, ensuring appropriate measures as detailed in table 4.5 and 4.6 are in place. It may also include off-site visits to the customer location.

When the root cause of the odour is found, the customer will be updated with an explanation and provided with a timescale for its resolution. Furthermore, the situation is assessed for hazards to determine any possibility of health risk to the local community.

To ensure any limitations regarding everyday staff becoming desensitised to the odour, if site odour complaints persist with no result in locating its source, personnel who do not spend prolonged time on a single site, such as the Area Operations Manager, will participate in the walkaround checks.

6.4 Notification of Operations with Potential to Cause an Odour Problem

Where operations may impact on local residents, notification will be made to the Customer Centre who will log the details on their Bulletin Board. This will be used to provide information directly to customers who call with queries. Letter drops may also be used.

The Environmental Health Officer of Oxford City Council and/or South Oxfordshire District Council (Contact Details) will be contacted directly if there are risks of odour generation (e.g. digester cleaning, tank cleaning or process issues). NOTE: This will only take place on known sensitive sites where Local Authorities and the EHO are already involved. We also proactively email Oxford Science Park and the Kassam stadium.

For assets under STC permit, we notify the EA in accordance with the permit conditions and notifications procedure, see appendix 3.

If notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, Thames Water shall investigate and carry out a review of the OMP and appropriate measures if deemed necessary.

Appendices

Appendix 1. Odour Risk Assessment

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Appendix 2. Odour Improvement Plan

Odour Improvement Plan Oxford STW

Odour Improvement Plan Oxford STW

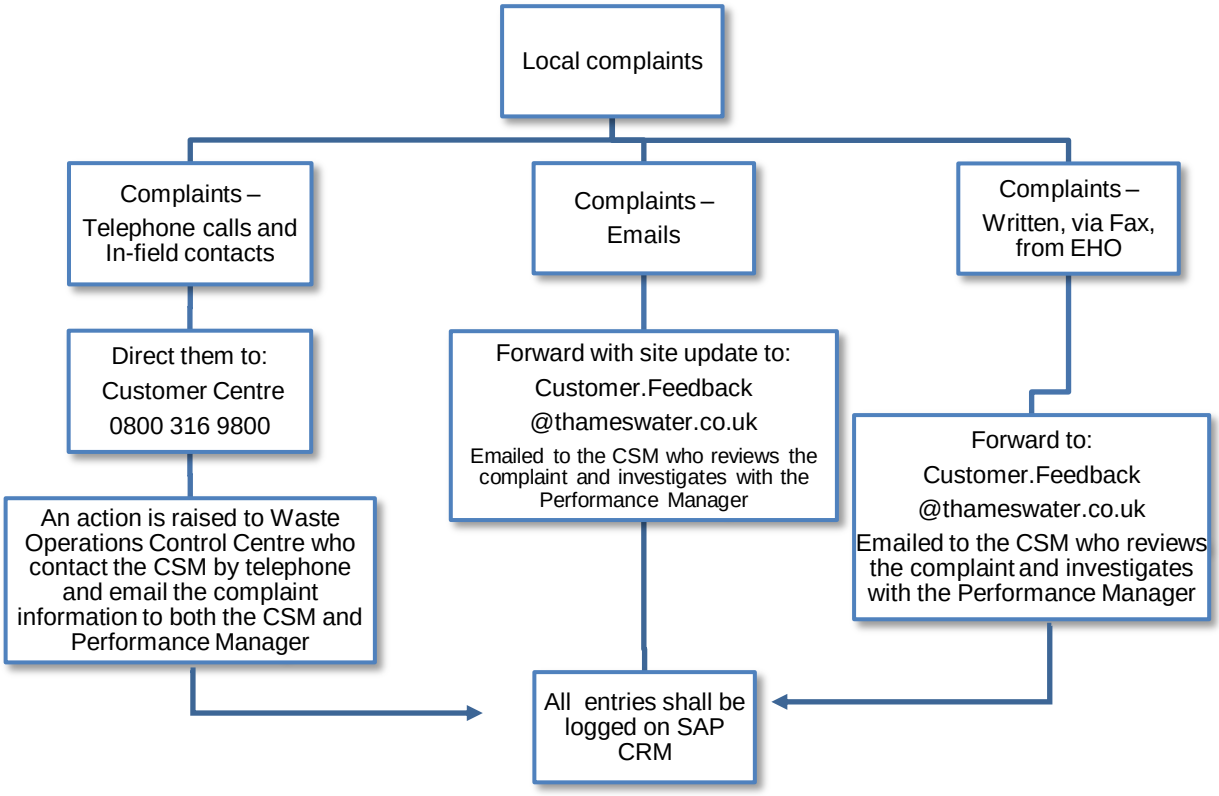
20/07/2023

Process Stage	Owner	Problem	Plan	Action	Expected difficulties	Measures to mitigate	Timeframe	
Works inlet area	David Furness	Inlet screens and Detritor are inadequate for the loading of the works	Improvement works are proposed for AMP8 for additional screening facilities and grit removal	Work with Capital Maintenance Projects to develop the correct solutions for the site.	Understanding of timescales with AMP8. Funding.	Manpower to dig out screens when issues arise. Insure OCU fully functioning. Ongoing maintenance of existing plant. Remove grit from system as required	AMP8	Med
Media Replacement & OCU Recommendations	David Furness	End of life of media & works identified in monthly inspections	Establish trigger levels for media use. Monitored monthly.	Raise required risk ahead of spent media, allowing for planned replacement of media.	None	Monthly reports, planned approach. Trigger points established for media replacement.	Ongoing	Med
Disused secondary digesters	David Furness	Tanks only used in an emergency. Potential odours from tank content	Process failure, approved use of tanks, ML5 sign off.	Use the disused secondary digesters, return contents gradually back through process, wash tanks once emptied.	Access issues requiring specialist sub contractors. Funding.	low odour impact due to content.	as and when required	Short
Site	Thames Water	New development encroaching STW	Cover and treat	AMP8 plans	Funding	None required	2030	Long
THP Cake Reception Building	David Furness	Potential for roller-shutter doors to fail.	Introduce planned maintenance regime and consider maintaining critical spares on site.			Ongoing maintenance.		Med

Appendix 3. Customer Communications Plan

Complaints Process

All locally received complaints are re-directed to the Customer Centre. Please refer to figure below for details.



IMPORTANT NOTE:
Any communications received from the local Member of Parliament or senior council officers need to be forwarded to the Local/Regional Government Liaison person. Name: Miles Evans Telephone: (07747) 647304

Communications

Level 1	Stable operations: Compliant with Operational Asset Standards.
Communications Approach	Standard regular proactive contact with key stakeholders.

Stakeholders External	Frequency of Contact	Method of Contact	Aim of Contact	TW Contact/Level
Local councils Environmental Health Department	As required but at least quarterly	Telephone / email / meeting	Update on operational activity on site	Performance Manager and Customer & Stakeholder Manager
Environment Agency	As required	Telephone / email / meeting	Update on operational activity on site	Performance Manager and environmental permitting team
Oxford Science Park and Kassam Stadium complex, Local residents associations *(if applicable)*	As required but at least annually	Telephone / email / meeting	Update on operational activity on site	Performance Manager and Customer & Stakeholder Manager
Stakeholders Internal	**Frequency of Contact**	**Method & Level of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	As required	Report sent out by operations to the business	Update the business on operational activity on site	Duty Manager
Customer Centre (Swindon)	As required	Report sent out by operations to the business	Update the business on operational activity on site	Duty Manager

Level 2	Unstable operations: • Non-compliant with Operational Asset Standards on one or more sub-processes leading to increased odour risk.			
Communications Approach	As Level 1 plus: • Use of Contact Centre Bulletin Boards / Briefing Contact Centre agents / Briefing statement with Q&A prepared for the press office (to use reactively). • Monthly discussions with, and quarterly visits from, the EHO. • Commence proactive communications with other stakeholders.			
Stakeholders External	**Frequency of Contact**	**Method & Level of Contact**	**Aim of Contact**	**TW Contact/Level**
Local councils Environmental Health Department	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager and Customer & Stakeholder Manager
Environment Agency	Potential for notification procedure	As required as per notification procedure	As required as per notification procedure	Pollution desk
Local residents' associations (*if applicable*). Oxford Science Park and Kassam Stadium Complex	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager and Customer & Stakeholder Manager
Stakeholders Internal	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	Immediately then weekly	Q&A prepared for press office by Operations	To enable the press office to deal with queries from the press (reactive only).	Duty Manager
Customer Centre (Swindon)	Immediately then weekly	Telephone / email	To enable the Customer Centre to deal with queries from the press (reactive only).	Duty Manager
Other areas/stakeholders outside Oxford STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses, including Oxford Science Park and Kassam Stadium Complex	Immediately then monthly	Telephone / email / meeting	Report unstable operation with action plan	Performance Manager and Customer & Stakeholder Manager

Level 3	Emergency • Temporary or transient activities not deemed to be compliant with Operational Asset Standards. High risk of odour emitting plant.			
Communications Approach	As level 2 plus: • Odour event set up internally (including OOH's cover from OMC (Kemble Court)). • Weekly discussions with EHO. • Monthly Stakeholder meetings, (internal and external – include MPs, Councillors, schools, businesses etc.). • Press release may be required.			
Stakeholder External	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local council(s) Environmental Health Department	Immediately then weekly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Level 5 Manager (Operations Manager) / Level 4 Manager (Regional Operations Manager)
Environment Agency	As required as per notification procedure	As required as per notification procedure	As required as per notification procedure	Pollution desk
Local residents' associations (if applicable), Oxford Science Park and Kassam Stadium Complex	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Performance Manager and Customer and Stakeholder Manager
Councillors / MPs for local areas	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Level 5 Manager (Operations Manager) / Level 4 Manager (Regional Operations Manager)

Stakeholders Internal	Frequency of Contact	Method of Contact	Aim of Contact	TW Contact/Level
Press Office	Immediately then daily	Q&A and press release prepared by press office	To enable the press office to deal with reactive queries from the press and prepare a media strategy if required.	Duty Manager
Customer Centre (Swindon)	Immediately then daily	Telephone / email	To enable the Customer Centre to deal with queries from customers (reactive only)	Duty Manager
Other areas/stakeholders outside Oxford STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses, Oxford Science Park and Kassam Stadium Complex	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Process / Site Manager

Appendix 4. Site Drawings

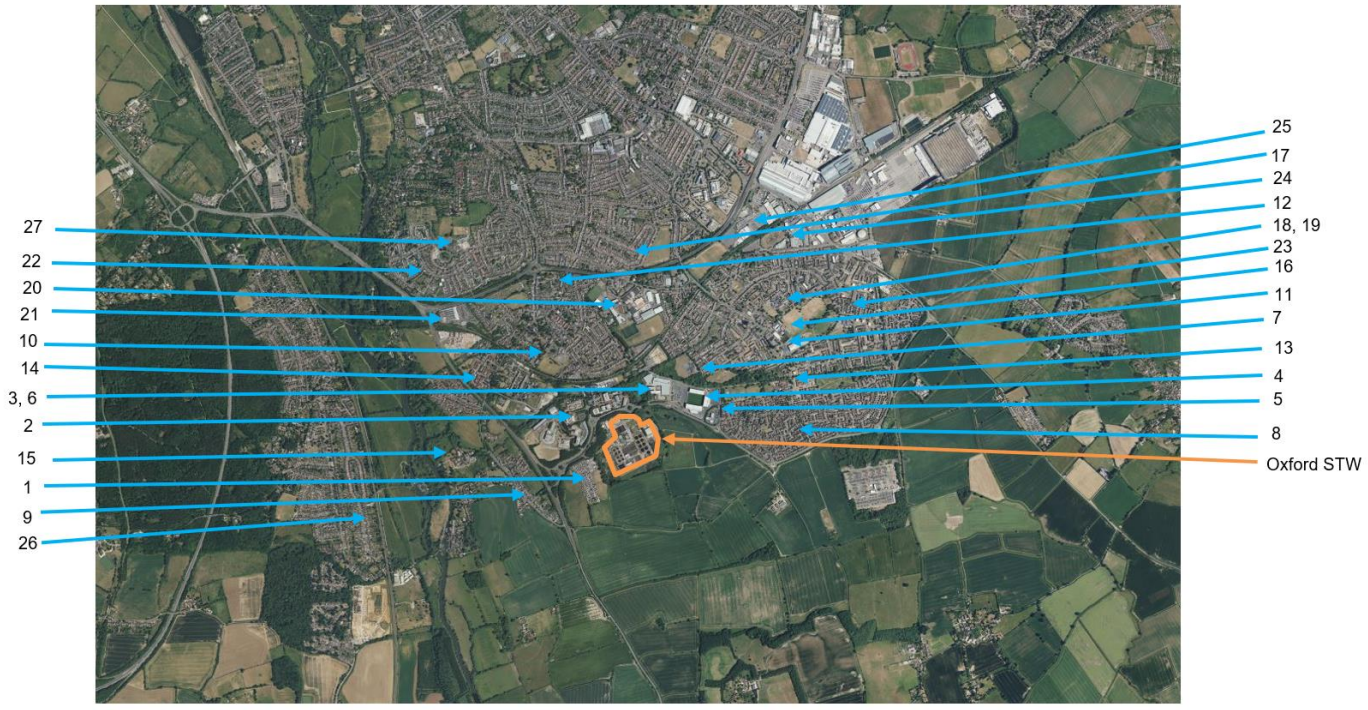


Figure A - Site Location Map (numbers of receptors explained in **Table 2.1**)

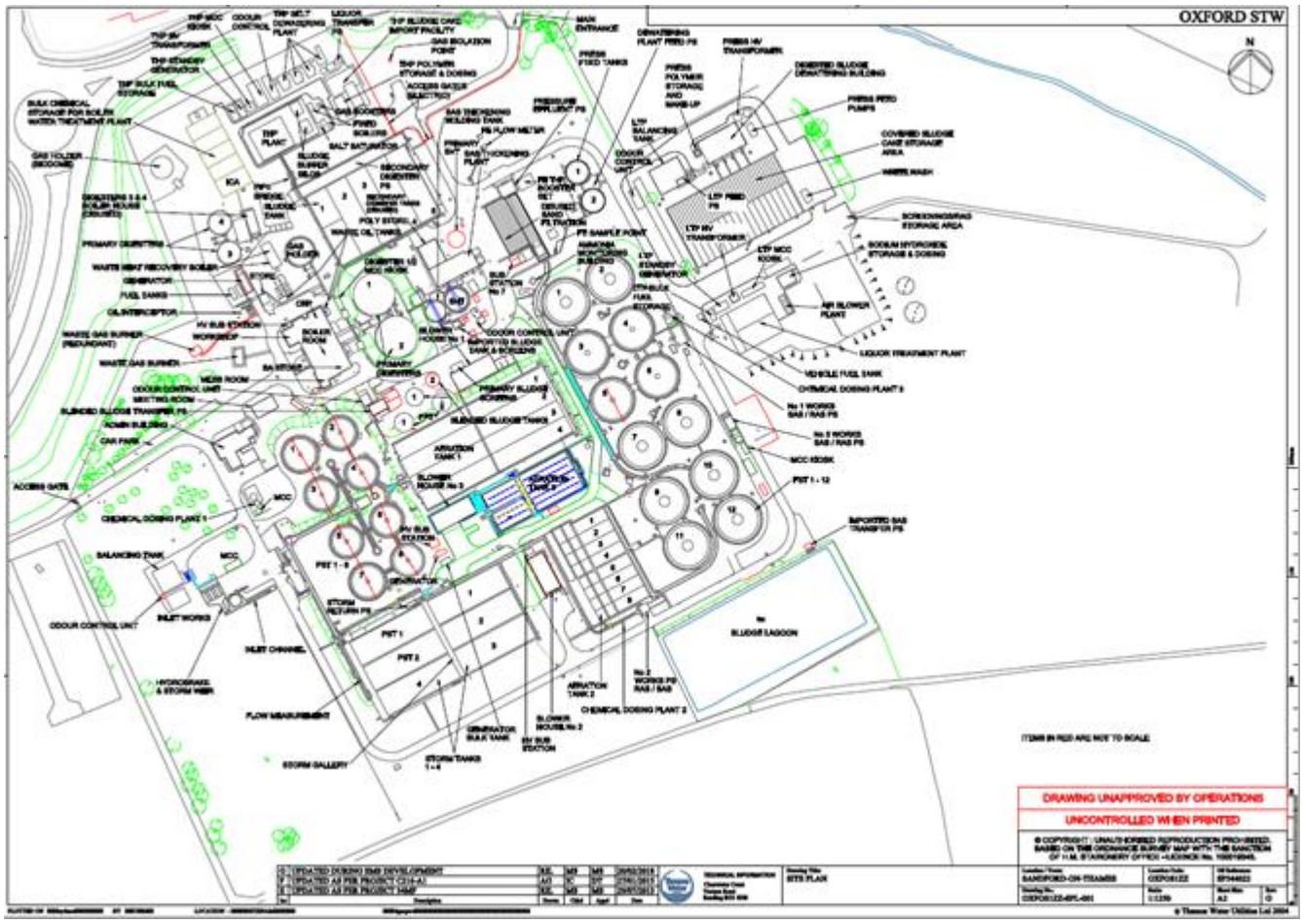
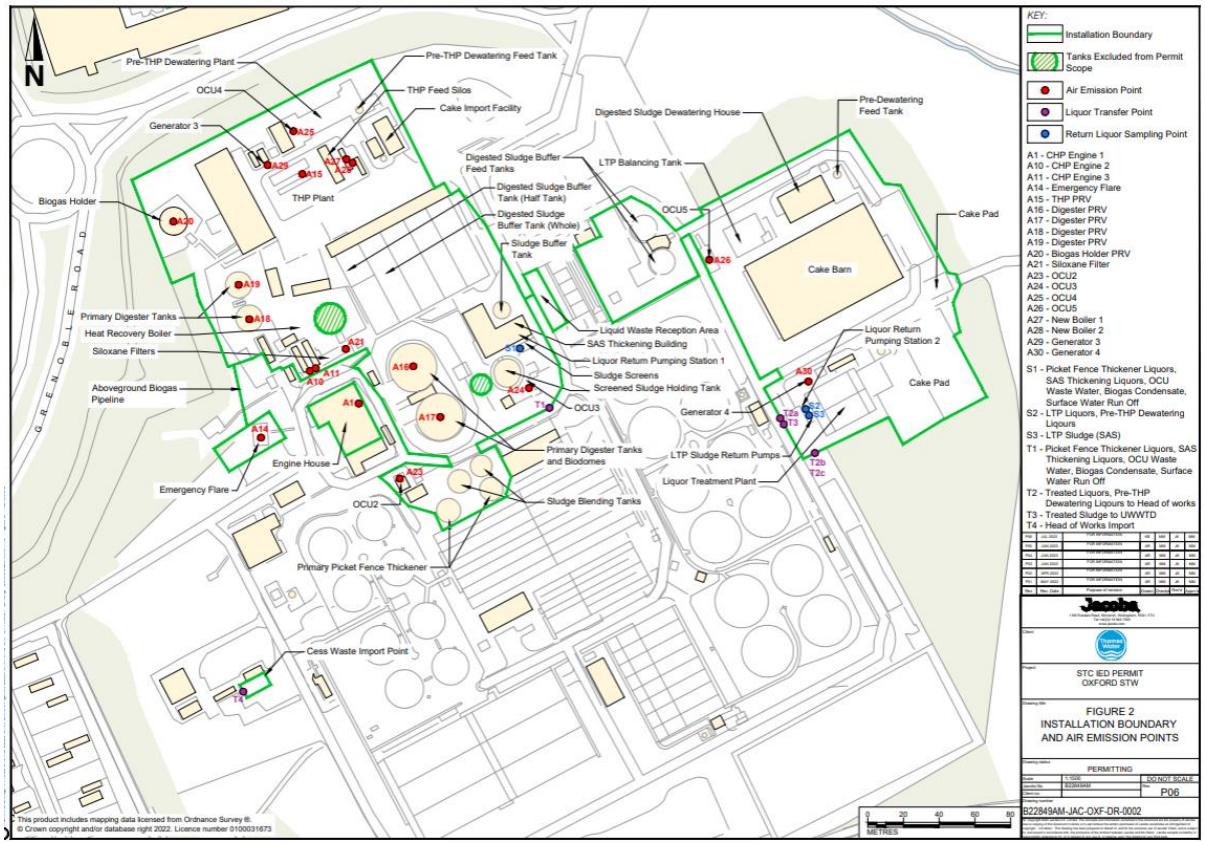
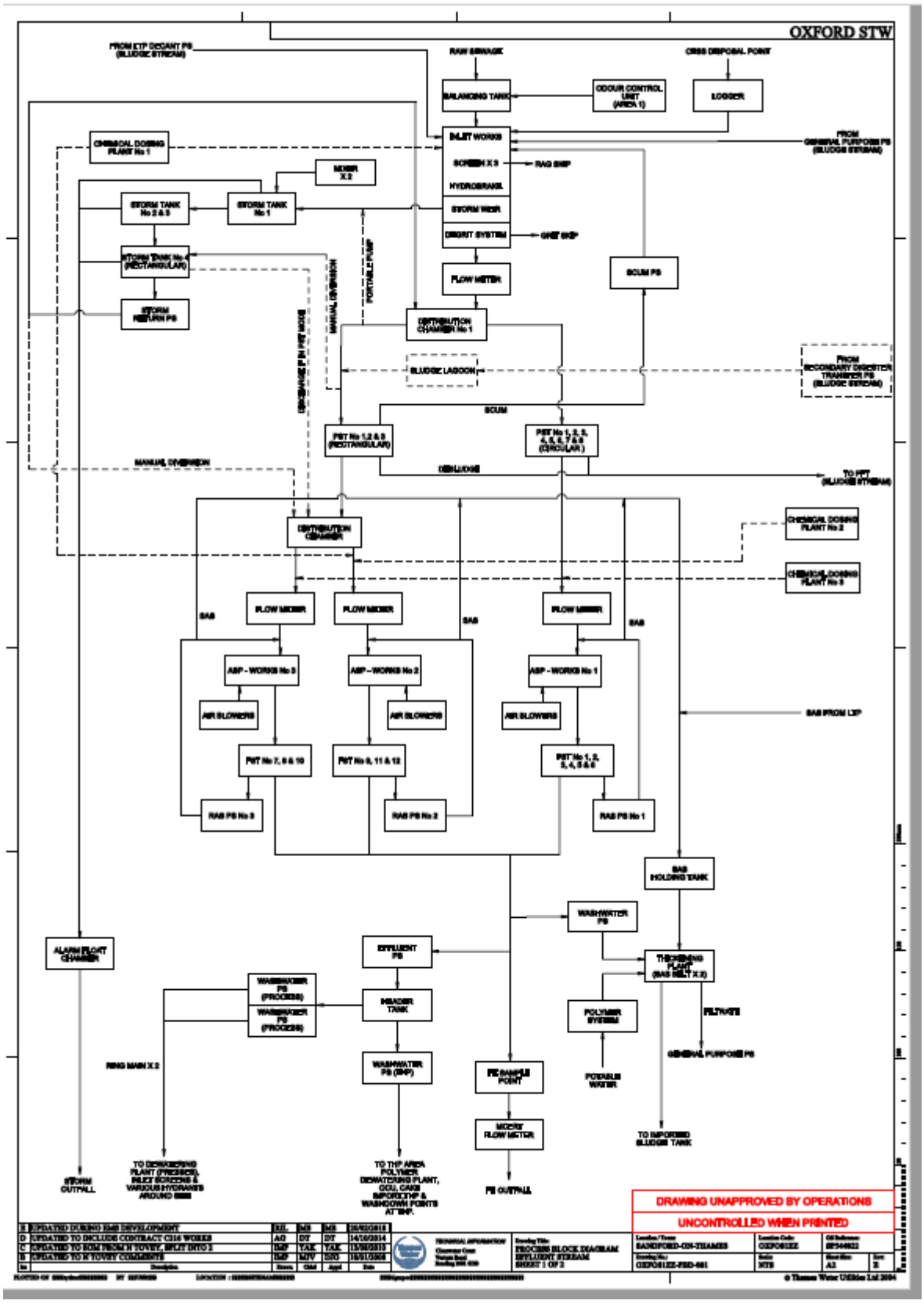


Figure B - Site Plan of Oxford STW

Figure C - Area Permitted under Sludge Treatment Centre Permit




OXFORD STW
RAW SEWAGE
CRSS DISPOSAL POINT
BALANCING TANK
ODOUR CONTROL UNIT (AREA 1)
LOGGER
INLET WORKS
SCREEN X 3
RAG SKIP
HYDROBRAKE
STORM WEIR
GRIT SYSTEM
GRIT SKIP
FLOW METER
SCUM PS
CHEMICAL DOSING PLANT No 1
MIXER X 2
STORM TANK No 2 & 3
STORM TANK No 1
STORM TANK No 4 (RECTANGULAR)
STORM RETURN PS
PORTABLE PUMP
MANUAL OVERPUMP
DISTRIBUTION CHAMBER No 1
SLUDGE LAGOON
SCUM
PST No 1,2 & 3 (RECTANGULAR)
PST No 1, 2, 3, 4, 5, 6, 7 & 8 (CIRCULAR)
DRAWDOWN
TO PST
DISTRIBUTION CHAMBER
CHEMICAL DOSING PLANT No 2
CHEMICAL DOSING PLANT No 3
FLOW MIXER
FLOW MIXER
FLOW MIXER
SAS
ASP - WORKS No 3
ASP - WORKS No 2
ASP - WORKS No 1
AIR BLOWERS
AIR BLOWERS
AIR BLOWERS
SAS FROM LSP
PST No 7, 8 & 10
PST No 9, 11 & 12
PST No 1, 2, 3, 4, 5 & 6
RAS PS No 3
RAS PS No 2
RAS PS No 1
SAS HOLDING TANK
WASHWATER PS
ALARM FLOAT CHAMBER
EFFLUENT PS
THICKENING PLANT (GAS BELT X 3)
WASHWATER PS (PROCESS)
WASHWATER PS (PROCESS)
MEADER TANK
POLYMER SYSTEM
FILTRATE
GENERAL PURPOSE PS
RING MAIN X 2
WASHWATER PS (SWP)
POTABLE WATER
FE SAMPLE POINT
MCERT FLOW METER
TO IMPORTED SLUDGE TANK
STORM OUTFALL
TO DEWATERING PLANT (PRESSES), BELT SCREENS & VARIOUS HYDRANTS AROUND SWP
TO THP AREA POLYMER DEWATERING PLANT, ODU, CAKE IMPORT/HP & WASHDOWN POINTS AT SWP.
FE OUTFALL
DRAWING UNAPPROVED BY OPERATIONS
UNCONTROLLED WHEN PRINTED
D UPDATED TO INCLUDE CONTRACT C316 WORKS AG DT DT 14/10/2014
C UPDATED TO SOM TECH'N TOVEY, SPLIT INTO 2 BMP TAK TAK 13/08/2013
B UPDATED TO N TOVEY COMMENTS BMP MTV SDO 18/01/2013
PROCESS BLOCK DIAGRAM EFFLUENT STREAM SHEET 1 OF 2
BASINGSTOKE-ON-THAMES
OXFORD STW
A3
© Thames Water Utilities Ltd 2014

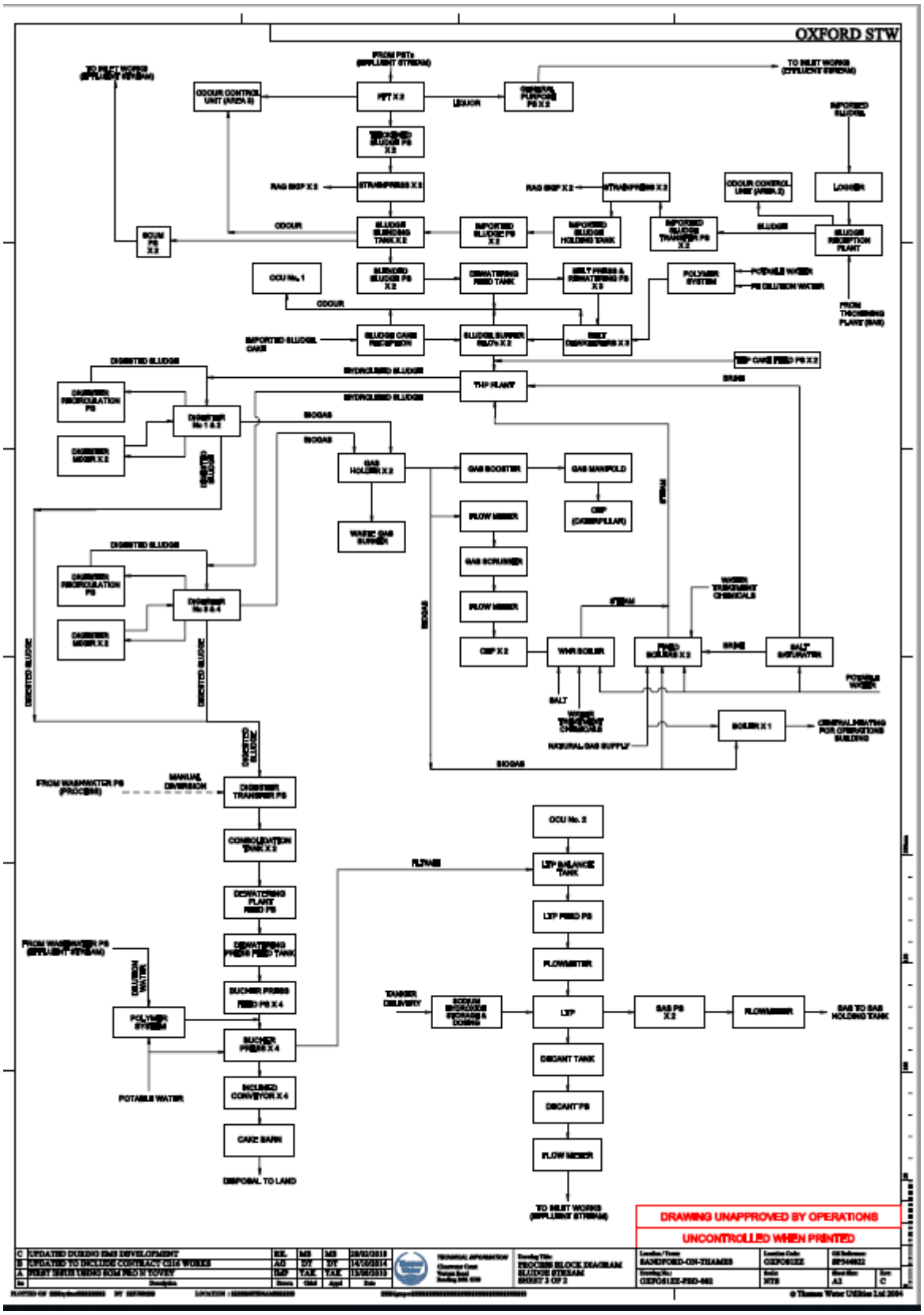
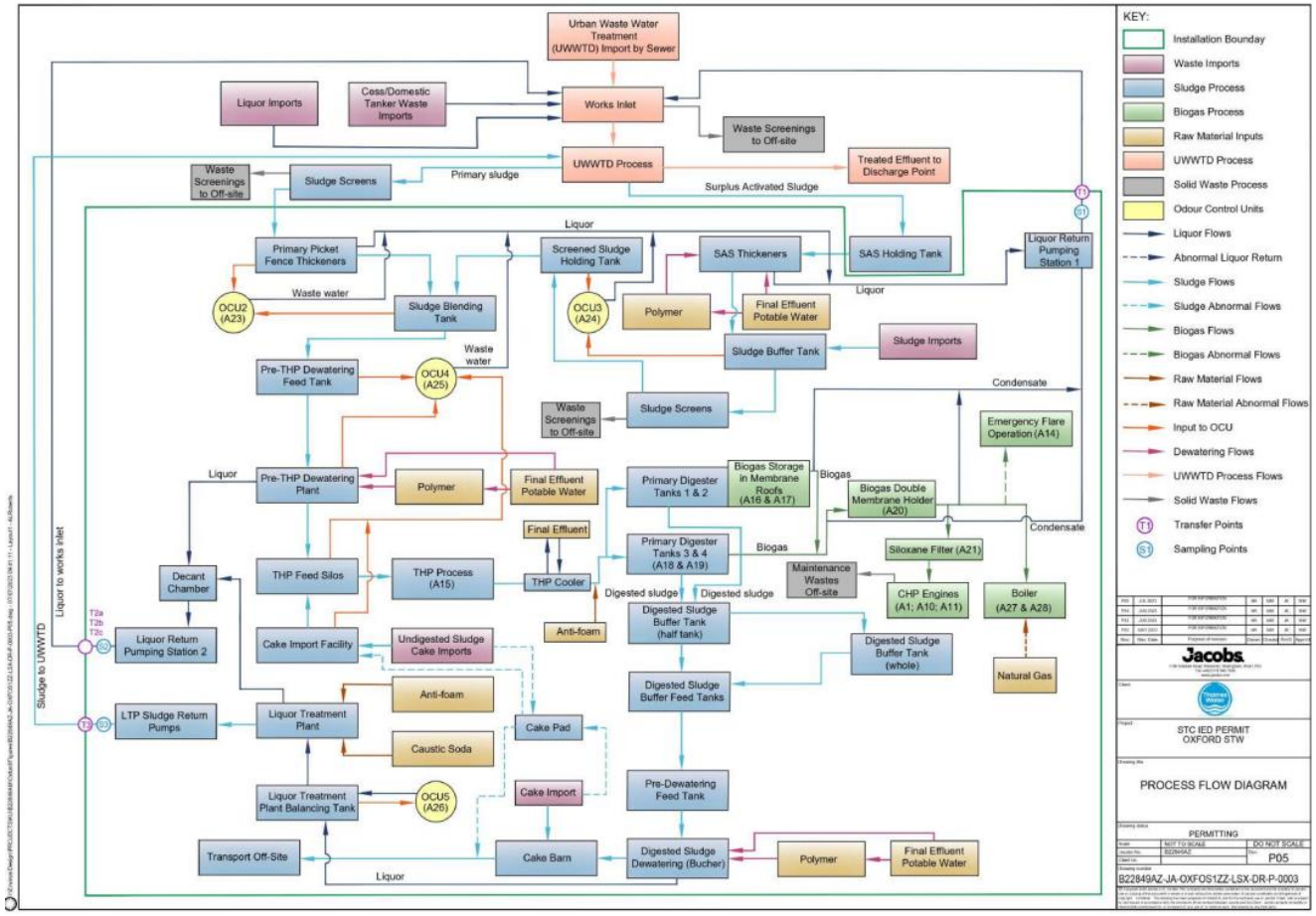


Figure B1 - Process Block Diagrams for UWWTD and Sludge Treatment Centre

Figure D2 - Process Block Diagram for Permitted Activities



Appendix 5. Site Rounds

ID	Instruction	Daily	Weekly
1	**Final Effluent**		
a)	Check the effluent quality at the sample point. Sample (ammonia, phosphorus, temperature & turbidity) in accordance with SOM. Record in site log book & via Direct Text.	**X**	
b)	Check final effluent sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
c)	Check storm sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
d)	Visual check on point of discharge to the watercourse if accessible. Check operability of outfall flap valve if fitted.	**X**	
e)	Check storm discharge point, if shared & if accessible.	**X**	
f)	Compensation water pumps. Check and clear ultrasonic head of cobwebs etc.	**X**	
g)	Check data and operation of inline monitor. Check inline monitor installation for damage, take appropriate action where required.	**X**	
h)	Remove and clean inline monitor probe.		**X**
i)	Check flow meter & flume is clear of debris. Take appropriate action.	**X**	
2	**Preliminary Treatment**	Daily	Weekly
a)	Check Crude sewage appearance. Does it look normal for the site?	**X**	
2.1	**Cess Waste Reception Point**		
a)	Note any suspicious activity or discharges as required	**x**	
b)	Check logger system is operating correctly	**x**	
c)	Check all pipework is in good condition	**x**	
d)	Where a macerator is fitted, check operation and oil reservoir	**x**	
e)	Where a manual stone trap is fitted, clear of accumulated material	**x**	
f)	Check grit bins are available and stocked with grit for winter	**x**	
g)	Carry out general housekeeping, remove litter, clear debris, washdown any spillages, empty bins	**x**	
h)	Ensure all signage is in good condition, clean and legible	**x**	

ID	Instruction	Daily	Weekly
i)	Check washdown equipment is operating correctly	x	
2.2	**Inlet / storm pumping station**	Daily	Weekly
a)	Check Ammeter reading, Too high could indicate a blockage. Too low could indicate an air lock or impeller damage. Where reading is unusual ensure appropriate action is taken.	X	
b)	Check the well level is within the normal operating limits taking into account the flow conditions at the time (such as storm conditions & peak flow to site). If level is too low or high, this could indicate control issues or pumping issues.	X	
c)	Check condition of the wet well. Does it have more than the usual scum or debris floating on top that will indicate the need for a wet well clean?	X	
d)	Check fault light(s) are not on, take appropriate action as required.	X	
e)	Check flow rate (where meter is fitted); is it within the normal operating range?	X	
f)	Inspect buildings, kiosks and control/switchgear panels for general condition, damage and that they are securely locked. Clean and tidy the interior of the buildings and/or Kiosks. Remove rubbish from site or if large volume arrange for collection.	x	
g)	Listen for undue pump noise and check for undue vibration by safely touching the lifting chain or guide rail.	X	
h)	Check non-return valve is operating correctly Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted is it at the usual angle? If it is low and chattering it could indicate the pump is blocked.	X	
i)	Check operation of the ultrasonic level control. Is it reading correctly? Compare the well level with the normal readout from the display. Check hard wired control floats, clean as required. Are floats weighed down with rag or debris preventing them from lifting if the water level rises?	X	
j)	Check pumps, pipelines and couplings for leaks where possible.		X
k)	Start the cleaning cycle manually where required.	X	
l)	Pumps - Log hours run		X
m)	Pumps - Log kWhrs		X
2.3	**Screen(s) / macerator(s)**	Daily	Weekly
a)	Check inlet channel level is normal taking into account the flow conditions at the time (such as storm conditions & peak flow to site).	X	
b)	Check screen operation and check for screenings carryover.	X	

ID	Instruction	Daily	Weekly
	Check for blockages and blinding (hairpinning) on screen panels and remove where necessary. Check for rag rolling or rag balls upstream of the screen and remove where necessary. Check for any grit build up in front of screen		
c)	Inspect debris disposal mechanism for correct operation and verify screenings are being removed. Check & clean any obstructions impeding the operation of screen mechanisms.	**X**	
d)	Check screens bypass is available and clean	**X**	
e)	Clean area around screen. Check & clean screen panels of any obstructions.		**x**
f)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action to replace them if needed. Inspect grease pots and fill them when level is below the standard. Use grease nipples to lubricate required parts of screen.	**X**	
g)	Visually check unit and its associated equipment for the following: Safety & security with all panels locked & guards secure and in good condition. Excessive noise or vibration Overheating External damage, leaks, missing fixings Where applicable, ensure main and brush drives turn and that brushes are spinning	**X**	
h)	Check operation of wash water system for screens Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.	**X**	
i)	Check & clean accumulation of screenings and fat from debris disposal mechanism Check & clean launder chutes and channels for accumulation of grit, sand, rag, fat,	**X**	
j)	Check the lip, labyrinth or other seals between the screen and the channel wall are making an effective seal.	**X**	
k)	Visual check on the screenings removal brushes for blinding and wear. Clean the brushes as required. Ensure the brushes are in correct contact with the screen and that screenings are being removed.	**X**	
l)	Check and clean instrumentation probes, floats and ultrasonic heads (where applicable).	**X**	
2.4	**Screenings handling**	Daily	Weekly
a)	Check control system and amps on panel for normal levels / operation, take appropriate action as required. Jumping amps indicates a blockage.	**X**	

ID	Instruction	Daily	Weekly
b)	Where installed, visual check for normal operation of macerator. Look for visible blockages/build up on unit, high flows in front of macerator. Listen for unusual noise. Take appropriate action as required.	**X**	
c)	Where installed, check and empty stone trap.	**X**	
d)	Clean area around screenings handling units and skips.		**X**
e)	Check operation of wash water system for screenings handling. Check the inline wash water filter is present, clean and feeding the spray bars (where applicable Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.	**X**	
f)	Check screenings product quality and quantity, Check level of screenings in skip and change skip when full.	**X**	
g)	Check operation of auto drain.		**x**
h)	Where installed check operation of the trough desludge system. Check for grit build-up in trough - hose out where required.		**x**
i)	Visual check on condition and operation of brushes (ensure trough is being cleaned). If blinding occurs regularly have wear on screw brushes checked.		**x**
j)	Check screw conveyor and brushes for wear and central running.		**x**
k)	Clean and check mesh for blinding and hairpinning.		**x**
2.5	**Grit removal**	Daily	Weekly
a)	Check mechanical plant is operating correctly. Check equipment– Compressor, Rake, Detritor & Pista grit.	**X**	
b)	Check manually de-gritted constant velocity channels for build-up of grit, take appropriate action as required.	**X**	
c)	Check inflow and outflow for normal rate of flow and correct distribution.	**X**	
d)	Check volume, dryness and quality of grit produced.	**X**	
e)	Remove rag from the areas around baffles and mechanical equipment	**X**	
f)	Log manual de-gritting operations where required.	**X**	
g)	Log abnormal grit volumes.	**X**	
h)	Clean grit channel as required. Check grit build up in inlet channels and clean out if necessary.		**X**
i)	Check operation of wash water system and check the inline filter is present, clean and feeding the spray bars (where applicable)	**X**	
j)	Check aerated grit channels for air flow and bubble pattern (where applicable).	**X**	

ID	Instruction	Daily	Weekly
2.5	Skips	Daily	Weekly
a)	Check skip capacity is adequate, and inform contractor when skip is full.	**X**	
b)	Rake skip where required.	**X**	
c)	Remove excess water if there is a facility to do so.	**X**	
d)	Ensure only prescribed material is in the skip. Remove any materials not prescribed.	**X**	
2.6	**Storm separation and treatment**	Daily	Weekly
a)	Check Flow To Full Treatment penstock is set at correct level.	**X**	
b)	Check storm return system is operational, manually return storm contents where required.	**X**	
c)	Check storm tanks cleaning system, check level sensors, check tanks are clean and empty outside of storm conditions.	**X**	
d)	Check and clear storm screens where required. (automatic clearance and manual clearance linked to safe system of work)	**X**	
e)	Check screens bypass is available and clean	**X**	
f)	Check and clear/replace any outlet screening sacks		**X**
g)	Check separation weirs and clean where required.		**X**
h)	During storm check that the flow to treatment is normal. (Treating Flow To Full Treatment)		**X**
i)	Log abnormal flows. Log storm discharge flows. Log storm flows in dry weather conditions.		**X**
j)	Log storm events.		**X**
k)	Remove any debris in the system.		**X**
l)	Storm LTA – Visually check area is clean and operating within site parameters. Remove any debris.		**X**
m)	Storm LTA – Check for short circuiting during operation. Inspect banks for leakage		**X**
2.7	**Flow measurement**	Daily	Weekly
a)	Check site is within flow permit (treating Flow To Full Treatment before going to storm). Check that flow is going through site as expected.	**X**	
b)	Check flow meter and flume and clean where required	**X**	
c)	MCERTS – Log & record flow meter readings	**X**	
d)	Check EDM (Event Duration Monitor) sensor is clean and weir is free of debris	**X**	
3	**Primary Treatment- Primary Settlement Tanks**	Daily	Weekly
a)	Check and log sludge level by dipping tanks (Mon/Wed/Fri)	**X**	

ID	Instruction	Daily	Weekly
b)	Check bridge/scraper operation	**X**	
c)	Check de-sludge pump(s) and timer for normal operation	**X**	
d)	Check scum boards for breaks or carry under	**X**	
e)	Check scum trap for normal operation and clean/hose out	**X**	
f)	Check settled sewage quality (visual check only)	**X**	
g)	Check stilling chamber for rag, clear as necessary	**X**	
4	**Secondary Treatment**		
4.1	**Secondary Treatment – Activated Sludge**	Daily	Weekly
a)	Check air filters indicators for normal readings. Check blower control panel. Check the blowers for normal operation. Check there are no illuminated fault lights.	**X**	
b)	Check and record dissolved oxygen (D.O) readings, where probes are installed.	**X**	
c)	Sample, measure and record Mixed Liquor Suspended Solids (MLSS) /RASS concentration and sludge settleability (Stirred Specific Volume Index) (SSVI), (Monday/Wednesday/Friday)	**X**	
d)	Vent condensate from air lines		**X**
e)	Check SAS pump(s) are operating correctly	**X**	
f)	Check and record sludge return from the final settlement tanks (RAS rate)	**X**	
g)	Check D.O probe and / or timers are carrying out the correct control functions. Aeration control function.	**X**	
h)	Check flow distribution to aeration lanes if more than one lane present	**X**	
i)	Log changes to RAS rate, Log flows (where meters are fitted), Log KWh, Log SAS Rate.	**X**	
j)	Check and record bubble pattern and size of the bubbles	**X**	
k)	Check mixers for rotation in anoxic (un-aerated) zones	**X**	
l)	Check recycle pumps are running, as required (Biological Nutrient Removal -BNR plants)		**X**
m)	Check redox monitor is operating correctly (BNR plants)		**X**
n)	Check VFA / liquor return (BNR plants)		**X**
o)	Check and record rate and frequency of SAS removal	**X**	
p)	Withdraw the D/O probe from the tank and remove clean		**X**
4.2	**Secondary Treatment – Biological Filters**	Daily	Weekly
a)	Visually check for correct flow distribution across the filter (radial distribution)	**X**	

ID	Instruction	Daily	Weekly
b)	Keep filter surface clear of all debris and any significant moss or weed growth. Deal with ponding as appropriate.	**X**	
c)	Where recirculation is installed, check for normal operation at the correct flow rate	**X**	
d)	Check all air vents and under drains are clear and not flooded	**X**	
e)	Clear distribution arm orifices and or weir plates of debris	**X**	
f)	Remove end caps and rod/flush arms - clear debris from open channel arms	**X**	
g)	Check for appropriate flow distribution between filters to suit filter size	**X**	
h)	Check operation of distributor arms (uniform speed of rotation)	**X**	
i)	Check for leakage at the centre column seals and end caps. Short circuiting etc.	**X**	
j)	Check rotation timer. Check alignment of rotation alarm sensor and target plate	**X**	
5	**Secondary Settlement – Humus Tanks / Final Settlement Tanks**	Daily	Weekly
a)	Check correct operation of desludging pump(s) or valve(s)	**X**	
b)	Check scraper/bridge operation where installed	**X**	
c)	Check and log blanket level with portable blanket meter where detectors not fitted. (Monday, Wednesday, Friday)	**X**	
d)	Check tank surface for buildup of floating debris. Visually check effluent quality over the weir for solids carry over	**X**	
e)	Check RAS pump(s) are operating correctly (FSTs only)	**X**	
f)	Check Bellmouth and de-rag where required	**X**	
g)	Check effectiveness of weir brushes, chains, “other systems” where fitted	**X**	
h)	Check scum boards for breaks or carry under	**X**	
i)	Check scum removal system for correct operation, clear any fouling where necessary	**X**	
j)	Check flow of recirculation bleed back/constant draw off where used	**X**	
k)	Check operation of fixed blanket detectors and alarms		**X**
l)	Check operation of Mallard pump by test running in hand, where installed		**X**
m)	Clear overflow weirs and launder channels of any build-up that will affect the tanks or effluent performance	**X**	
6	**Chemical Dosing**	Daily	Weekly
a)	Check that chemical is discharging, rather than dosing pump running dry (any nozzles blocked?)	**X**	

ID	Instruction	Daily	Weekly
b)	Check chemical storage tank level - reorder as required. Log level in storage tank, Log discharge rate.		2 days a week
c)	Check for excessive vibration in the dosing pump		2 days a week
d)	Check the level in the internal bund and empty as required. Report any abnormalities.		2 days a week
e)	Visual check for leaks on tanks and visible chemical lines		2 days a week
f)	Check the trace heating system		2 days a week
g)	Check external storage tank bund for rainwater and/or chemical. Empty as appropriate.		X
7	**Tertiary Treatment**		
7.1	**Low Head Sand Filter**	Daily	Weekly
a)	Check smooth movement of bridge, unusual sounds and vibrations, and abnormal flow patterns	X	
b)	Check water level in each filter, compare with other units and relate to flow rate, and last backwash	X	
c)	Check unit isn't in bypass	X	
d)	Check for evidence of chemical leaks	X	
e)	Check cleanliness of carriage & filter area	X	
f)	Check sodium hypochlorite level in the bridge tanks where fitted and fill from bulk tank	X	
g)	Check sodium hypochlorite bulk tank level	X	
h)	Check the amount of sand in the wash water	X	
i)	Check the colour of the backwash water	X	
j)	Check the correct amount of hypochlorite is being dosed	X	
k)	Check water level in each filter, compare with other units and relate to flow rate, and last backwash	X	
l)	Log backwash timer settings and head loss	X	
m)	Log flows and flow rate, where meters are fitted	X	
n)	Clean the level sensor head		X
o)	Log clarity of feed (compare with final effluent)	X	
7.2	**Disc Filter**	Daily	Weekly
a)	Log backwash pressure	X	
b)	Check frequency of backwash is within correct range		X
c)	Check bypass is not working during normal operations	X	
d)	Check depth in and out of the drum for normal operation	X	
e)	Check drum is rotating in correct mode and sounds normal	X	

ID	Instruction	Daily	Weekly
f)	Check all ancillaries are operating normally	X	
g)	Log flows and flow rate where meters are fitted	X	
h)	Sample and record turbidity on feed (compare with final effluent)	X	
i)	Inspect inside filter for large pieces of debris		X
j)	Check for accumulation of weed in backwash trough		X
k)	Check and clean backwash water strainer.		X
l)	Check for soundness of mesh panels by lifting inspection panels		X
m)	Check wash water pressure and nozzles for normal operation		X
8	**Raw Sludge Holding & Thickening**		
8.1	**Sludge Holding Tanks**	Daily	Weekly
a)	Check mixing regime is correct	X	
b)	Log levels in tank(s)	X	
c)	Decant liquors	X	
d)	Check tank(s) for ragging and blockages and clear or remove (where safe access is possible)	X	
e)	Check that holes on sludge cage(s) are clear where fitted, Clean sludge cage(s) dewatering holes (where safe access is possible)	X	
f)	Log tanker movements and compare with schedule	X	
g)	Ensure any crust build up does not interfere with any control equipment/alarm floats	X	
8.2	**Picket Fence Thickener**	Daily	Weekly
a)	Check fence is rotating & “stop, look, listen,” for mechanical issues.	X	
b)	Check weir overflow quality and the surface of the unit. Clear any buildup of debris	X	
c)	Log blanket measurements / pump timers	X	
d)	Sample from discharge pump (run manually if necessary) and assess product quality. Sample, analyse and record % dry solids entering the PFT. Sample, analyse and record % dry solids out (Monday, Wednesday, Friday)	X	
e)	Check control system is operating normally	X	
f)	Log any changes to settings or duty	X	
g)	Log sludge flows in (where meters fitted) and out	X	
h)	Visually assess the dry solids & flow entering the PFT	X	
i)	Log hours run meters	X	
j)	Remove buildup of debris on the rake	X	
8.3	**Belt Thickeners**	Daily	Weekly

ID	Instruction	Daily	Weekly
a)	Check for good floc formation. Check sludge on the top belt and assess the conditioning of the sludge. Check belt drainage and filtrate quality	**X**	
b)	Check product quality & quantity. Check condition of hopper	**X**	
c)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	**X**	
d)	Sample, analyse & record % Dry Solids on feed and sludge/cake (Monday, Wednesday, Friday)	**X**	
e)	Check sludge feed rate and log	**X**	
f)	Check poly dosing system. Log polymer usage, note each bag change/delivery. Make adjustments to optimise	**X**	
g)	Ensure wash water pressure is available at a minimum of 6 bar	**X**	
h)	Clean belt steering paddles and check they are functioning correctly	**X**	
i)	Clean hopper level probes and check they are functioning correctly	**X**	
j)	Wash Station - Check formation of spraying fans, rotate internal brush to clean spray nozzles. (Minimum twice daily)	**X**	
k)	Visual Check - Hydraulic Power Pack - Check oil level and top up using clean equipment and fresh oil as required, maintain as close to full level as possible. Oil level must not be allowed to fall below 3/4 as this will cause serious damage	**X**	
l)	Jet wash clean the belt filter.	**X**	
m)	Use low pressure water hose to clean complete machine, frame, rollers and hoppers.	**X**	
n)	Check condition of Belt Filter for blinding / blockages / good filtration	**X**	
o)	High pressure steam clean the belt from underside.		**X**
p)	High pressure steam clean complete machine, frame rollers and hoppers avoiding all electrical and instrumentation equipment		**X**
q)	Check condition of Belt Filter for wear i.e. Creasing / condition of seam to avoid failure / breakage and damage to other components		**X**
8.4	**Drum Thickeners**	Daily	Weekly
a)	Check for good floc formation. Check sludge feed rate. Check product thickness (visually). Check filtrate quality	**X**	
b)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	**X**	
c)	Sample for % dry solids analysis and record (Monday, Wednesday, Friday)	**X**	
d)	Check spray bar nozzles to ensure they are clear and spraying correctly. Check spray bar wash water pressure	**X**	
e)	Clean probes in discharge hopper, hose down and carry out cleaning duties	**X**	

ID	Instruction	Daily	Weekly
f)	Log polyelectrolyte used – each drum/bag change	X	
g)	Log sludge inlet flow meter, monitor throughput	X	
h)	Check & clean flocculator tanks		X
i)	Check appearance of mesh, adjust cleaning and cleaning pause intervals if necessary.	X	
j)	Clean dry solids monitors sensors		X
k)	Clean foot valves on washwater suction lines		X
l)	Clean mechanical filter on washwater booster set		X
m)	Clean washwater booster secondary screen in channel		X
n)	Jet/remove fat deposits from thickened sludge discharge pipework		X
o)	Log hours run		X
9	**Odour Control**	**Daily**	**Weekly**
	Tasks for all Odour Control Units		
a)	Check covers, hatches and doors are closed	X	
b)	Confirm duty fan running and standby fan availability	X	
c)	Check damper position to ensure they have not been tampered with	X	
d)	Check ductwork for any signs of damage or leaks	X	
	Specific tasks for Biofilter OCU		
e)	Check the spray pattern from the irrigation nozzles and clean nozzles where required. (If possible)	X	
f)	Check for free discharge of effluent water to drain	X	
g)	Check for free discharge on any condensate removal points	X	
	Specific tasks for Chemical Scrubber OCU		
h)	Check water softener availability, check salt reservoir level, and top up if required.	X	
i)	Check stocks in bulk chemical tanks and reorder if required – tanker delivery	X	
j)	Check that the Redox and pH are within the agreed range – on dosing skid	X	
k)	Check duty and standby dosing pumps are available for each bulk chemical	X	
l)	Check the duty scrubber liquor recirculation pump is running and the standby is available in auto	X	
m)	Check that there is free drainage of scrubber blow-down liquor to drain	X	

ID	Instruction	Daily	Weekly
n)	Check differential pressure gauges are within design range (if fitted)	X	
o)	General check for leaks in the scrubber liquor recirculation and dosing system – raise follow on work if any defects are identified	X	
	Specific tasks for Carbon OCU		
p)	Examine ductwork for any signs of damage or leaks and check trapped condensate drains are free flowing. If a manual drain valve is provided, operate the valve until the flow of condensate ceases and leave valve in closed position.	X	
q)	Check differential pressure gauge for over-pressure (if provided) – indicates media fouling	X	
10	**On Site Pumping**	Daily	Weekly
a)	Pumping System(s) (Drainage, Interstage, Washwater, Recirculation, Return Liquors etc.) operating correctly?	X	
b)	Check Ammeter reading - too high could indicate a blockage. Too low could indicate an air lock or impeller damage.	X	
c)	Check the well level is within the normal operating limits - taking into account the flow conditions at the time. If level is too low or high, this could indicate control issues or pumping issues.		
d)	Check condition of the wet well- does it have more than the usual scum or debris floating on top that will indicate the need for a wet well clean?		
e)	Check fault light(s) are not on	X	
f)	Check flow rate (where meter is fitted); is it within the normal operating range?	X	
g)	Check for undue pump noise and vibration by safely touching the lifting chain or guide rail.	X	
h)	Check non-return valve. Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted, is it at the usual angle? If it is low and chattering it could indicate the pump is blocked	X	
i)	Check operation of the ultrasonic level gauge. Is it reading correctly? Compare the well level with the normal readout from the display.	X	
j)	Check pumps, pipelines and couplings for leaks. Check for visible leaks.	X	
k)	Start the cleaning cycle manually where required	X	
l)	Pumps - Log hours run	X	
m)	Pumps - Log kWhrs	X	
n)	Check hard wired control floats - are floats weighed down with rag or debris preventing them from lifting if the water level rises.	X	

ID	Instruction	Daily	Weekly
o)	**Washwater Pumping** - Check the pipe line pressure from a gauge (where installed) on the pressure vessel or the pipe line manifold. Possible indication of strainer blockage	**X**	
p)	**Washwater Pumping** - Check operation of surge vessels (where installed).	**X**	
q)	**Washwater Pumping** - Check the strainers. If necessary, put automatic strainers in manual clean and inspect the manual strainers where local conditions allow.	**X**	
r)	**Washwater Pumping** - Check automatic filters are operating correctly	**X**	
11	**Distribution Chambers**	Daily	Weekly
a)	Inspect all weirs and brush clean. Remove any debris, scum, algal growth, blanket weed, grit, etc. from the chamber. Check flow split is correct.	**X**	
b)	Ensure any rag is removed, especially from around the penstocks, gate valves and their spindles. Ensure none of this passes over the weir.	**X**	
c)	Check that all valve, penstock and weir operating positions are correctly set.	**X**	
d)	Check chamber for any visible leaks	**X**	

Appendix 6. Sludge Rounds

	Instruction	Daily	Weekly
1	**Liquid Sludge Import Facilities**	Daily	Weekly
a)	Check sludge logger device is fully operational	**X**	
b)	Check that the pattern of imports is in line with site requirements/agreement with tanker operators.	**X**	
c)	Check general area is clean and tidy	**X**	
d)	Check reception tank for rag/grit build up		**X**
2	**Sludge Screen**	Daily	Weekly
a)	Check sludge screen operation	**X**	
b)	Check screened sludge quality	**X**	
c)	Check / clean moisture sensor	**X**	
d)	Visually check unit and its associated equipment for the following: Safety & security with all panels locked & guards secure and in good condition. Excessive noise or vibration Overheating External damage, leaks, missing fixings	**X**	
e)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action to replace them if needed. Inspect grease pots and fill them when level is below the standard. Use grease nipples to lubricate required parts of screen.	**X**	
f)	Carry out checks on cold weather operation systems before frost sets in	**X**	
g)	Check screenings quality & quantity		**X**
h)	Check general area is clean and tidy		**X**
i)	Check washwater is operating correctly during period of sludge discharge Ensure wash water pressure of spray bar is correct. Check the inline filter is present, clean and feeding the spray bars (where applicable). Check the spray bar pattern and clean the spray bar nozzles as required.		**X**
j)	Clean steel probes on rotamat screen		**X**
3	**Sludge Buffer & Blending Tanks** "Sludge Blending Tank" refers to a tank, into which more than one type of sludge is fed, requiring mixing: normally immediately prior to sludge digestion or dewatering. It may on some sites be referred to as a sludge holding tank or digester feed tank.	Daily	Weekly

	Instruction	Daily	Weekly
a)	Check that mixer is operating correctly. Mixers are normally inhibited if the sludge level falls below a set level to protect the impellor, pump or blower.	X	
b)	Check for signs of stratification or poor mixing and rectify where necessary	X	
c)	Check pH and if less than 5 attempt to reduce septicity and freshen sludge	X	
d)	Check for ragging and blockages and clear or remove (where safe access is possible)	X	
e)	Check amps on mixer motor		X
f)	Check tank control system		X
4	**Sludge Treatment Inter Process Pumping**	Daily	Weekly
a)	Check Ammeter reading, Too high could indicate a blockage. Too low could indicate an air lock or impeller damage. Where reading is unusual ensure appropriate action is taken.	X	
b)	Check flow rate (where meter is fitted); Is it within the normal operating range?	X	
c)	Check the well level is within the normal operating limits taking into account the flow conditions at the time. If level is too low or high, this could indicate control issues or pumping issues.	X	
d)	Check operation of the ultrasonic level gauge. Is it reading correctly? Compare the well level with the normal readout from the display.	X	
e)	Listen for undue pump noise and check for undue vibration by safely touching the lifting chain or guide rail.	X	
f)	Check pumps, pipelines and couplings for visible leaks	X	
g)	Check non-return valve is operating correctly Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted is it at the usual angle? If it is low and chattering it could indicate the pump is blocked.	X	
5	**Pasteurisation**	Daily	Weekly
a)	Check batch rates according to sludge levels	X	
b)	Check digester temperatures in relation to pasteurisation plant	X	
c)	Check hmi panel	X	
d)	Check operation of biotherm reactor aeration blower package.	X	

	Instruction	Daily	Weekly
e)	Check heat exchanger performance	X	
f)	Check digested sludge buffer tanks	X	
g)	Check blended sludge buffer tanks	X	
h)	Check operation of biotherm reactor mixer	X	
i)	Check operation of heat exchanger mixer	X	
j)	Check operation of scum cutter	X	
k)	Check pump and valve operation	X	
l)	Log and record flows, pressures and temperatures	X	
m)	Check % ds of feed sludge to pasteurisation plant (Monday, Wednesday, Friday)	X	
n)	Check, remove and clean temperature probe		X
6	**Primary Sludge Digestion**	Daily	Weekly
a)	Check sludge discharge to limpet chambers, where installed. Clear any blockages	X	
b)	Check digester feed system is working Clear any blockages	X	
c)	Check digester heating system is working & temperatures are within HACCP range.	X	
d)	Check digester mixing system is operating correctly	X	
e)	Log digester temperatures (HACCP) Log inlet and outlet temperatures of each boiler Log inlet and outlet temperatures of sludge and water in heat exchangers	X	
f)	Log sludge feed volumes into each digester and establish the retention time (HACCP)	X	
g)	Check operation of sludge and water recirculation pumps Check pumps, pipelines and couplings for leaks where possible.	X	
h)	Monitor water supply where glycol is not used to heat exchanges that are exposed to elements, Ensure water is drained when heat exchanges are not in use.	X	
i)	Log use of secondary fuel within boilers.	X	
j)	Sample sludge into and out of digester. Analyse and record % dry solids. (Monday, Wednesday, Friday.) Analyse and record % volatile matter. (3 times a week Monday – Thursday)	X	
k)	Check digesters for foaming on the top.		X

	Instruction	Daily	Weekly
l)	Remove grit from base of digester if facility is provided. **Do not** leave grit removal operation unattended and ensure valve is fully closed before leaving task.		X
m)	Sample, measure and record pH of digested sludge		X
7	**Secondary Sludge Digestion**	Daily	Weekly
a)	Check mixing system, for short-circuiting or separation, Mix before transfer to the next process, where facilities exist	X	
b)	Decant supernatant liquor when required	X	
c)	Log status of each tank	X	
d)	Record number of day's storage	X	
8	**Biogas Handling, Storage, & Utilisation.**	Daily	Weekly
a)	Check all condensate traps manually and drain or top up if necessary. This check is required **twice daily** in prolonged periods of warm weather. Check automatic u-tubes visually, to ensure that there are no gas leaks or freezing Check automatic drain traps working correctly. Use manual drains if automatic drains not working, report defects	X	
b)	Check glycol pressure relief valve and ensure liquid level visible in sight glass	X	
c)	Check pressure/vacuum relief (whessoe) valves are not passing biogas. Listen for gas passing, note any unusual smell, visual check of valve.	X	
d)	Check for genuine operation of flare stack / waste gas burner, e.g. chp is at full power and there is excessive gas make	X	
e)	Check and record dehumidifier temperature	X	
f)	Log gas volumes: produced, flared, to chp, to boilers	X	
g)	Sample, monitor & record methane composition of biogas	X	
h)	Manually check gas isolation valve handle operation by closing & opening valve.		X
9	**CHP & Biogas Power Management**	Daily	Weekly
a)	Check automatic drain traps working correctly. Use manual drains if automatic drains not working, report defects	X	
b)	Check for genuine operation of flare stack / waste gas burner, e.g. CHP is at full power and there is excessive gas make	X	
c)	Check glycol pressure relief valve and ensure liquid level visible in sight glass	X	
d)	Check & log hours run	X	

	Instruction	Daily	Weekly
e)	Check & log kwh exported (where relevant)	X	
f)	Check & log kwh generated	X	
g)	Check & log kwh used on site	X	
h)	Check & log use of secondary fuel	X	
i)	Check & log gas used	X	
j)	Check & log heat liberated from engine, heat dumped, heat liberated from boilers	X	
k)	Check & log engine temperatures and pressures, by exception	X	
l)	Check & log gas stream for methane composition		X
m)	Check automatic u-tubes to ensure that there are no gas leaks or freezing		X
n)	Check pressure/vacuum relief (whessoe) valves are not passing biogas. Listen for gas passing, note any unusual smell, visual check of valve.	X	
10	**Liquor Treatment**	Daily	Weekly
a)	Check return liquors and return rate	X	
11	**Chemical Dosing**	Daily	Weekly
a)	Check that chemical is discharging, not just dosing pump running (any nozzles blocked?)	X	
b)	Check chemical storage tank level - reorder as required	X	
c)	Check for excessive vibration in the dosing pump	X	
d)	Check the level in the internal bund and empty as required	X	
e)	Check for leaks on visible chemical lines	X	
f)	Check the trace heating system	X	
g)	Check external storage tank bund for rainwater and/or chemical. Empty as appropriate.		X
h)	Check the correct amount of chemical is being delivered for the conditions		X
i)	Check storage tank can take delivery before delivering		X
12	**Sludge Dewatering – Belt Press**	Daily	Weekly
a)	Check poly dosing system, Log polymer usage, note each bag change/delivery, Make adjustments to optimize	X	-
b)	Check sludge feed rate and log	X	
c)	Check sludge on the top belt and assess the conditioning of the sludge, Check belt drainage and filtrate quality	X	
d)	Check product quality & quantity, Check condition of stockpile	X	

	Instruction	Daily	Weekly
e)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
f)	Ensure wash water pressure is available at a minimum of 6 bar	X	
g)	Clean belt steering paddles and check they are functioning correctly	X	
h)	Clean hopper level probes and check they are functioning correctly	X	
i)	Wash station - check formation of spraying fans, rotate internal brush to clean spray nozzles. (minimum twice daily)	X	
j)	Visual Check - Hydraulic power pack - check oil level top up using clean equipment and fresh oil as required, maintain as close to full level as possible. Oil level must not be allowed to fall below 3/4 as this will cause serious damage	X	
k)	Jet wash clean the belt filter.	X	
l)	Use low pressure water hose to clean complete machine, frame, rollers and hoppers.	X	
m)	Check condition of belt filter for blinding / blockages / good filtration	X	
n)	Steering flaps - check condition and correct operation for activation of the hydraulic steering mechanism and check for wear and replace as required	X	
o)	Sample, analyse & record % dry solids on feed and cake, (Monday, Wednesday, Friday)	X	
p)	High pressure steam clean the belt from underside.		X
q)	High pressure steam clean complete machine, frame rollers and hoppers avoiding all electrical and instrumentation equipment		X
r)	Check condition of belt filter for wear i.e. Creasing / condition of seam to avoid failure / breakage and damage to other components		X
13	**Sludge Dewatering – Centrifuge**	Daily	Weekly
a)	Check condition of stockpile, Check quality of product	X	
b)	Check kwh, amps and hours run	X	
c)	Check poly dosing system	X	
d)	Check quality of centrate	X	
e)	Check sludge feed rate, Check quality of product in feed	X	
f)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
g)	Log hours run	X	
h)	Log kwh hours run	X	

	Instruction	Daily	Weekly
i)	Log polymer usage, note each bag change/delivery	X	
j)	Log sludge flow rate	X	
k)	Log volume of cake produced	X	
l)	Make adjustments to get optimum throughput, product quality and poly dosing	X	
m)	Sample, analyse & record % dry solids on feed and cake (Monday, Wednesday, Friday)	X	
14	**Poly Make Up, Storage, & Dosing – Liquid**	Daily	Weekly
a)	Poly make up storage & dosing – liquid - check supply of polymer held in IBC; Top up, replace, order as appropriate	X	
b)	Liquid - check dosing pumps & settings	X	
c)	Liquid - check dilution water is available	X	
d)	Liquid - clean up any spillages of liquid	X	
e)	Liquid - log usage of polymer i.e. IBCs level	X	
f)	Liquid - log settings of dosing pumps	X	
g)	Liquid - log type of polymer	X	
h)	Liquid - check polymer flowmeter pressure – if above 3 bar clean filter and mixer		X
i)	Liquid - check made up solution appears ok	X	
j)	Liquid - check bunded area for spillages	X	
15	**Poly Make Up, Storage, & Dosing – Powder**	Daily	Weekly
a)	Dry powder - check dosing pumps & settings	X	
b)	Dry powder - check supply of polymer held in silo; Top up, replace, order as appropriate	X	
c)	Dry powder - check bunded area for spillages	X	
d)	Dry powder - check dilution water	X	
e)	Dry powder - check dry room / silo is heated, dry and doors are closed	X	
f)	Dry powder - check made up solution appears ok	X	
g)	Dry powder - check polymer is dry and flowing, look at screw drive and discharge to wetted head – “JETWET”	X	
h)	Dry powder - clean up any spillages	X	
i)	Dry powder - log settings of dosing pumps	X	
j)	Dry powder - log type of polymer, check using correct polymer.	X	

	Instruction	Daily	Weekly
k)	Dry powder - log usage of polymer i.e. bags used	X	
l)	Dry powder - check polymer flowmeter pressure – if above 3 bar clean filter and mixer		X
16	**Sludge Cake Transfer**	Daily	Weekly
a)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
b)	Check conveyor rollers & keep clear	X	
c)	Check drive bearings for wear & operation	X	
d)	Check electric trip wire emergency stop wire	X	
e)	Keep general area clean. Clear up any spillages	X	
f)	Check belt condition	X	
17	**Sludge Cake Storage**	Daily	Weekly
a)	Ensure silo not filled above 70% capacity. Inform Bio-recycling of any changes to sludge production.	X	
b)	Keep general area clean to minimise odour	X	
c)	Log & record each storage pad bay activity and status if applicable	X	
d)	Check wheel wash is operational	X	

Appendix 7 – Monthly OCU Health Checks

Monthly Health Checks

Biofilter

Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check condensate drains are free flowing	
2	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
3	Check the airflow through the system and any anomalies investigated.	
4	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities	
5	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
6	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
7	Examine the irrigation system to ensure correct operation including spray pattern, clean the strainer and unblock nozzles or replace as deemed necessary.	
8	Take a sample of the drainage water and measure the pH value and compare to target pH value (this is not pH 7 for modern biotech)	
9	Check all hatches and doors for integrity and ensure they are closed	

Chemical Scrubber

Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check condensate drains are free flowing	
2	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
3	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
4	Check the airflow through the system and any anomalies investigated.	
5	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities	
6	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
7	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
8	Examine the recirculation pumps and distribution pipework to ensure correct operation, clean the strainer and check trough / distributor.	
9	Carry out a functional check of the dosing system ensuring target pH and Redox are achieved, and validate the probe calibration using a handheld unit	
10	Calibrate if necessary	
11	Visually check the seals of all hatches note any leaks.	
12	Visually check the wet scrubber housing, note any significant deterioration	
13	Scrubber dosing cabinet - Check chemical dosing pumps for leaks	
14	Scrubber dosing cabinet - Check that dosing rates are correct	
15	Scrubber dosing cabinet - Check all valves, instruments and pipe-work for leaks	
16	Scrubber dosing cabinet - Check inside of cabinet for chemical residue and dirt and wash if necessary	
17	Scrubber dosing cabinet - After wash down check catch-pot high level alarm is working before draining	

Carbon Adsorber

Please enter any comments you may have in the yellow comments boxes

Number	Task	Comments
1	Examine ductwork for any signs of damage or leaks and check trapped condensate drains are free flowing. If a manual drain valve is provided, operate the valve until the flow of condensate ceases and leave valve in closed position.	
2	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	
3	Visually inspect the Odour control system will be made and any defects or deterioration of the housings will be reported.	
4	Check the airflow through the system and any anomalies investigated.	
5	Measure the pressure drop across the system by measuring the inlet and outlet pressure. Record any abnormalities. Read off Delta-P gauge if fitted or using a portable manometer	
6	Measure the contaminate levels (primarily H2S) at the inlet and at the stack	
7	Check visually all fans, check for excessive noise and report any necessary maintenance to be undertaken as applicable.	

---- End of OMP ---