Asset Management
Asset Standard
Odour Management Plan

Long Reach STW

LREAS1ZZ

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0 Contents

Figures and Tables:

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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
0	Creation of Long Reach OMP	[redacted]		March 2007
1	Update Risk Assessment / Improvement Plan			April 2007
2	Update for greater H4 Compliance			
3	Conversion of OMP into new Standard Format			October 2014
4	Update Risk Assessment/Improvement Plan			April 2017
5	Review and update of OMP			April 2019

6	Updated alongside AD permit application	[redacted]		June 2021
6.1	New Sludge Treatment Centre Permit Application			July 2022
6.2	IED AD application Resubmission	[redacted]	[redacted]	August 2023

0.3 Sign Off

Area Operations Manager	[redacted]	Date: August 2023
Performance Manager		Date: August 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 effected 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 Long Reach 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 Long Reach 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 Long Reach STW are identified, and how, as far as is reasonably practicable, they are controlled and recorded. It is primarily a management guide; detailed 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 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 Urban Wastewater Treatment Directive (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).

There is also a bespoke waste operation permit EPR/DB3538RS relating to limited imports of specific organic wastes such as sugars and Fat, Oil & Grease (FOG), but this is no longer in operation.

A separate permit for the Long Reach CHP plant is held by Finning UK Limited, with a sub-set of activities managed by Thames Water (gas bags, boosters, scrubbing plant, flares). The nature of these operations is such that only in exceptional circumstances would these permitted activities become a defined source of odour.

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)

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:

Long Reach STW
Marsh Street
Dartford
Kent
DA1 5PP
What3Words ref: also.chimp.vibrate
EPR Permit number to be included when issued

The Long Reach Sewage Treatment Works was originally built in 1923, and was designed to safely treat sewage from the surrounding local area, with a population of approximately 60, 000. Since 1923 Long Reach has been constantly upgraded and expanded to be able to treat an ever-expanding drainage area. Today the Long Reach Works serves an area of over 200sq miles, with a population of just over 900,000.

The Long Reach STW is located on the south bank of the River Thames in the Kent Borough of Dartford, just to the west of the Dartford River Crossing. The site is located on Marsh Street. It may be accessed via the A206. The nearest motorway intersection is Junction 1 of the M25.

The works receives flows from parts of Bexley, Bromley, Croydon, Dartford, Sevenoaks, Tandridge and Tonbridge and Malling. The catchment extends to the boundary with Southern Water and includes part of the Thames Gateway development area.

The site is in a relatively rural location for the East of London, approximately 2.5 km North of Dartford, with a large housing estate to the South of the site entrance. To the East is the former Littlebrook Power Station, which is currently being demolished with warehouses beyond. To the West of the site are the Dartford Marshes and the River Darent.

Receptors

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

Table 2.1 - Location of potentially sensitive odour receptors.

Receptor Number	Receptor Address	Receptor type	Approximate distance to the nearest site boundary (m)	Direction from the site	Receptor Sensitivity
1	Warehouses – Amazon LCY3, Europa & DPD	Industrial	340	East	Medium

2	Littlebrook Pier	Industrial	560	East	Low
3	Dartford Crossing	Road	1400	East	Low
4	Residential area surrounding Halcrow Avenue/Abbey Mead Close	Residential	500	Southeast	High
5	Residential area surrounding Birdwood Avenue	Residential	170	South	High
6	Residential area surrounding Darwin Avenue	Residential	600	Southwest	High
7	Dartford Bridge Community Primary School	School	410	Southwest	High
8	The Leigh UTC & La Marelle – Dartford's French School	Schools	730	Southwest	High
9	Area surrounding Rennie Drive	Industrial	60	South / Southeast	Medium
10	Sainsburys Dartford Distribution Centre	Industrial	920	Southeast	Medium
11	Holiday Inn Express London - Dartford	Hotel	1200	Southeast	High
12	DoubleTree by Hilton Dartford Bridge	Hotel	1500	Southeast	High
13	Area surrounding Bridge Close	Industrial	1500	East	Medium
14	Area surrounding Anchor Boulevard	Commercial	1600	Southeast	Medium
15	The Enchanted Woodland	Woodland	720	South	Low
16	Residential area surrounding Henderson Drive	Residential	960	South	High
17	Joyce Green Playground	Playground	1200	South	Medium
18	Temple Hill	Residential	1500	South	High
19	Saint Anselm's Roman Catholic Primary School &	Schools	1400	South	High

	Temple Hill Primary Academy				
20	Area surrounding Riverside Way	Industrial	1700	Southwest	Medium
21	Dartford Clay Shooting Club	Recreational	880	West	High
22	Joyce Green Beach	Recreational	950	Northwest	High
23	Area surrounding Burnett Road	Industrial	1800	Northwest	Medium
24	The River Cray Confluence	Open Area	1500	Southwest	Low
25	Purfleet Container	Industrial	770	Northeast	Medium
26	Residential area surrounding Windermere Avenue	Residential	1350	North	High
27	Purfleet Train Station	Transport	1100	North	Medium
28	Residential area surrounding Caspian Way	Residential	1350	North	High
29	RSPB Rainham Marshes	Open Area - Nature Reserve	1800	Northwest	Low
30	Purfleet Primary Academy & Woodlands Pre-School	Schools	1600	North	High
31	Residential area surrounding Fanns Rise	Residential	1750	North	High
32	Area surrounding Stonehouse Lane	Industrial	1900	Northeast	Medium
33	Residential area surrounding Wood Avenue	Residential	1850	North	High
34	Circus Tavern Entertainment Complex	Recreational	1800	North	High
35	Morrison Water Services	Commercial	Adjacent	South	Medium
36	Residential area surrounding Stones Avenue	Residential	300	South	High

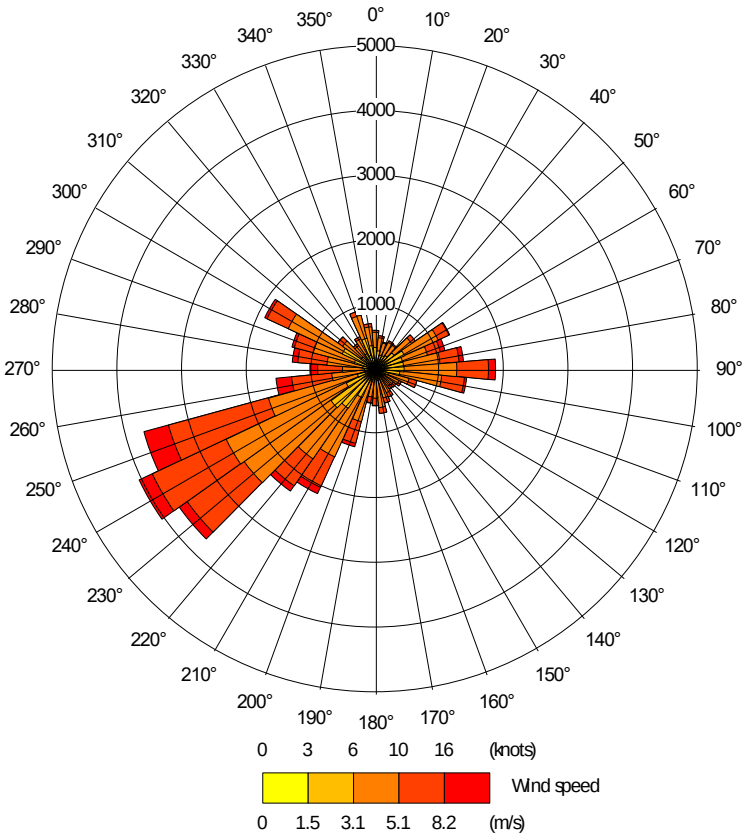
2.2 Off-site sources of odour

There have been no other off-site odour sources identified to date.

2.3 Wind Rose and Weather Monitoring

London/City Airport meteorological station (approximate location NGR E 543189 N 180444) is located approximately 13.2 km west-northwest 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 southwesterly, which means receptors northeast of the site would have the highest probability of experiencing potential increases in odour emissions.

Figure 2.31: London/City Airport Wind Rose, 2016-2020



There is no on-site weather station at Long Reach STW. 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. 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

2.5.1 UWWTD activities

Raw sewage enters the inlet works from two culvert sewers, and passes through 4 x 6mm screens. Screenings are treated by Spirac units on the works flow and then deposited into skips regularly collected by a specialist contractor. Grit settles out in the Constant Velocity (CV) channels after screening. Grit is then pumped into a "classifier" system where it is separated from liquid and is deposited into skips. Storm overflow is diverted into 4 x storm tanks where flow is screened, and the screenings pass to Washpactors where they are cleaned and then into skips.

Flow passes to 8 x rectangular shaped (Primary Settlement Tank) PSTs equipped with individual sludge scrapers and scum removal systems. Settled sewage passes to 9 x aeration lanes fed by 9x blowers. The Primary sludge passes to 4 x PFTs and mixed liquor passes to 12 x (Final Settlement Tanks) FSTs, each one being equipped with a scraper and a scum removal. Surplus Activated Sludge (SAS) is then sent to the treatment plant and Return Activated Sludge (RAS) returned to the aeration lanes.

SAS from the final settlement tanks (FSTs) is pumped to the SAS buffer tank, before it is pumped to and thickened within the SAS dewatering building, which contains five belt thickeners. The SAS buffer tank is an above ground, steel tank which is uncovered and not connected to any odour abatement.

Final effluent outfall is to the river Thames at Long Reach.

2.5.2 Sludge Treatment Centre Permit activities

See Figure D2 in Appendix 4 for the process flow diagram of permitted activities.

Sludge Imports

The STC comprises two waste import offloading points for permitted, imported wastes. One of the import points can be found close to the inlet of the sewage treatment works for wastes that consist of liquids and associated sludges from domestic and municipal sources, that are similar in composition to those materials derived from the sewer network and managed via the UWWTD route. These wastes are imported by road.

The second waste import offloading point is for permitted imports of sludges into the anaerobic process, to be mixed with indigenous sludges. Sludge is imported to the anaerobic digester plant from other waste water treatment works, via a data logger into the import tank. The import tank is steel on a concrete base, enclosed and odour abated, with malodourous air extracted to an odour control unit that is shared with the picket fence thickeners (PFTs). Sludge is screened, to remove rag and grit, which is discharged into skips for offsite disposal. Imported sludge is pumped from the import tank to the High Energy Blending Tank (HEBT) where it is mixed with indigenous sludge and Surplus Activated Sludge (SAS), prior to the Thermal Hydrolysis Plant (THP) process.

Sludge Conditioning

Sludge from the aerobic treatment processes is pumped from the primary settlement tanks via a subsurface pipe into one of the four PFTs on site, which under normal conditions operate three tanks thickening sludge and one tank being filled. Supernatant from the sludge weirs out of the tank and is returned to the works inlet via the site drainage for treatment via the aerobic process. These PFTs are all covered steel tanks on concrete bases and are odour abated. Once thickened, the sludge is pumped above ground from the PFT to the primary sludge buffer tank and HEBT for processing via the THP or directly to the digester feed tanks, via a THP bypass.

SAS from the SAS buffer tank is pumped to the SAS dewatering building, which contains five belt thickeners A bulk powder system is used with the SAS belt thickeners which automatically makes up a polymer coagulant and doses it into the belt thickeners to aid coagulation. After thickening the thickened SAS is pumped above ground to the HEBT to be mixed with raw thickened indigenous sludges and imported sludge. Liquors are returned via the site drainage to the works for additional treatment via the aerobic process.

Sludge Treatment - THP

Prior to digestion, a proportion of the sludge is treated within the THP. The THP plant is fully odour abated, located on made ground and is bunded, with drainage returning via the site drainage for additional treatment. Thickened sludges combine within the HEBT and are blended in order to achieve a homogenous blend of raw SAS and mixed primary sludges for the centrifuges and other downstream processes. Blended sludge in the HEBT weirs equally into one of two pre-THP storage tanks at the beginning of the THP Process; a recirculation pump can return sludge to the HEBT preventing overfilling of this tank.

From the pre-THP storage tanks the mixed sludge is pumped to screens, which remove further rag and inorganic material which is discharged into large skips for offsite transfer and disposal, with the screened sludge entering into two screened sludge holding tanks. These two feed tanks are of steel construction, covered and feed sludge via dedicated pumps to three THP centrifuges, which dewaters

the sludge prior to the THP. A polymer is added to each centrifuge feed line to aid coagulation, with the polymer being made up from a bulk powder system and stored in a day tank for use. The centrate from all centrifuges drains to site drainage and is returned to the inlet for further treatment and the dewatered sludges fall into hoppers and are pumped, via dedicated pumps, to the top of the THP Feed Silo. The silo acts as buffer capacity for the THP and is of steel construction. Screw augers move the sludge into the inlets of the THP feed pumps, which pumps sludge to the THP Pulper Tank.

There is one THP stream which operates a 24-7, batch process in parallel across the three reactor tanks. In the THP Pulper Tank, fresh dewatered sludge is preheated via recovered steam from the reactors and flash tank. When a batch of sludge is called for, the required volume is pumped from the pulper to one of the three reactor tanks for treatment. The sludge is then discharged to the THP Flash Tank. The THP Flash Tank provides a thermal buffer to release excess energy from the sludge which is cooled by inline mixing with raw sludges from the digester feed tanks, prior to it entering downstream processes.

Alternatively, sludge from the HEBT can be bypassed directly into the digester feed tanks, and onwards to the primary digesters.

Sludge Treatment - Digestion

There are eight tanks adjacent to the THP in two banks of four parallel tanks, which operate as primary digester tanks , with tanks no. 2, no. 3 and no. 4 fed from one transfer pump, and tanks no. 6, no. 7 and no. 8 fed by another transfer pump, via aboveground sludge pipelines. These tanks are filled on a batch basis and empty by gravity, with digested sludge spilling out and into tank no. 1 which spills into tank no. 5, which are both primary digester tanks. The eight tanks are all of the same type and design, insulated steel tanks on a concrete base with a conical bottom that extends slightly below ground and each tank has a fixed concrete roof, with the exception of tank no. 3 which has a metal roof.

Following treatment over an appropriate number of days, sludge gravitates via aboveground pipes to the third secondary digester tank.

Biogas generated within the digestion process, largely methane, rises through the digester and is captured within the gas space at the top of each digester, and transferred via aboveground pipes into the adjacent two gas storage holders for utilisation on site.

Sludge gravitates into the sequential primary digester tank on site via an above ground pipe, which then spills into the Main Dewatering Press Buffer Tank.

Sludge Dewatering and Storage

Fully digested sludge is then pumped above ground into the local press dewatering tank, which is adjacent to the dewatering presses located within the cake barn. There are five presses which are serviced by dedicated pumps. A powder polymer coagulant, stored in a bulk silo, is automatically made up and dosed into each press feed line. Filtrate from the presses returns to a wet well and is then pumped back to the works inlet for further treatment via the aerobic process.

Digested sludge cake falls onto the floor of the cake barn into one of two bays, before shovel loaders move the digested sludge cake into the main barn. Digested sludge cake is subject to removal from site under the Sludge Use in Agriculture Regulations 1989 (SUiAR), and in accordance with the Biosolids Assurance Scheme (BAS). The cake barn is an enclosed building with solid concrete floors and solid concrete internal walls, however, there is no drainage within the building and excess liquid is mixed with digested sludge cake as required. A large odour control unit is used to provide odour abatement to the cake barn and SAS thickening building, while the local press dewatering tank is connected to one of the two OCUs which abate the THP.

Cake Imports

Thames Water will import treated sludge cake from other works, for temporary storage in the site cake barn. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including confirming that the incoming cake complies with the requirements of both SUiAR and BAS prior to import. Cake will then be retained. The waste stream is the same as that arising from the treatment of sludge within the Long Reach 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. Cake will only be imported for the shortest time practicable, however, this storage duration will be impacted by issues such as prevailing weather and availability of the landbank.

Biogas Systems

Biogas from the primary digesters is captured and stored within one of two gas holders on the site via an aboveground biogas pipeline. The biogas pipelines are fitted with condensate pots to capture entrained moisture which is discharged to the site drainage. The biogas storage holder is fitted with pressure release valves as a safety precaution in the event of over pressurising the system.

Biogas is used on site within the boilers or emergency flares which are operated by Thames Water, or, within the CHP engines operated by Finning (UK) Ltd.

The site has three biogas CHP engines and the Heat Recovery Boiler (HRB) which supplies steam to the THP process, that are located within a separate energy compound and receive biogas from the site operations for combustion, which generates electricity and recoverable heat, both of which are used on site. The three CHP engines operated by Finning (UK) Limited as a multi-operator installation under a separate Environmental Permit (EPR/ WP3838UH/V003).

Biogas may also be combusted within the site's four boilers, which are dual fuelled but only run on diesel when run. Heat generated by the boilers is used to regulate the anaerobic digester operational temperature.

In the event of excess biogas due to CHP engines or boilers being unavailable or there being more biogas than the CHP engines or boilers can utilise, there are two ground mounted emergency flares which can combust biogas. These are utilised under 10% of the year, less than 876 hours per year and their use is recorded.

Liquor Return

Site drainage from operational areas is captured within the site wide drainage system and is returned to the inlet of the sewage treatment works for treatment within the UWWTD treatment route.

2.5.3 Other Permitted activities plus description

There is an Environmental Permit for a FOG plant that covers the reception of specialist organic wastes imported by tanker. However, this plant is no longer in operation.

3 Site Management Responsibilities and Procedures

3.1 Site Roles

Figure 3.1 - Site Roles

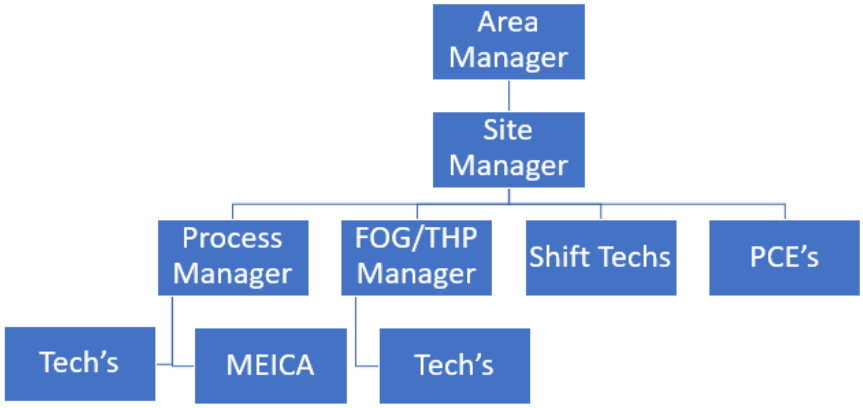


Table 3.1 - Tasks and Responsibilities

Role	Tasks and Responsibilities
Regional Operations Manager	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	Responsible for overall performance of the STW and will be responsible for • odour control and management at the site • day to day implementation of the OMP • dealing with customer complaints • assessing the scope of, and updating, the OMP as it is implemented. • day-to-day operation of the STW • Ensuring staff Thames Water staff undergo appropriate training

Role	Tasks and Responsibilities
Technically Competent Manager	Hold the required WAMITAB qualification to support the activities on site under the STC permit, ensuring permit conditions are complied with.
Team Manager	Responsible for day-to-day operation of the STW.
Shift Process Controller	Monitoring and recording of site data and operating process plant.
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.
Dayworks Tech 1 / Shift Operator	Day to day duties include: • maintaining and operating process equipment. • process monitoring and recording site data
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 24 hours per day and 7 days per week.

3.2 Key Contacts

Role	Name	Email address	Phone Number
Area Operations Manager	[redacted]		
Performance Manager			
Technically Competent Manager			
Team Manager			
Customer and Stakeholder Manager			
Customer Centre			

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.

All Technicians/operators have received or are working towards training appropriate to their grade and, in the Wastewater Operating Process NVQ Level 2, an element of training and assessment in the control of odour. All records of staff training are held on the company HR training database in SAP and in the LOAD document kept on Documentum

4 Odour Critical Plant Operation, Monitoring and Management Procedures

4.1 Odour Sources, Critical Issues and History

The Long Reach site is in an industrial setting on the river Thames. Since 2018 we have received a small number of formally recorded complaints **–** 2 in 2022 (YTD), 1 in 2021, 6 in 2020, 2 in 2019, 2 in 2018.

An Odour Risk Assessment is included as Appendix 1.

An Odour Improvement Plan is included 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 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 Critical 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 Long Reach 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:

- Site Drainage
- Incoming Sewers

- Cess Reception, Discharge, Wash down & Drainage
- Storm Tanks
- Storm Screens
- Open Skips
- Screens and Screenings handling
- Screenings Skips
- Grit Removal Equipment and grit handling
- 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
- Final Settlement Tanks
- Scum Removal System
- RAS Chambers & Pumping
- SAS Chambers & Pumping
- SAS Buffer Tank
- Outfall

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

- Cess Reception, Discharge, Wash down & Drainage
- Sludge Reception, Screening, Wash down & Drainage
- Screenings Skip
- Picket Fence Thickeners
- SAS Thickening & Pumping
- High Energy Blending tank
- THP Centrifuges
- THP Area
- Primary Digestion
- Sequential Primary Digestion and Mixing
- Dewatering press buffer tank
- Bucher Presses
- Cake Barn (including cake imports)
- Vehicle Movements and Wash Down
- Biogas Storage
- Boilers
- Standby Generators
- OCUs 1 – 4

4.2.3 Odour Critical Plant

The following list of odour critical plant has been identified during the odour risk assessment:

- THP Area
- Biogas Storage
- OCUs 1 – 4

4.2.4 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.

Table 4.0 Sludge Treatment Centre Permit Tank Inventory

Tank Purpose	Number	Operational Volume (m^3)	Construction	Average Retention Time (where available)
Sludge Import Tank	1	251	Steel	2.1
Picket Fence Thickeners	4	884	Steel	0.6
High Energy Blending Tank	1	10	Steel	0.01
Pre-THP Storage Tank	2	59	Steel	0.17
THP Screened Sludge Holding Tank	2	59	Steel	0.17
THP Feed Silo	1	73	Steel	
THP Pulper Tank	1	34	Steel	20-30 mins
THP Reactor Tank	3	13	Steel	
THP Flash Tank	1	42	Steel	
Digester Feed Tanks	2	254	Steel	1.45
Primary Digestion Tanks	6 (tanks no. 2, no. 3, no. 4, no. 6, no. 7 and no. 8)	2000	Insulated steel tanks, concrete base, fixed concrete roof (excluding no.3 which has a metal roof)	14.1
Primary Digestion tanks	2 (tanks no.1 and no. 5)	2000	Insulated steel tanks, concrete base, fixed concrete roof	4.7
Sequential Primary Digestion Tank	1 (tank no.1)	3739.28	Above ground concrete tank with a fixed roof	4.4
Main Dewatering Press Buffer Tank	1 (tank no.3)	3739.28	Steel, sitting on top of an existing concrete tank, fixed roof.	4.4
Emergency Storage Tank	1	3,739	Concrete	N/A
Local Press Buffer Tank	1	35	Steel on concrete base	0.04
Liquor Buffer Tank	1	200	Concrete	0.5
Polymer Tank (for SAS dewatering)	1	25 tonnes	Steel	N/A
Polymer Silo (for THP)	1	25 tonnes	Steel	N/A
Polymer Silo (for digested sludge)	1	35 tonnes	Steel	N/A
Boiler Diesel Tank	1	79,704 L	Steel	N/A
Boiler Diesel Day Tank	1	2,100 L	Steel	N/A
Workshop tank (for site vehicles)	1	8,000L	Steel	N/A

An inventory of potential odorous materials relating to the Sludge Treatment Centre Permit is shown in Table 4.1 below. Air Emission Points are listed, and the locations shown on the site plan in Figure C of Appendix 4.

Table 4.1 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 imports	Cake Barn	5000 tonnes	90 days	19 06 06	Point Source (see OCU entry)	Low
Biogas	See Air Emission Point Plan	Gas holder capacity is 3080m^3 (each)	Continuous operation	N/A	Point Source	Low
Liquor	Site drainage	Liquor is continuously pumped to the head of works	Liquor is continuously pumped to the head of works	16 10 02	Diffuse	Low
Releases from OCUs	For OCUs see detailed consideration in section 5.1.2	Variable throughput	Continuous operation	NA	Point source	Low/Medium
Raw imported sludge	Sludge import tank & HEBT / Works inlet	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 08 05	Point Source (See OCU entry)	Medium/High
Primary Sludge	Picket fence thickeners & Primary sludge buffer tank & HEBT	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 08 05	Point Source (see OCU entry)	Medium/High
Thickened sludge import	Sludge import tank & HEBT	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage	19 02 06	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
			of the process are detailed in Table 4.0			
Surplus Activated Sludge	SAS dewatering building & HEBT	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	19 08 05	Point source (see OCU entry)	Medium/High
Sludge screening skips	Before the Sludge Import Tank & before the THP Screened Sludge Holding Tanks	2	Skips emptied within 24 hours of being full	19 08 01	Diffuse	Low

Table 4.2 Odorous raw materials for Sludge Treatment Centre Permit

Raw Material	Odorous	Storage	Mitigation	Odour Risk
Sludge polymer:				
FLOPAM FO4650 VHM	None	25 tonnes stored in bunded silo	Contained with lid	Low
FLOPAM FO4698XXR	None	25 tonnes stored within bunded silo		Low
FLOPAM FO4800MPM	None	35 tonnes stored within bunded silo		Low
Biogas	N/A	N/A		Low
Diesel	Solvent	286,328 L stored in bunded fuel tank	Contained with lid	Low

Corrosion inhibitor- Nalco 22310	Ammoniacal	300L bunded tank	Contained and within building	Low
Caustic soda- Nalco 77224	Odourless	300L bunded tank	Contained and within building	Low
Caustic soda Liquor - Brenntag	Odourless	300L stored in 33kg/25L drums stored on portable bunds	Contained and within building	Low
Salt – Aquasol	Odourless	6 tonnes in 25kg bags	Stored in a building	Low
Bi-sulphite solution - Nalco 77211	Sulfurous	300L bunded tank	Contained and within building	Low
Hydrogen peroxide	Odourless	150L stored in 30kg/30L drums stored on portable bunds	Contained with lid	Low
Ferric chloride	Chlorine	16m3 (22.72 tonnes) in double skinned tank	Delivery pipework double skinned	Low

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

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 as 'Normal mitigations'.

4.3.1 Odour Control Units

- OCU 1

Odour Control Unit 1 draws odorous air from the following process units:

- Sludge import tank
- Picket fence thickeners
- Primary sludge distribution Chamber

The motive force for this air is two fans operating in a duty/standby configuration which draw air from the sewage plant through a cylindrical biofilter, then through one of the duty/standby cylindrical carbon filters and finally out to atmosphere via a discharge stack. The fans are located between the carbon filters and the discharge stack.

- OCU 2

Odour Control Unit 2 draws odorous air from the following process units:

-
- Local press buffer tank
- Local press filtrate tank

Section of pipework that connects OCU 2 and 3 however isolation valve which is always kept closed isolating the two OCUs.

The motive force for this air is two fans operating in a duty/standby configuration which draw air from the sewage plant through a cylindrical biofilter, then through one of the duty/standby cylindrical carbon filters and finally out to atmosphere via a discharge stack. The fans are located between the carbon filters and the discharge stack.

- OCU 3

Odour Control Unit 3 draws odorous air from the following process units:

- Thermal Hydrolysis Plant
- THP associated storage tanks
- High Energy Blending Tank
- Centrifuge area
-

Air is drawn through a biofilter and then through activated carbon filters by 2 No. fixed speed fans. The fans operate on a duty / standby basis and treated air is vented to atmosphere via an exhaust stack.

- OCU 4

Odour control unit 4 draws odorous air from the following process units:

- Cake Barn
- SAS thickening building

Odorous air is drawn from the Cake Barn and SAS Thickening Building by three variable speed Extraction Fans through an Activated-Carbon Annular filter. The Fans operate on a duty/assist/ standby basis and treated air is vented to atmosphere via an exhaust stack.

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 Long Reach STW are summarised 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	Odour and offensiveness L/M/H	Specific odour management tasks	Responsibility	Monitoring	Monitoring Frequency	Trigger for Action	Remedial action and timescale
Site Housekeeping	General / L	Keep site clean and tidy. Set site rounds and maintenance checks.	Site Tech 1s	Visual Inspection	Daily	Mess reported/ seen	Immediate
Site Drainage	Sewage / L	Check drains clear to enable effective wash down of odorous material	Site Tech 1s	Visual Inspection	Weekly	Drainage blocked	Tanker to suck out when available.
Incoming Sewers	Raw sewage / L	Check crude sewage appearance as per weekly site rounds in appendix 5. Covered.	Site Tech 1s / Process Controller / Shift Operators	Visual Inspection	Daily	A change in sample results	Escalate to process scientist ASAP
Cess Reception, Discharge, Wash down & Drainage. Linked tasks specified in Appendix 5 section 2.1	Raw sewage, chemical waste / L	Check washdown equipment is operating correctly Ensure tankers are coupled correctly	Site Tech 1s	Visual Inspection	Daily	Washdown equipment not working Spillage	Investigate and rectify when reasonably practicable. Clean up ASAP
Storm Tanks Linked tasks specified in Appendix 5 section 2.6	Raw sewage / L	Check storm tanks cleaning system, check level sensors, check tanks are clean and empty outside of storm conditions as per weekly site rounds in appendix 5	Process Controller	Visual Inspection	Daily	Storm tank containing sludge once storm event has passed/ Comms failure	Return remaining sewage to STW head of the works and clean the tank / Investigate Comms issue so far as reasonably practicable.

Storm Screens	Screenings / L	Washpactor system in place	Process Controller	Visual Inspection	As required	N/A	N/A
Open Skips Linked tasks specified in Appendix 5 section 2.5	Screenings / L	Checked on site rounds and removed asap when full.	Process Controller	Visual Inspection	Weekly	Skip full	Skip to be emptied when biffa can attend.
Screens and Screenings handling Linked tasks specified in Appendix 5 section 2.3 and 2.4	Screenings / L	Routine cleaning and checks are per site rounds in appendix 5	Site Tech 1s	Visual Inspection	Daily	Mess on the floor	To be cleaned daily
	Screenings / L	Daily collection by specialist contractors.	Contractors	N/A	as required	Full Skip	Screening to be removed when contractor is available
	Screenings / L	Inform contractor if skips are full.	Process Controller	Visual Inspection	As required	Full Skip	Screenings to be removed when contractor is available.
Screenings Skips Linked tasks specified in Appendix 5 section 2.5	Screenings / L	Inform contractor if skips are full.	Process Controller	Visual Inspection	As required	Full Skip	Screenings to be removed when contractor is available.
Grit Removal Equipment and grit handling Linked tasks specified in	Septic grit / L	Routine cleaning and checks are per site rounds in appendix 5.	Site Tech 1s	Visual Inspection	Daily / Weekly	Grit pile building up	Move to grit holding area when required.

Appendix 5 section 2.5							
Flow & Distribution to Primary Settlement Tanks	Raw Sewage / L	Flow & Distribution to Primary Settlement Tanks occurs via underground channel.	N/A	N/A	N/A	N/A	N/A
Primary Settlement Tanks Linked tasks specified in Appendix 5 section 3	Raw Sewage / L	Routine cleaning and checks of PSTs are per site rounds in appendix 5. Ensure sludge blankets kept to minimum	Site Tech 1s / Shift Operator	Visual Inspection	Daily	Fat build up on scraper blades	Remove fat and clean when required.
Fats, Oil & Grease Scum Removal System	Scum / L	Routine checks to ensure operational	Shift Operative	Visual Inspection	Daily	N/A	N/A
Primary Raw Desludge Pumping	Raw Sludge / L	Covered wet well. Constant flow.	Process Controller	Visual Inspection	Daily	Blockage	Unblock as required
Flow & Distribution to Secondary Treatment	Settled sewage / L	Ensure Scum removal is working correctly on PSTs Flow & Distribution to Secondary Treatment occurs via underground channel.	Shift Operative	Visual Inspection	Daily	Scum buildup	Ensure scraper is working correctly
Activated Sludge Plant Lanes & Zones	Activated sludge / L	Routine checks of are per site rounds in appendix 5	Site Tech 1s	Visual Inspection	Daily / Weekly	Phantom zones / floating detritus in anoxic zones	Clean/ inspect RTC as necessary

Linked tasks specified in Appendix 5 section 4.1							
Final Settlement Tanks Linked tasks specified in Appendix 5 section 5	Final Effluent / L	Routine checks of FSTs are per site rounds in appendix 5	Site Tech 1s	Visual Inspection	Daily / Weekly	Rotation failure, High blanket	Investigate and repair as necessary.
Scum Removal System	Scum / L	Cleaning of scum box	Site Tech 1s	Visual Inspection	Daily	Failed Scum Pump	Investigate and repair as necessary.
RAS Chambers & Pumping	Activated Sludge / L	Routine checks	Site Tech 1s / Shift Operator	Visual Inspection	Daily	Pump not working	Inspect and repair as necessary.
SAS Chambers & Pumping	Activated Sludge / L	Underground pipe	Process Controller	Visual Inspection	Daily	N/A	N/A
Outfall: River Thames	Final Effluent / L	Submerged outfall	Process Controller	Visual Inspection	Daily	N/A	N/A
SAS Buffer Tank Linked tasks specified in Appendix 6 section 3	Activated sludge / L	The tank conditions are checked as part of the sludge rounds in appendix 6.	Site Tech 1s	Visual Inspection	Daily / Weekly	Hole in tank	Inspect / repair as necessary

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	Odour risk if measures fail
Cess Reception, Discharge, Wash down & Drainage Linked tasks specified in Appendix 5 section 2.1	Raw sewage, chemical waste/ L	Check washdown equipment is operating correctly as per site rounds in appendix 5 Ensure tankers are coupled correctly	Site Tech 1s	Visual Inspection	Daily	As detailed previously above	As detailed previously above	Low
Sludge Reception, Screening, Wash down & Drainage Linked tasks specified in Appendix 6 section 1 and 2	Raw Sludge / L	Covered sludge import tank abated by OCU 1.	N/A	SCADA	Continuous	OCU failed	Investigate and repair as necessary	Medium
		Deliveries are made on a sealed hard-standing. The tanker delivery is connected by the driver to a hose which connects to a storage / buffering tank before being pumped (via metered pumps) to the main sludge blending tank for onward treatment.	Driver	Visual Inspection	As required	Hose splits	Repair Hose Clear Up ASAP	Medium
		Routine checks of Sludge Import Facilities are per sludge rounds in appendix 6	Site Tech 1s	Visual Inspection	Daily / Weekly	Mess on the floor	Clean up as necessary	Medium
Skip Linked tasks specified in Appendix 5 section 2.5	Screenings / M	Regular emptying of skip	Process Controller	Visual Inspection	Daily	When skip full	Empty skip	Medium
Picket Fence Thickeners	Raw Sludge / L	Abated by OCU 1	N/A	SCADA	Continuous	OCU failed	Investigate and repair as necessary	Medium

Linked tasks specified in Appendix 6 section 8.2		Ensure weirs are kept clear	Team Manager	Visual Inspection	As required	Blockage	Further inspection	Medium
		Routine checks of PFTs are per site rounds in appendix 5	Site Tech 1s	Visual Inspection	Daily	High H2S	Inspect OCU	Medium
SAS Thickening & Pumping	Activated sludge / L	In a building with doors left shut. Connected to OCU.	Process Controller N/A	Visual Inspection SCADA	Daily Continuous	Doors left open	Close doors	Low
High Energy Blending tank	Blended sludge /L	Covered Tank. Routine checks. Connected to OCU.	THP Shift Operator N/A	Visual Inspection SCADA	Daily / Weekly Continuous	OCU failed	Inspect and repair as required	Low
THP Centrifuges	Return Liquors / L	Underground pipes with two open chambers. Routine checks. Connected to OCU.	THP Shift Operator N/A	Visual Inspection SCADA	Daily Continuous	Dolphin pump failure	Repair as necessary	Low
THP Area	Off-Gas from System / M	Routine checks. Abated by OCU 3 and 4	THP Shift Operator N/A	Visual Inspection SCADA	Daily Continuous	High H2S alarms	Inspect OCU	Medium
Primary Digestion Linked tasks specified in Appendix 6 section 6	Digested sludge / L	Inspect water/glycol levels on digester pressure vacuum device tank (condensate pots)	Shift Operative	Visual Inspection	Daily	Low water level	Top up	Low
		Routine checks of Primary Digesters are per sludge rounds in appendix 6	Site Tech 1s	Visual Inspection	Daily / Weekly	Sludge leak	Investigate further	Low
		Tanks covered with fixed roofs.	N/A	N/A	N/A	N/A	N/A	Low
Sequential primary Digestion and Mixing Linked tasks specified	Digested sludge / M	Open aerated tanks with air mixing system.	N/A	N/A	N/A	N/A	N/A	Medium
		Routine checks are per sludge rounds in appendix 6	Site Tech 1s / Shift Operator	Visual Inspection	Daily	Sludge leak	Investigate as required	Medium

in Appendix 6 section 7								
Dewatering press buffer tank	Digested sludge / L	Covered. Checked as part of sludge rounds.	Shift Operator	Visual Inspection	Daily / Weekly	N/A	N/A	Low
Bucher Presses Linked tasks specified in Appendix 6 section 12	Digested sludge / L	Bucher Presses enclosed in a building with doors left shut. Abated by OCU.	THP Shift Operator N/A	Visual Inspection SCADA	Daily Continuous	OCU failure/ Doors left open	Repair as needed/ Close doors	Low
Cake barn (including cake imports) Linked tasks specified in Appendix 7 section16 and 17	Sludge cake / L	Dispersion and OCU system in place for Cake Barn, OCU 2. Fully enclosed providing wind barrier Cake in storage forms a crust after a day or two reducing risk of odour. No additional turning or handling during cake storage. Imports subject to pre-acceptance checks.	N/A	SCADA	Continuous	OCU failed, Cake barn doors left open	Repair / Close doors	Low
Vehicle Movements & Wash Down	Sludge cake / L	Wheel wash in place – automatic system	Driver	As described	As required	Wheel wash failed / Drivers passing through to quickly	Investigate further/ memo to drivers.	Low
Biogas Storage Linked tasks specified in Appendix 6 section 9	Biogas / L	Routine checks of Biogas Handling, Storage, & Utilisation as per sludge rounds in appendix 6.	Shift Operator	Visual Inspection	Daily / Weekly	N/A	N/A	Medium
		The gas system is protected with a comprehensive array of pressure and flow sensors and with isolation valves to minimise the potential for release if a leak is detected.	N/A	N/A	N/A	N/A	N/A	Medium
Boilers	Biogas / H	Slam shut valves.	Controller of Premises / Boas M	Visual Inspection	Daily	N/A	N/A	Low

OCUs 1 – 4 Linked tasks specified in Appendix 5 section 9	None / L	Monthly performance checks by specialist Framework agreed contractors.	Contractors	As described	Monthly	N/A	N/A	Medium
		Routine checks of OCUs as per site rounds in appendix 5	Site Tech 1s	Visual Inspection	Daily	OCU not working	Investigate/ raise	Medium

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

Process stage	Event	Status (Frequent, Rare, Planned)	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Incoming Sewers	Hot dry summer / severe drought	R	Call Waste Networks Team to implement chemical dosing. Contact customers, EHO, EA.		Medium
Incoming Sewers	Industrial / illegal discharge (chemical odour)	R	Call trade effluent Team to investigate issue		Low
Cess Reception, Discharge, Wash down & Drainage	Spillage	R	Hose down area as per spillage section 4.3.3.	Tech 1s to clean area	Low
Storm Tanks	Amajets failure	R	Investigate & repair.	Repair of Amerjet. Tech 1 to clean out tank, once returned	Low
	Amajets are not automatic, may lead to sludge residues left in tanks.	R	Manually flush clean tanks as soon as practicable and ensure amajet availability when draining	Tech 1 to clean out tank, once returned	Low

	Power cut or mechanical failure of storm pumps	R	Stand by power generator available on site	Operate the standby generator. Engineers to investigate and repair storm pumps.	Low
Storm Screens	Compactor blockages	R	Clear blockage and dispose, out of hours resource made available		Low
Open Skips	Spillages due to overfilling	R	Clear up as per spillage section 4.3.3 and dispose	Contact Scyvia to clear out screenings	Low
Screens and Screenings handling	Mechanical failure / Blockage of screenings handling plant leading to spillage	R	Repair fault and clear spillage	Contact Syvia	Low
Screenings Skips	Spillage due to overfilling	R	Clean up as per spillage section 4.3.3 and dispose	Contact Scyvia	Low
	Not collected by contractor	R	Cover skips and Chase contractor	Contact Scyvia	Low
Grit Removal Equipment and grit handling	Drained down following mechanical failure	R	Arrange tanker to clean grit channel	Repair pump	Medium
	Grit not collected by contractor	R	Chase contractor to collect grit	Arrange collection by scyvia	Medium
Primary Settlement	Scraper / Bridge failure	R	Drain down and clean tank.	Arrange scraper repair	Medium
Fats, Oil & Grease Scum Removal System	Mechanical failure of scum removal system	R	Arrange repair and manual de-scumming	N/A	Low
Primary Raw Desludge Pumping	Failure of both raw sludge pumps	R	Critical spares of raw sludge pumps and out of hours resource available	Explore additional options	Medium

	Blockage / Failure of hoppers or valves	R	Drain down and clean tank	Order new valves	Medium
Flow & Distribution to Secondary Treatment	Pump failure	R	Hire pumps	N/A-Gravity fed	Low
Activated Sludge Plant Lanes & Zones	Scum build up in anoxic zone	R	Remove scum with tanker		Low
	Diffused air system failure	R	Drain down and clean tank		Low
	Power failure	R	Stand by power generator available on site		Low
	Excessive build-up of foam on surface	R	Chemical dosing / Manually remove scum		Low
Final Settlement	Scraper / Bridge failure of FSTs	R	Drain down and clean tank		Low
Scum Removal System	Scum build up on the surface due to failure of scum removal system	R	Pump replacement. Biological dosing		Low
RAS Chambers & Pumping	RAS pump failure	R	Hire temporary pumps, replacement spares.		Low
SAS Buffer Tank	Tank structure failure	R	Tanker SAS off-site		Low

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

Process stage	**Event**	**Status (Frequent, Rare, Planned)**	**Ops mitigation**	**Expansion of TWUL operational response to odour under Int/Ab//E events**	**Odour risk after mitigation**
Cess Reception, Discharge, Wash down & Drainage	Spillage	R	Hose down area as per spillage section 4.3.3.		Low
	Fan failure on OCU system	R	Pump down tank and cease import		Medium

Sludge Reception, Screening, Wash down & Drainage	Spillages due to filling / overfilling	R	Clean up area as per spillage section 4.3.3		Medium
Skip – Sludge Imports	Screenings skip not collected by contractor	R	Cover skips / Chase contractor		Medium
Picket Fence Thickeners	Mechanical failure	R	Take tank out of service and use others - 3 of the 4 tanks normally used, so spare in case of failure. When draining tank down hose tank down to ensure all sludge deposits removed.	Investigate failure and order parts	Medium
SAS Thickening & Pumping	Spillages	R	Clean up as per spillage section 4.3.3 and hose down to site drainage		Low
High Energy Blending tank	Spillages	R	Clean up as per spillage section 4.3.3 and hose down to site drainage		Low
THP Centrifuges	Spillages	R	Clean up as per spillage section 4.3.3 and hose down to site drainage		Low
THP Area	Leak from blowback lines and gas skid	R	THP turned off, all vessels isolated.		Medium
Primary Digestion	Spillages from limpet chambers	F	Clean up spillage as per spillage section 4.3.3	Arrange speedy repair	Low
Sequential primary Digestion and Mixing	Partially digested sludge due to failure of primary digesters	R	Reduce digester feeding		Medium
Bucher Presses	Spillages	R	Hose down and clean up area as per spillage section 4.3.3		Low
Dewatering press buffer tank	Spillage due to overfilling	R	Clean up area asap		Low
Cake Barn	Out of compliance cake	R	Should any odorous sludge cake be produced, this will be subject to process checks undertaken to identify root cause of production and removed from site expediently.	Non-compliant cake to be stored in separate bay and sampled until compliant	Low

Cake barn (including cake imports)	Cake not collected by contractor	R	Arrange removal or cover up.		Low
Biogas Systems	Over pressurisation of biogas bags	R	Flare off excess gas		Medium
	Failure of CHP engines	R	Flare off excess gas	Contact Finnings	Medium
	Biogas release through PRVs				
OCUs 1 – 4	Media failure of carbon filters or biofilter	R	Call specialist contractor to replace media and contact customers, EHO, EA.	Consider temporary odour suppressant sprays if OCU can not be restarted	Medium

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
Incidents and emergencies				For all entries TWUL's incident management response process would	

				be followed including use of Site Incident Cards (SICs)	
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	Stop sludge imports, stop cess imports and look to export sludge off site. Possibility to hold sludge back in the PST's for a short time.		Medium
Flooding	Flooding causing process or equipment problems	E	There is a flood plan in place as part of the emergency response plan, which can be found on SharePoint	Tankering/pumps 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.		Low
Power cuts	Loss of power to fan leading to loss of odour control	E	Within Thames Water's incident response planning, arrangements are already in place with a supplier for temporary generators. This agreement has a Service Level Agreement for provision within 24 hours.	Greatest risk in persistent inclement weather where temporary external power outages might constitute the most likely externally generated risk. Recourse to temporary generators.	Low
Fire	Failure of fans or sludge building	E	Fire alarm, call emergency services. Reduce throughputs and stop imports.		Low/Medium

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.

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.

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.

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).

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 Long Reach the processes is 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 below - this is dependent on the primary/SAS ratio. Long Reach fits into the fourth row of the table.
- Dry solids feed: see table below, Long Reach has a target of 10%DS, but this can vary between 8-14%DS and impacts the HRT.

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	2.5	2	1.75	n/a	6
MAD after Pre-pasteurisation	4.5	4	3.5	3	n/a	7
MAD after Acid Hydrolysis	4.5	4	3.5	3	n/a	7
MAD after Thermal Hydrolysis	7	6.5	6	5.5	5.5	14

* mesophilic anaerobic digestion
[x] surplus activated sludge, arising from the UWWTD treatment 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 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.

Sniff Testing
Sniff testing has been incorporated into our Odour Improvement Plan (Appendix 2). This is to allow time to ensure that the most effective sniff testing can be carried out using personnel not sensitised to smells on site.

The procedure will be undertaken in response to complaints or if a risk of odour nuisance at sensitive receptors is expected and/or has been substantiated.

• Sniff testing will be carried out at by someone not routinely based at site, who are less sensitised to odour produced on site.
• Assessing potential odour sources within the Urban Waste Water Treatment (UWWT) and Sludge Treatment Centre (STC) processes and attempt to trace the odour to its source.
• The procedure and recording form which will be used can be found in appendix 7 of the OMP.

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 on SAP. Records of skip management, which collect wastes generated from UWWTD activities, and any spillages and remedial actions are held in the Logbook. Sludge blanket levels are recorded on run charts and electronically via the Cockpit.

There is a SCADA system on this site.

A monthly condition report on the OCUs is sent to the team manager by the contractor and stored on SharePoint.

- General housekeeping is recorded in Tough Book Work Schedule
- The cess imports are recorded electronically via the cess logger at the inlet works.
- Primary Sedimentation Tanks sludge blankets and scum removal performance recorded in Tough Book Work Schedule.
- The sludge blanket levels in the Final Settlement Tanks and Consolidation Tanks are recorded in the Performance Data folder in Documentum.
- The imported sludge are recorded in the Waste Transfer Notes.
- The exported sludge cake movements and volumes are recorded in the Waste Transfer Notes.
- The screenings and grit movements and volumes are recorded in the Waste Transfer Notes.

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: 'Security and Emergency Risk Management Process' and 'Event Management Procedure'. These are company confidential documents and therefore, are 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 should not affect the running of Long Reach 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) Temperature assessment in sequential primary digestion tanks on the basis that increased temperatures give greater potential for volatilisation of odours
(g) For PSTs, asset condition (wear/damage) would consider odour risks where assets are taken offline
(h) 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(A13)

Serves the sludge import tank, picket fence thickeners and primary sludge distribution chamber. Circa. 2012

Parameter	Value	Units
Total air extraction	1656	M3/hr
Design temperature	20	C
design average biofilter inlet H2S concentration	0-33.3	ppm
design maximum biofilter inlet H2S concentration	33.3	ppm
design average biofilter outlet H2S concentration	0-1.67	Ppm
design maximum biofilter outlet H2S concentration	1.67	ppm
design average carbon filter outlet H2S concentration	0-1.67	Ppm
design maximum carbon filter outlet H2S concentration	1.67	ppm
Design average biofilter inlet odour concentration	666,00	ouE/m3
Design average biofilter outlet odour concentration	3330	ouE/m3
Design maximum biofilter inlet odour concentration	539822	ouE/m3
Design maximum biofilter outlet odour concentration	8062	ouE/m3
Design average carbon filter outlet odour concentration	3330	ouE/m3
Design maximum carbon filter outlet odour concentration	8062	ouE/m3

Design back pressure across Biofilter	1	kPa
Design bi-trickling filter system max H2S removal efficiency	95	%
Design carbon filter max H2S removal efficiency	99	%

For continuous operational monitoring, the system incorporates:

- Continuous inlet and outlet H2S monitoring with alarms.
- Low flow alarm
- Visibility of air flow and fans on SCADA

For periodic operational 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.

OCU2 (A14)

Odour Control Unit 2 draws odorous air from the Local press buffer tank and local press filtrate tank. Circa 2000

First stage Bioscrubber

Original manufacturer	Hibernia
Height x Width x Length	Ø1,500 mm x 3,500 mmH
Construction type	Cylindrical
Media type	Pumice (Lava Rock)
Design Air Flow Rate	636 m3/hr
Design removal efficiency	98%
Design Temperature	20°C
Design H2S inlet load	0.1 ppm (max and average)

Design parameters back calculated by ERG

Second stage carbon filter

Height x Width x Length	Ø700 mm x 1,450 mmH
Construction type	Cylindrical
Media type	Carbon
Design Air Flow Rate	636 m3/hr
Design removal efficiency	99%
Design Temperature	20°C
Design H2S inlet load	0.05 ppm (max and average)

Design parameters back calculated by ERG

For continuous operational monitoring, the system incorporates:

- Continuous local H2S monitoring

For periodic operational 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 (A15)

Serves THP and associated storage tanks, and High energy blending tank. Commissioned in 2015.

Parameter	Value	Units	ACH
Design air flow rate – High energy blending tank	61	Am^3/hr	1
Design air flow rate – Pre-THP sludge storage tank No.1	70		1
Design air flow rate – Pre-THP sludge storage tank No.2	70		1
Design air flow rate – Screened sludge storage tank No.1	70		1
Design air flow rate – Screened sludge storage tank No.2	70		1
Design air flow rate – Dewatering centrifuges x3	1050		12
Design air flow rate – Centrate buffer tank	63		2
Design air flow rate – THP plant feed silo	80		1
Design air flow rate – Digester feed tank No.1	278		1
Design air flow rate – Digester feed tank No.2	278		1
Design air flow rate – Local dewatering press buffer feed tank	64		1
Design air flow rate – Local dewatering filtrate buffer tank	77		1
Total design gas flowrate	2,231		-
Design temperature	0 to 20	°C	-
Design inlet H_2S concentration (to bio-trickling filter)(max)	34.5	ppm	-
Design inlet Mercaptans conc (to bio-trickling filter)(max)	6.9	ppm	-
Design inlet DMS concentration (to bio-trickling filter)(max)	6.9	ppm	-
Design inlet humidity	70	%RH	-
Design inlet odour (to bio-trickling filter)(max)	556,348	ou_E/m^3	-
Design system H_2S removal efficiency	95	%	-
Required outlet odour	<1000	ou_E/m^3	-
Area classification inside duct	Zone 1		
Area classification outside duct (local to Fan)	Zone 2		

Mercaptans & DMS design values, not guarantee. Maximum odour is not based on max Mercaptans & DMS.

For continuous operational monitoring, the system incorporates:

- Continuous inlet H2S monitoring with alarms
- Extract fan differential pressure alarm,
- Washwater low flow alarm
- Visual and control on both fans.

For periodic operational 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 (A16)

Serves the cake barn and SAS thickening buildings, commissioned in 2015.

Parameter	Day time value	Units	Night time value	Units
Design air flow rate – SCS building	132,000	Am^3/hr	44,000	Am^3/hr
Design air flow rate – SAS building	10,183		3,394	
Total design gas flowrate	142,183		47,394	
Design temperature	0 – 20	ºC	0 – 20	ºC
Design inlet H2S concentration (max)	0.86	Ppm	0.86	Ppm
Design inlet humidity	70	%RH	70	%RH
Design system H2S removal efficiency	99	%	99	%

For continuous operational monitoring, the system incorporates:

- Continuous inlet H2S monitoring with alarms
- Building odour fan differential pressure alarms
- Visibility of fans and actuated valves on SCADA

For periodic operational 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 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 Long Reach.

Table 5.1 Maintenance and Monitoring of Odour Control Units

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

*monitoring only required on OCUs covered by STC permit

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

All four OCUs at Long Reach are covered by a service and maintenance contract. They are inspected on a monthly basis and reports are sent to the team manager. 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 (m3/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.

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

>50ppb hydrogen sulphide will be used as a threshold value for media change out.

H_2S SCADA Set Points:

SCADA Set Point	**Description**	**Alarm Setting**
OCU 1	Inlet H2S monitor Outlet H2S monitor	30 high 35 high high 0.05 high 0.1 high high
OCU 3	Inlet H2S monitor	35 high 35 high high
OCU 4	Inlet H2S monitor	1 high 1.5 high high

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 biofilters, irrespective of media type, *will stipulate a minimum of 30 seconds* ***retention time***, for a biofilter and carbon filter to achieve a minimum of 95% removal efficiency.

H2S readings are reported in the monthly service reports which inform odour equivalents (OEs). The accepted OEs for H2S at 0.5 part per million is equivalent to 1,000 odour units. A “red action” would be raised for any value 3 parts per million on the discharge from a biofilter (before the carbon filter) and 0.5 parts per million off the subsequent carbon filter. Where there is a biofilter or carbon filter alone a ‘red action’ would be 0.5ppm regardless of removal efficiency. There is a relationship between increases in discharge efficiency from the biofilter since if this rises it will start to exhaust the carbon filter defining the red action. Contextual knowledge must inform any triggers for action; rather than focusing on a single value.

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/Carbon filters - 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 OCU – 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 Figure 5.1 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 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/carbon filter,* 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).

Figure 5.1 – 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.	

5.1.4 Records

Maintenance history records are kept electronically on SAP or the company's SharePoint system.

5.2 Fault Reporting

Faults identified during routine inspections are reported to the Team Manager or Process Controller 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 Process Controller, Team Manager or Duty Manager, 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 Long Reach 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 Long Reach 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 'Long Reach Sewage Treatment Works'

3. Telephone - Customer Services 0800 316 9800

If the customer / resident would prefer to contact either Dartford Borough Council or the Environment Agency instead, their contact details are as follows:

Dartford Borough Council - Environmental Services
Telephone: 01322 343434

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

Customer contacts regarding Long Reach 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 by the Customer Services 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 Long Reach 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.

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 Customer & Stakeholder Manager will ensure the customer who made the complaint is contacted and obtain further details. These details include their proximity 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 such 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. Emails and phone calls are used to inform external stakeholders of activities with potential to release odour. Letter drops may also be used.

The Environmental Health Officer of Dartford Borough Council will be contacted directly if there are risks of odour generation related to the UWWTD activities. NOTE: This will only take place on known sensitive sites where Local Authorities and the EHO are already involved.

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

AM-OMP%20Long%20Reach%20STW-RA.xl

Appendix 2. Odour Improvement Plan

Odour Improvement Plan Longreach STW

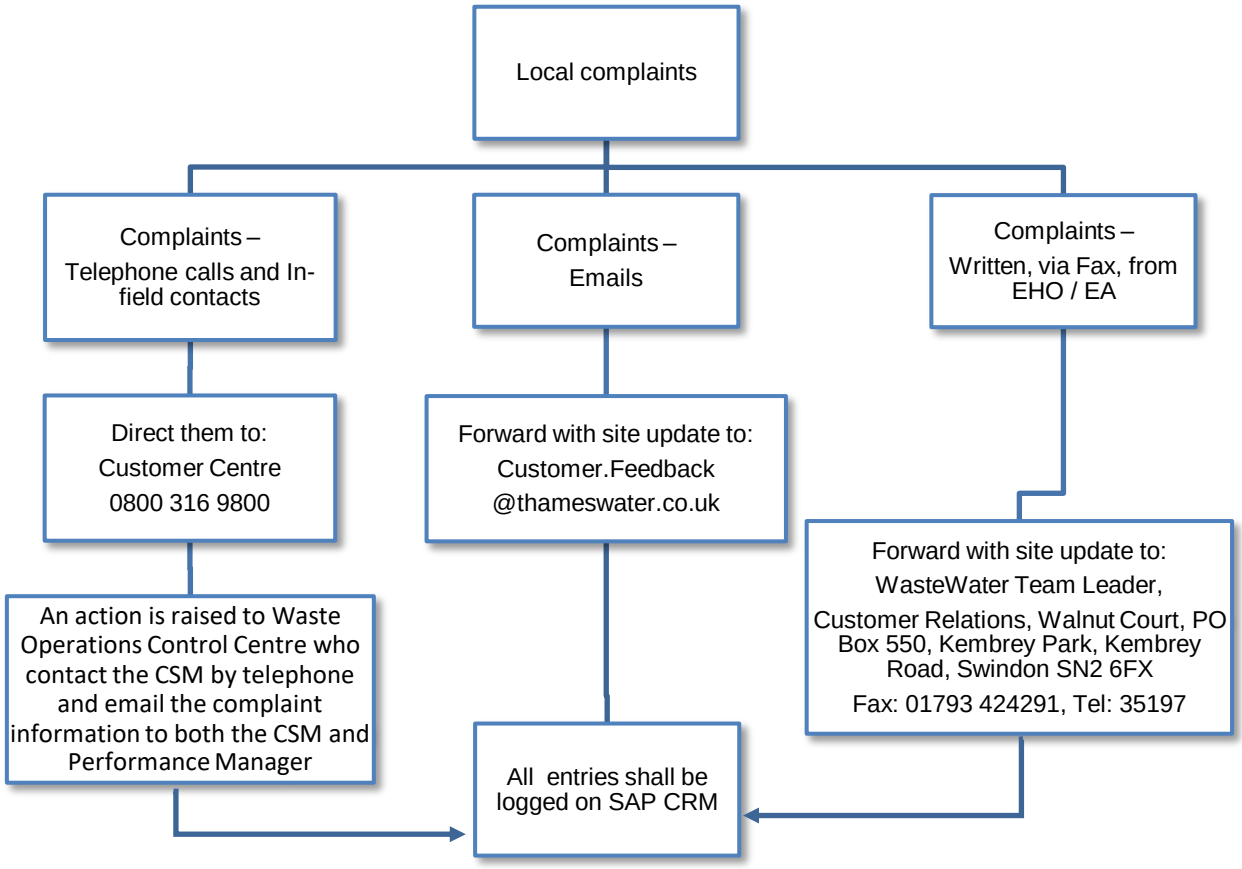
Review Date: Aug-23

Process Stage	Owner	Plan	Action	Expected difficulties	Measures to mitigate	Timeframe
THP	David Bourne	Measure pre & post filter for media effectiveness	Cake building OCU media condition assessment has been carried out. Awaiting quotes for required work on media and other works.	achieve funding	None required currently	Jan-24
THP	David Bourne	Replacement	one fan (number 3) internals worn - risk in place to replace	achieve funding	run duty assist 2 so mitigations required	Jan-24
OCUs general	David Bourne	Action recommendations in monthly OCU health checks	Action recommendations in monthly OCU health checks	achieve funding	N/A	ongoing
Sniff Testing	Odour Specialist	implement sniff testing	Procedure written for sniff testing,in order to achieve effective sniff testing personnel needs to be identified to carry out the procedure who are not acclimatised to smells on site.	resource	N/A	6 months from permit issue

Appendix 3. Customer Communications Plan

Complaints Process

All locally received complaints are re-directed to the Customer Centre. Please see 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:	[redacted]
Telephone:	

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 council(s) 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
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 council(s) 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)*	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 customers (reactive only).	Duty Manager
Other areas/stakeholders outside Long Reach STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses	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)*	Immediately then monthly	Telephone / email / meeting	Report emergency event with action plan and update with progress	Performance Manager and Customer & 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	Duty Manager

			deal with queries from customers (reactive only)	
Other areas/stakeholders outside Long Reach STW potentially impacted				
Stakeholder	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local businesses	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 Including Receptors from Table 2.1

Long Reach STW

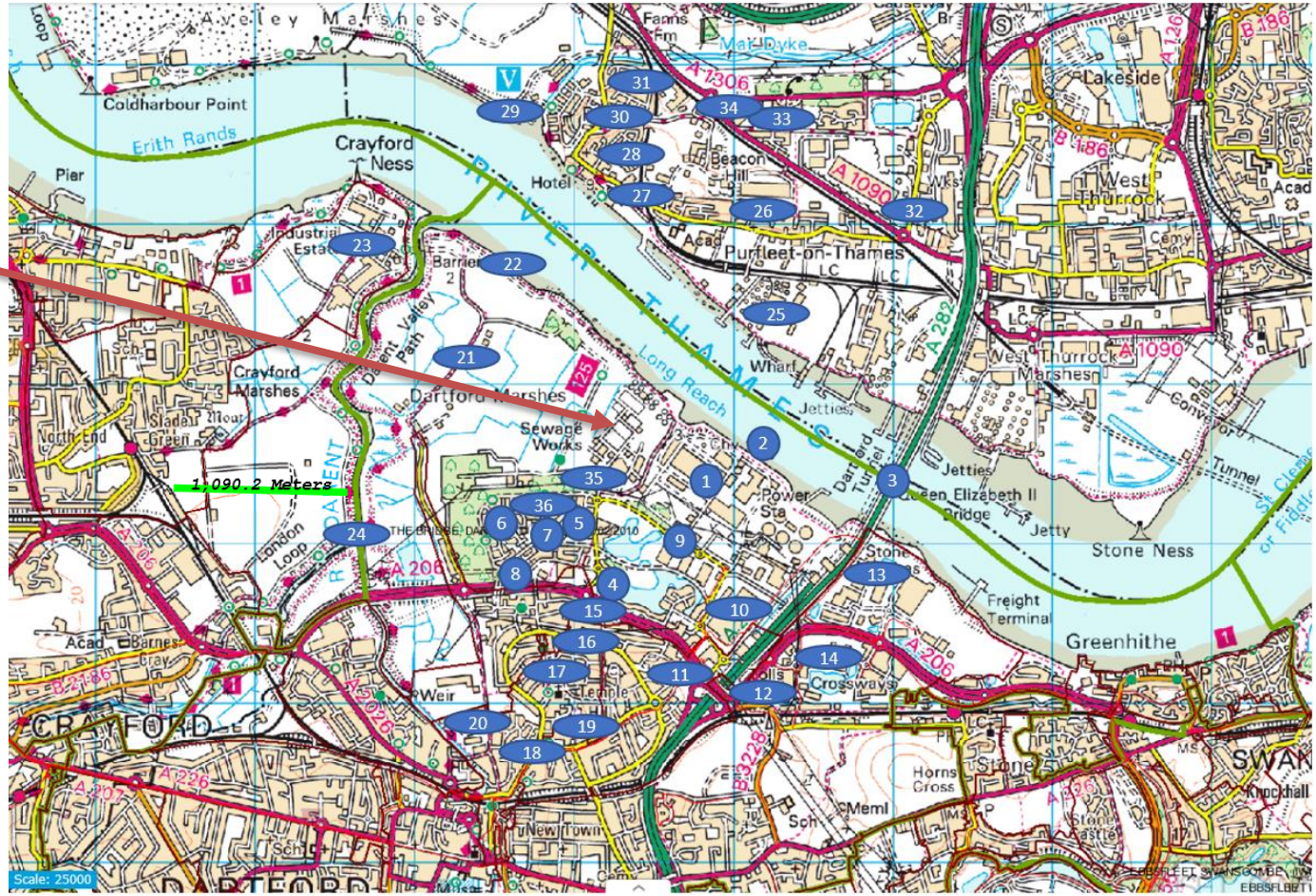


Figure B - Site Plan of Long Reach STW

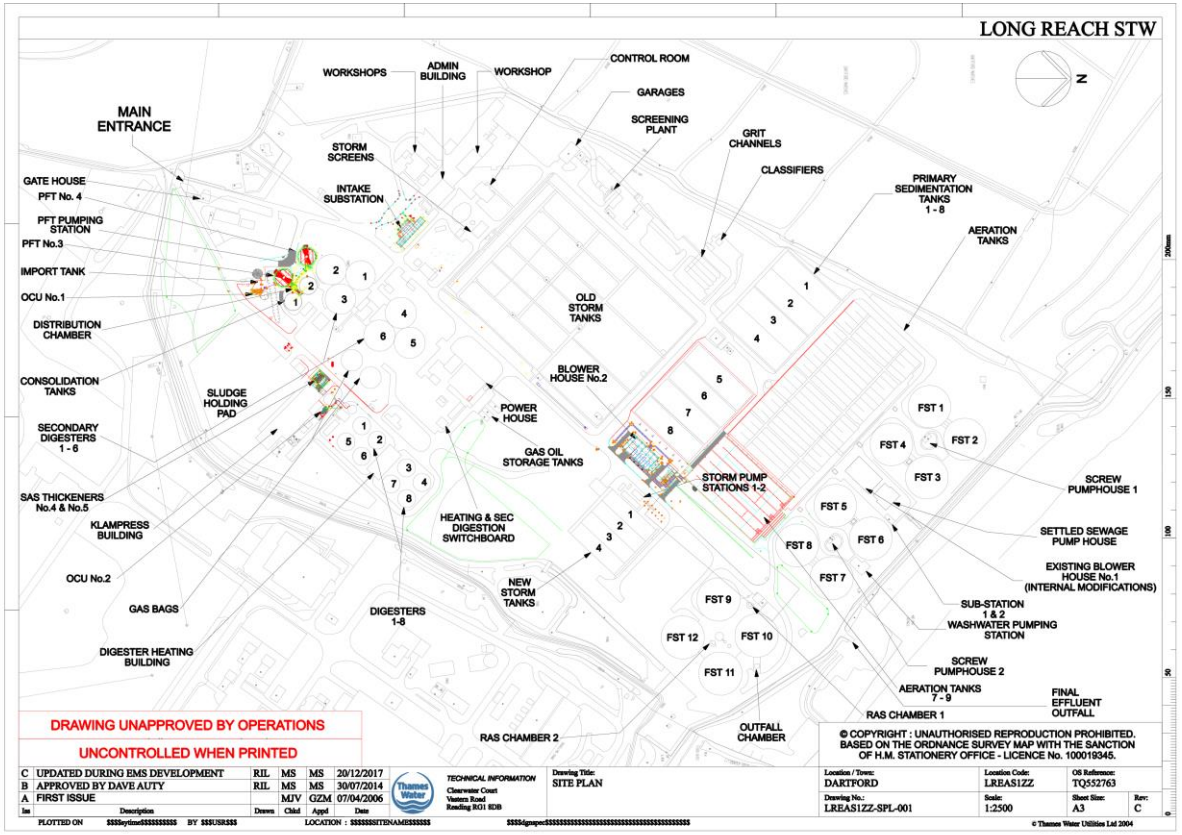


Figure C - Area Permitted under Sludge Treatment Centre Permit

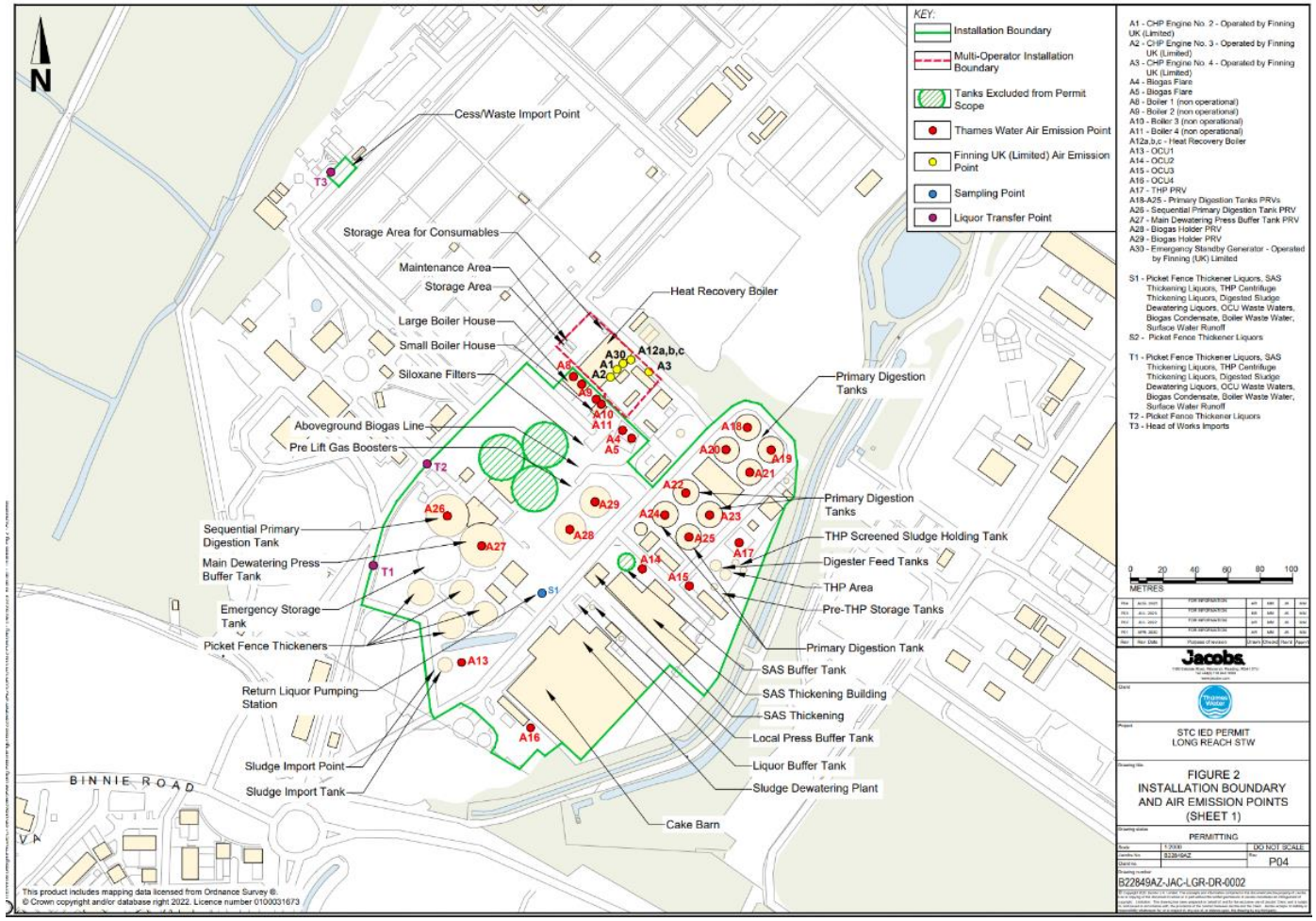


Figure D1 - Process Block Diagram for whole site

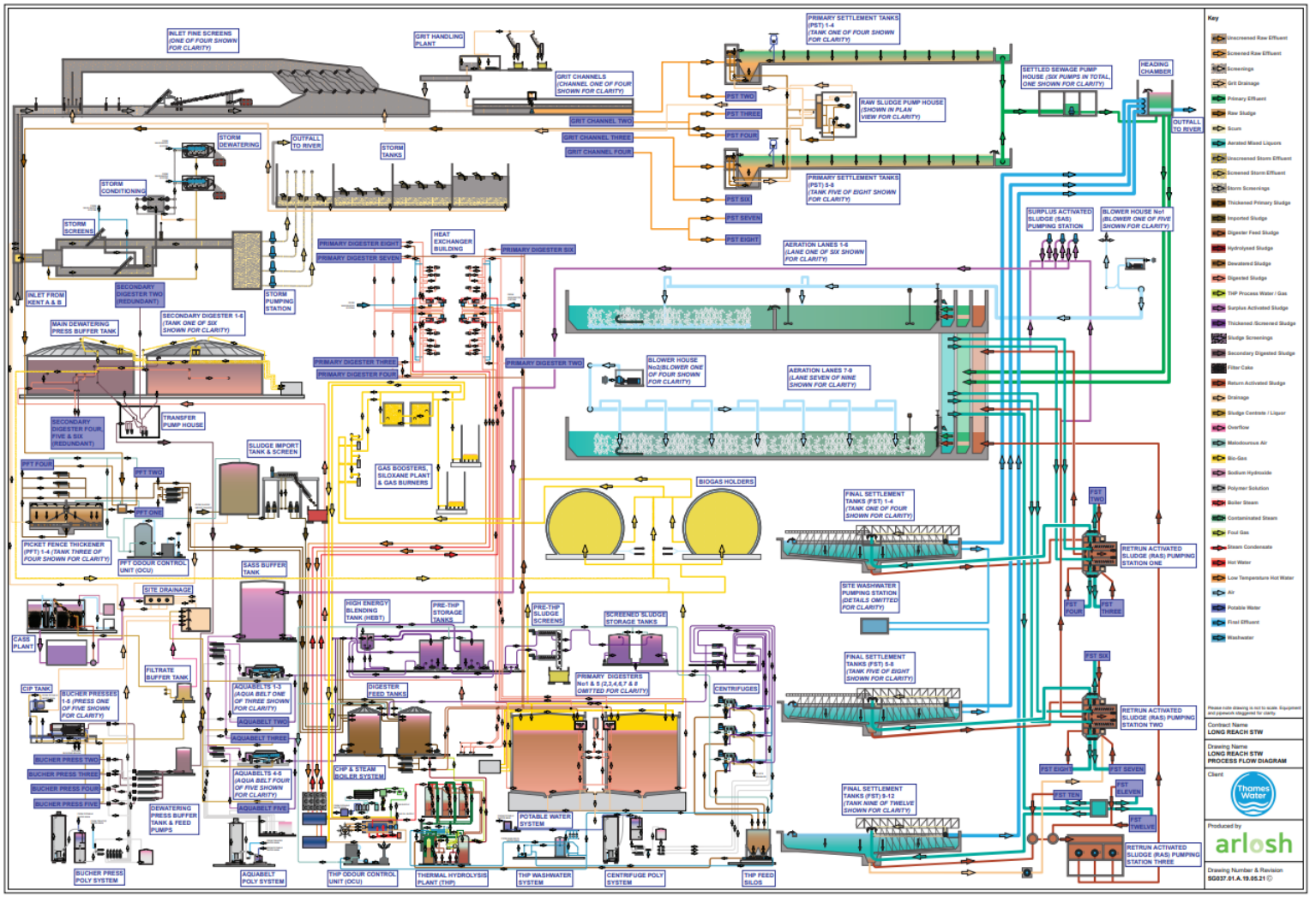
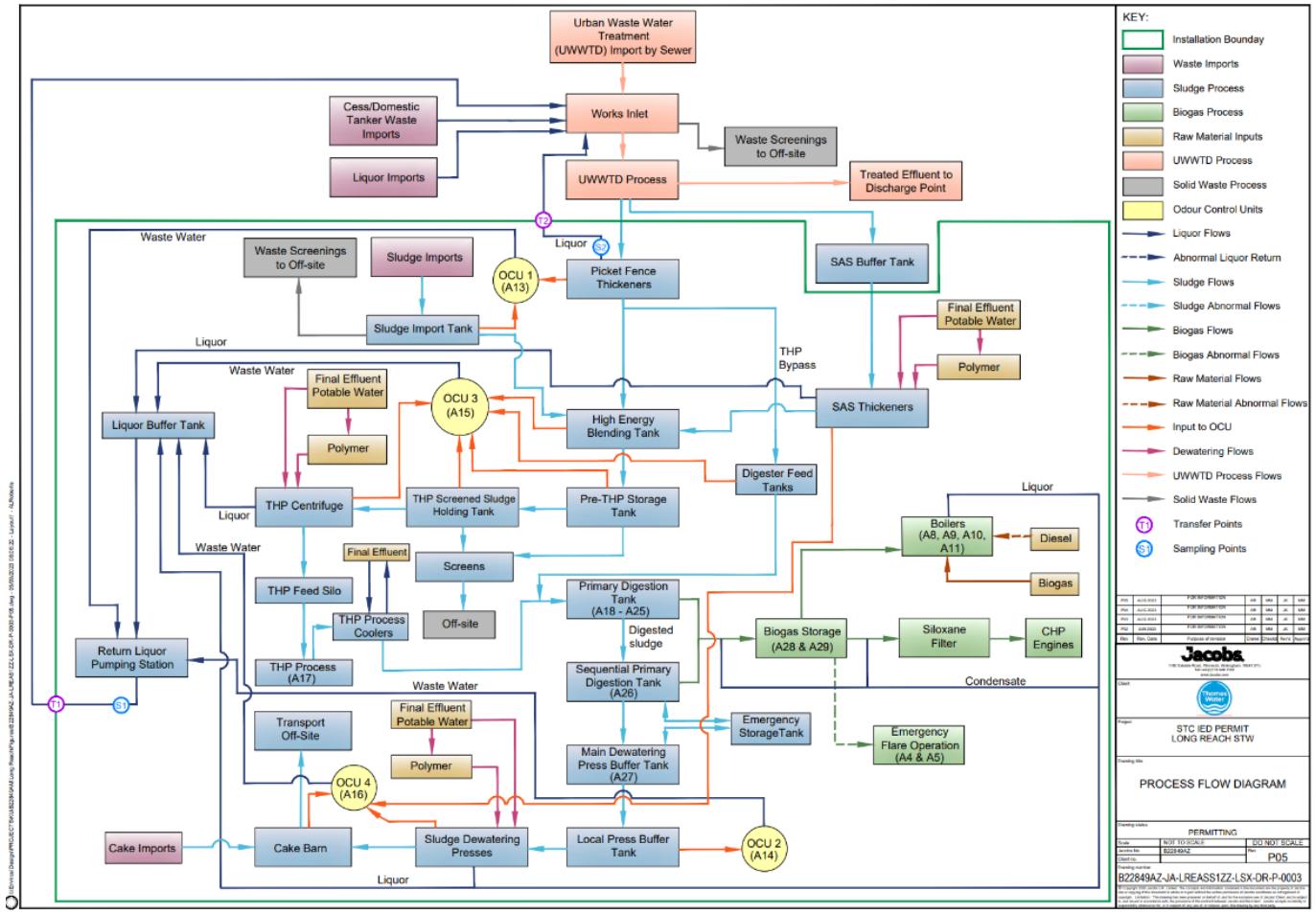


Figure D2 - Process Block Diagram for permitted activities



Appendix 5. Generic Site Round Checks

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

ID	Instruction	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. 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	**X**	
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**	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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**	
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**

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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	
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	

ID	Instruction	Daily	Weekly
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	
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	

ID	Instruction	Daily	Weekly
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**	
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

ID	Instruction	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
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**	

ID	Instruction	Daily	Weekly
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	
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	

ID	Instruction	Daily	Weekly
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	
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	

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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. Generic Sludge Round Checks

	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**

	Instruction	Daily	Weekly
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
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.	**X**	

	Instruction	Daily	Weekly
	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.		
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**	
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**	

	Instruction	Daily	Weekly
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**
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**	

	Instruction	Daily	Weekly
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**	
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

	Instruction	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**	
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**	

	Instruction	Daily	Weekly
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**	
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**	

	Instruction	Daily	Weekly
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**	
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**	

	Instruction	Daily	Weekly
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: Odour sniff testing protocol:

Purpose

Sniff testing is conducted to assist in managing odours to prevent or minimise the risk of adverse odour impact offsite.

Frequency

The procedure is to be undertaken in response to complaints or if a risk of odour nuisance at sensitive receptors is expected and/or has been substantiated.

Pre-requisites for the assessor

The assessment is undertaken by a member of staff trained in the procedure. The assessment in response to complaints will be carried out by someone not based on site. The member of staff will normally be office based rather than operations based. This means that their senses are less likely to become affected by any site odours.

Assessors must comply with the following:

- They should not consume strongly flavoured food or drink (this includes coffee) at least half an hour before conducting the assessment.
- They should not smoke at least half an hour before conducting the assessment.
- They should not consume confectionary or soft drinks must be avoided for the duration of the assessment.
- Scented toiletries including perfume, deodorant or aftershave should not be applied less than an hour before conducting the assessment.
- If the assessment requires travelling between locations in a vehicle, this vehicle must not contain deodorises / air fresheners.
- If the assessor has a cold, sore throat, or sinus trouble they should not conduct the assessment.

Prior to the commencement of the inspection, the operator shall check the weather data including the wind direction, wind speed, temperature and rainfall.

Odour complaint investigation

Where possible, odour complaints will be actively investigated by an assessor. Timely receipt of a complaint is essential if such investigations are to have any value.

At each location the following procedure is undertaken:

a. The assessor will stand facing the wind and breathe deeply, for a period of 3-5 minutes.

b. The following information is recorded using the odour monitoring form.

    i. Time, wind speed and direction, temperature, precipitation.

    ii. The type of any odour(s) detected.

    iii. The intensity of any odours detected on a scale of 0 to 6.

    iv. The persistence of the any odours detected i.e. constant or intermittent.

    v. The likely source of any odours detected (e.g. a specified onsite IED source, a specified non IED sources, offsite odour source, etc).

    vi. Any abnormal conditions on site that may account for the odour e.g. broken duct, open door, unusual operation, spillage etc.

The pre-requisites for assessors and monitoring approach are as defined in the sniff testing procedure with the following exceptions:

- The first assessment should be conducted at the complainant's location.
- If site odours are detected, the assessor shall move back towards the site, assessing potential odour sources within the Urban Waste Water Treatment (UWWT) and Sludge Treatment Centre (STC) processes and attempt to trace the odour to its source.
- On site operations shall also be reviewed to identify any abnormal site operations or activities that could be responsible for elevated odour levels.
- The sensitivity of the offsite location to odours should be recorded as a comment.

The findings of the investigation should be reported back to the Thames Customer Services Centre so that feed-back can be provided to the complainant.

Odour monitoring form

Date: _____ Assessor name: _____

Time	Location	Receptor sensitivity (off site locations only)	Wind speed & direction	Temperature (degrees)	Rainfall (y/n)	Odours detected (description)	Intensity (0 – 6)	Persistence (intermittent / constant)	Perceived source	Other comments

Intensity			**Receptor Sensitivity**
1 Very faint odour	3 Distinct odour	5 Very strong odour	Low (e.g. footpath, road)
2 Faint odour	4 Strong odour	6 Extremely strong odour	Medium (e.g. industrial or commercial workplace)
			High (e.g. housing, pub/hotel etc.)

---- End of OMP ----