Asset Management
Asset Standard
Odour Management Plan

Wargrave STW

WARGS1ZZ

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0 Document Control & Procedures

0.1 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
1	Creation of OMP in new standard format	[redacted]		August 2014
2	Update of odour risk assessment/ critical odour issues and mitigation/ organisational and design change/ update on major works on sites	[redacted]	[redacted]	October 2016
3	Refurbishment and replacement of Odour control units	[redacted]	[redacted]	June 2018

4	New Sludge Treatment Centre Permit Application	[redacted]	[redacted]	September 2022
4.1	Sludge Treatment Centre Permit Resubmission	[redacted]	[redacted]	November 2023
4.2	Updated site plan	[redacted]		November 2024

0.4 Sign Off

Area Operations Manager	[redacted]	Date: November 2024
Performance Manager	[redacted]	Date: November 2024

0.5 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
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 the Wargrave Sewage Treatment Works (STW) Best Operating Practice and is a constituent part of the Environmental Management System (EMS). A key related document is the Site Operating Manual (SOM) – this document can be found as a hard copy in the Wargrave 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 Wargrave STW are identified, and how, as far as is reasonably practicable, they are controlled and recorded. It is primarily a management guide; detailed operational procedures are contained within the SOM referred to above.

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

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

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

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).

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

The following guidance has been used to inform the contents of the OMP where it relates to activities regulated under 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)
- .

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

Copies of the Odour Risk Assessment, Odour Improvement Plan, Customer Communications Plan, Site Drawings, and generic site and sludge rounds are included in Appendices 1-6.

2 Site Information

2.1 Location and Receptors

Site Address:

Wargrave STW
Wargrave Road
Wargrave
Reading
Berkshire
RG10 8DJ
What 3 words ref: ///caked.shameless.deflated
EPR Permit number to be included when issued

Wargrave STW lies to the southwest of Wargrave village. The works is located off the A321 from Twyford towards Henley.

The site is located in a mainly semi-rural location within the administrative area of Wokingham. The site is surrounded by fields, woodland and the River Loddon to the west and the fruit wholesaler operations of Sheeplands Farm / Hall Hunter Partnership to the immediate north, east and south of the site. Beyond this the edges of the settlements of Twyford and Wargrave are located approximately 490 m and 960 m to the South-East and North-East of the site respectively. The nearest sensitive receptors are commercial premises located approximately 25m to the South and include a furniture installation company and a sketch studio. The nearest residential dwellings are static homes at Sheeplands Farm located approximately 195m to the North-East of the site.

Wargrave STW serves a population equivalent of approximately 120,000, covering the village of Wargrave, the eastern part of Reading and surrounding areas.

Receptors

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

Table 2.1 – Location of potentially sensitive odour receptors.

	Receptor Address	Receptor type	Approximate distance to the nearest site boundary (m)	Direction from the site.
1	The Piggott C of E School	School	350m	To the east
2	Polehampton C of E Junior School	School	1200m	To the southeast
3	Polehampton Infant School	School	1400m	To the southeast

	Receptor Address	Receptor type	Approximate distance to the nearest site boundary (m)	Direction from the site.
4	The Charvil Piggott Primary school	School	1770m	To the south
5	Shiplake College	School	1350m	To the northwest
6	Robert Piggott C of E Junior School	School	1300m	To the northeast
7	Wargrave Chalk Pit	Nature Reserve	1200m	To the NE
8	Mumbery Hill Nature Reserve	Nature Reserve	1400m	To the NE
9	Loddon Reserve	Nature Reserve	1300m	To the S
10	Charvil Meadows	Nature Reserve	900m	To the south
11	Lower Shiplake	Town	1650m	To the north
12	Shiplake	Town	1200m	To the northeast
13	Wargrave	Town	1000m	To the north
14	Twyford	Town	410m	To the southeast
15	Charvil	Town	800m	To the south
16	Wargrave station	Railway	970m	To the north
17	Twyford Station	Railway	1760m	To the southeast
18	Farm field	Farm field	50m	All Direction
19	Sheeplands Farm – Hall Hunter Partnership, static homes	Residential	150m	To the northeast
20	House, Loddon Drive, house	Residential	100m	To the west

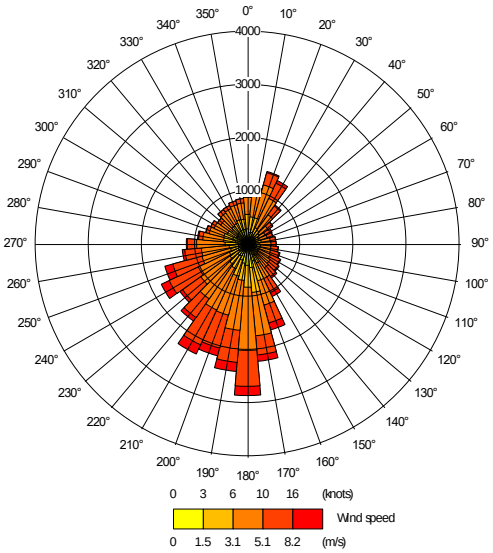
2.2 Off-site sources of odour

No potential off-site sources of odour have been identified.

2.3 Wind Rose and Weather Monitoring

RAF Benson meteorological station (approximate location NGR E 462586 N 191079) is located approximately 20.7 km 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 southerly, which means receptors north of the site would have the highest probability of experiencing potential increases in odour emissions.

Figure 2.31: Benson Wind Rose, 2016-2020



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

2.4 Site Layout and Treatment Processes

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

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

2.5 Process Description

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

2.5.1 UWWTD activities

Preliminary Treatment

- Flow enters the works via the Inlet Works.There are 2 x DWF pumps and 2 x Storm pumps in the inlet sewage pumping station
- Raw sewage is pumped to a high-level inlet, which is covered. This is vented to an odour control unit containing activated carbon filters.
- There are 3 x fine escalator type Screens; the number of screens that operate is dependent on the level in the inlet, or high differential generated between inlet and outlet chambers.
- Manually raked screens are available for emergency use in the event of failure of the above.
- The removed screenings drop from the discharge points into a hopper which in turn feeds the Launder, from there it goes to the grit removal plant where the grit is removed and feed into a skip, the flow continues along the launder to the two combi-wash units where the remaining rags etc. are washed, compacted and fed into the skip.
- After the screens a detritor removes grit, which is collected in a separate skip prior to off-site disposal.
- There is a wash water filter installed to provide a constant flow of water to the screens, grit removal plant and the combi-wash units.

Storm Water

- There are 4x circular storm water tanks. These are old PSTs, therefore they have half-bridge scrapers that are in poor condition and inoperable.
- Flow is directed to the storm tanks via the overflow weir and will fill storm tank No’s 1 & 2 together, then No 3, then No 4.
- While the storm tanks are empty or filling, the emptying valves on the respective storm tanks will remain closed. There is currently no auto return.
- A Magflow measures flow to the storm tanks.

- Excess flow will weir over and gravitate to the River Loddon from all four storm tanks. When the flow level drops, the storm tanks drain to the works drainage pumping station.
- Storm tank emptying is managed manually, starting with storm Tank No 4, No's 3, 2 and lastly No 1. The valve is shut as soon as the respective storm Tank is empty. This will not occur if the flow levels remain high.
- While the scrapers are inoperable, the storm tanks can only be cleaned manually by use of a tanker and hoses.

Primary Treatment

- Flow from the inlet works is fed to the 5 x PSTs via the feed chamber where the flow is split between PST No 5 and PST No's 1-4.
- The half-bridge scrapers are normally running at all times and are started individually at their respective local panels.
- The sludge from the desludging of the PSTs goes to the ageing tank (only 1 of the 3 is currently being used).
- Settled sewage weirs over and then the flow is split (50/50) into 2 x biological treatment streams.
- There are 5x desludge pumps, each pump is dedicated to 1 x PST.

Secondary Treatment

- Settled Sewage and Volatile Fatty Acid (VFA) feed are discharged into the main part of the Activated Sludge Plant (ASP) distribution chamber and split hydraulically 50/50 between the Oxidation Ditches and the Simplex surface aeration plant.

- ***Oxidation Ditches***
    - The RAS from the oxidation ditch FSTs is pumped to the ASP distribution chamber, where it splits 50/50 between the feeds to the anoxic zones associated with oxidation ditch stream No's 1 & 2.
    - Settled sewage flow rate is determined by the incoming crude sewage flow rate and the VFA feed, introduced at a constant flow rate from the VFA buffer tank.
    - The RAS and about 40% of the settled sewage and VFA enters the anoxic zone of each stream before flowing into the associated anaerobic zone where it mixes with the remaining 60% of settled sewage and VFA from the ASP distribution chamber.
    - Flow first enters the anoxic zones within each oxidation ditch. Baffles subdivide each anoxic zone into 4 x separately mixed areas where there are 4 x fixed speed submersible mixers that continuously mix the flow.
    - The flow then passes from the anoxic zone into the main ditch and is circulated and aerated by 3 x horizontal brush aerators.
    - Dissolved oxygen is continuously monitored and used to control the switching on or off dilute 'one' of the fixed speed aerators.
    - After treatment the flow from the ditch and travels by gravity to the 4 x FSTs (No's 5-8). The RAS flows by gravity to the oxidation ditch RAS & SAS pump well. The RAS is pumped to the ASP distribution chamber.
    - SAS is pumped from the oxidation ditch RAS and SAS pump well to the SAS buffer tanks.
    - There are 3 x RAS pumps operating duty/duty/assist
-
- ***Simplex Aeration***
    - The other 50% of the settled sewage flows through a Simples surface aeration ASP
- The Final Effluent from both plant overflows to the channel where they combine prior to discharge to the watercourse.
- Ferrous chemical dosing is utilised to support the biological nutrient removal process and is required to reduce residual phosphorus to meet discharge consents.

Tertiary Treatment

- There is no tertiary treatment.

Final Effluent

- Final effluent discharges to the River Loddon.

2.5.2 Sludge Treatment Centre Permit Activities

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW, which passes through the aerobic treatment process under the UWWTD. Indigenous primary sludge is drawn off the Primary Settlement Tanks (PSTs) and is pumped to a Primary Sludge Buffer Tanks, which sit outside the scope of the permit application. Primary sludge is pumped out and thickened on a Primary Thickening Plant and then pumped to the Digester Feed Tank. SAS is pumped to the SAS Buffer Tanks before being thickened in the SAS Thickening Plant and pumped to the Digester Feed Tank – the SAS Buffer tanks also sit outside the scope of the permit application. Liquors from Primary Thickening Plant are returned to the works inlet via the Liquor Buffer Tank 1 and Liquor Return Pumping Station 1 for further treatment. Liquors from the SAS thickening Plant is returned to the works inlet via Liquor Return Pumping station 2. Indigenous thickened sludge and imported sludge are both pumped to the Digester Feed Tank where they are mixed.

The Wargrave STC also accepts imports of sludge from other Thames Water facilities. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance. Sludge discharges through the hose and logger unit and into the Sludge Import Tank, which is then pumped to screens and then transferred to a Screened Sludge Import Buffer Tank and then pumped to the Digester Feed Tank.

The Wargrave STC accept tankered wastes to an import area within the site boundary but outside of the perimeter fence located on land owned by Thames Water. The cess is transferred into the Cess / Waste Import Tank, where it is then transferred to the Works Inlet. All imports will be assessed using the Thames Water standard waste pre-acceptance checks to ensure that they are appropriate for treatment via the UWWTD. Once pre-approved as suitable for treatment via the UWWTD route, the waste carriers are approved. Wastes will be subject to appropriate waste acceptance checks in accordance with Thames Water procedures. Incoming tanker vehicles are directed to the inlet offloading point, which is an impermeable surfaced area, equipped with sealed drainage.

The sludge pumped to the Digester Feed Tank, once thickened, is pumped to one of the two Primary Digester Tanks on the site. Sludge within the Primary Digester Tanks is heated via dedicated heat exchange systems using heat generated on site by the CHP engine or boiler. The Primary Digester Tanks are above ground and of steel construction with fixed roofs and fitted with Pressure Relief Valves (PRVs).

Following treatment over an appropriate number of days within the Primary Digester Tanks, sludge is pumped to one of four Secondary Digester Tanks. Digested sludge is held in the Secondary Digester Tanks for an appropriate retention time to ensure that the required level of pathogen kill is achieved in order to comply with digested sludge cake output quality requirements.

Digested sludge is pumped from the Secondary Digester Tanks to digested sludge Dewatering Plant by dedicated pumps. Whilst there are two centrifuges on site, they operate one at a time in the Digested Sludge Dewatering Building. Digested sludge is dewatered with a polymer and then the digested sludge cake falls to a conveyor and is transferred outside to the cake pad area. Liquor is pumped to the site drainage system to be returned to the inlet for treatment via Liquor Buffer Tank 2 and Liquor Return Pumping Station 3.

Digested sludge cake is deposited and stored on the open cake pad, an engineered area of hardstanding, prior to removal from the site under the Sludge Use in Agriculture Regulations 1989 (SUiAR), and in accordance with the Biosolids Assurance Scheme (BAS).

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

Imported treated sludge cake is offloaded on the cake pad. The waste stream is the same as that arising from the treatment of sludge within the Wargrave 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 is stored on an impermeable cake pad, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

Biogas from the Primary Digester Tanks is captured and transferred to a double membrane Biogas Storage holder at the site. The biogas transfer pipeline is equipped with condensate pots that capture entrained moisture from the generated biogas and allow it to be drained into the site drainage system for treatment. The Biogas Storage holder is fitted with PRVs as a safety precaution in the event of over pressurising the system. The biogas is taken from the Biogas Storage holder for combustion in one CHP engine with the vast marjority of the generated electricity used on site.

In the event that additional heating is required for the Primary Digester Tanks, there is a dual fuelled auxiliary boiler that can combust biogas or diesel fuel. An emergency flare is available for use during periods of essential maintenance and for emergency use. The emergency flare is utilised under 10% of the year or less than 876 hours per year.

3 Site Management Responsibilities and Procedures

3.1 Site Roles

Figure 3.1 - Site Roles

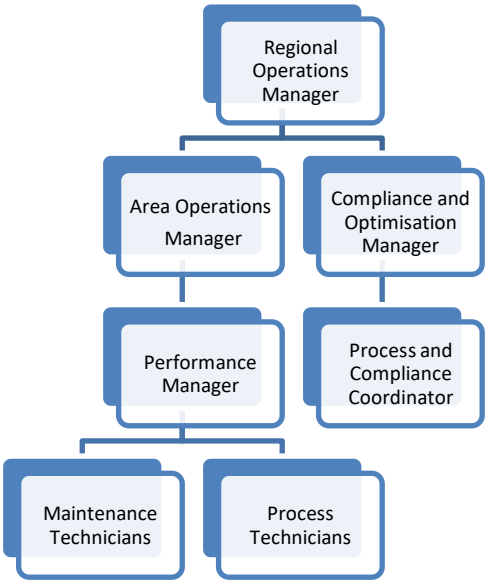


Table 3.1 - Tasks and Responsibilities

Role	Tasks and Responsibilities
Regional Operations Manager	Responsible for the overall performance of STW in this region.
Operations Manager	Responsible for the overall performance of the STW and catchments areas.
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 • assessing the scope of, and updating, the OMP as it is implemented. • dealing with customer complaints • day-to-day operation of the STW • Ensuring Thames Water staff undergo appropriate training
Technically Competent Manager*	Hold the required WAMITAB qualification to support the activities on site under EPR, ensuring permit conditions are complied with.

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

**anticipated*

The site is manned from 7:30am – 3:30pm on a normal working day and can be attended by standby staff out of working hours.

3.2 Key Contacts

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

3.3 Operator Training

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

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

4 Odour Critical Plant Operation, Monitoring and Management Procedures

4.1 Odour Sources, Critical Issues and History

There was 1 report of odour complaint in 2018 and 2 odour complaints in 2022.

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

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

Critical Odour Issues, Emergency Response and Mitigation Measures are summarised in Tables 4.3 to 4.7.

4.2 Identification of Odour Critical Plant

4.2.1 Odour Risk Assessment

An Odour Risk Assessment has been carried out and a copy is included in Appendix 1.

Odour Risk Assessment is not a 'one-off' exercise but an on-going process. It is constructed in the following manner:

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

Items scored in the Odour Risk Assessment with a risk score greater than 10, 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 Wargrave 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:

- General Odour
- Incoming Sewers & Reception Wet Well
- Cess Reception, Discharge, Wash down & Drainage
- Storm Tanks
- Screens & Screening Conditioning, Drainage & Rag Skip Management
- Grit Removal Equipment, Drainage & Grit Skip Management
- Flow & Distribution to Primary Settlement Tanks
- Primary Settlement Tanks
- Fats, Oil & Grease Scum Removal System
- Primary Raw Desludge Pumping
- Flow & Distribution to Secondary Treatment
- Oxidation Ditch Anaerobic Zones
- Oxidation Ditches
- Simplex Aeration Plant
- Flow & Distribution to Secondary Settlement
- Final Settlement Tanks
- Scum Removal System
- RAS Chambers & Pumping
- SAS Chambers & Pumping
- Inlet OCU
- Primary Sludge Buffer Tank

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

- Sludge Reception, Screening, Wash down & Drainage
- Cess Reception, Discharge, Wash down & Drainage
- Skip Management
- Primary Raw Sludge Thickening & Pumping
- SAS Thickening & Pumping
- Sludge Blending & Mixing
- Liquor buffer tanks
- Primary Digestion
- Secondary Digestion and Mixing
- Digester feed tank
- Belt thickeners
- Centrifuge
- Liquor Return
- Cake Pad & Drainage (including imports)
- Vehicle Movements & Wash Down
- Biogas Storage
- CHP
- Waste Gas Burner
- Standby Generators
- Sludge OCU

4.2.3 Odour Critical Plant

The following have been classified as odour critical plant following the Odour Risk Assessment:

- Incoming Sewers & Reception Wet Well
- Cess Reception, Discharge, Wash down & Drainage
- Cake Pad and drainage
- Biogas storage
- Inlet OCU and Sludge OCU

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
Sludge Import buffer Tank	1	62	Steel	< day
Screened Sludge Import Buffer Tank	1	7.5	Steel	< day
Digester Feed Tank	1	343	Concrete	1.5 day
Liqour Buffer Tank 1	2	223	Steel	1.5 days
Liqour Buffer Tank 2	1	343	Concrete	1-5 days
Primary Digester Tank	2	2,200	Steel	7-12 days
Secondary Digester Tank	4	733	Steel	5 days
Diesel Tank	1	23,150	Steel	NA
Diesel Tank	1	8,000	Steel	NA
Diesel Tank (boiler)	1	6,818	Steel	NA

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 Pad	2500	60 days	19 06 06	Diffuse	Low

Odorous and potentially odorous material (any solid, liquid or gas)	Location of odorous materials on site	Maximum quantity on site at any given day	Maximum time held on site (hours or days)	EWC Codes	Type of Emission	Odour potential High Risk / Medium Risk / Low Risk
Biogas	See point source emission plan	Gas holder capacity is 1,100m3	Continuous operation	N/A	Point source	Low
Liquor	Liquor buffer tank 1 Liquor buffer tank 2	Liquor is continuously pumped to the head of works via the inlet pumping station	Continuous pumping of liquors from liquor return pumping well.	16 10 02	Point source (see OCU entry) Diffuse	Low
Raw imported sludge	Sludge import tank	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	Diffuse	Medium/High
Primary Sludge	Primary thickening plant	-	-	19 08 05	Point source (see OCU entry)	Medium/High
Surplus Activated Sludge	SAS thickening plant	-	-	19 08 05	Point source (see OCU entry)	Medium/High
Blended Sludge	Digester feed tank	Refer to Table 4.0 Site Tank Inventory	Retention times for each stage of the process are detailed in Table 4.0	-	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
Odour Control Unit	See section 5.1.2	See section 5.1.2	-	-	Point source	Medium
Sludge Screenings	Skip	1 Skip	Emptied once every month	19 08 01	Diffuse	Low

Table 4.2 Odorous raw materials for Sludge Treatment Centre permit

Raw Material	Odorous	Storage	Mitigation	Odour risk
FloPam FB508	Mild odour	3,00L in 3 IBCs on portable bunds	Fully contained	Low
FloPam FO4490VHM	Not odorous	4 tonnes (stored in four Flexible Intermediate Bulk Containers (FIBC))	Within a building	Low
1.Flofoam H16 2.Flowfoam 139F	Mild odour	1. 1,000 litres stored in two bunded IBCs 2. 2,000 litres (stored in two bunded IBCs)	Fully contained	Low
Mobil Pegasus 705	Oil	2,000 litres (stored in a bunded IBC)	Fully contained	Low
Texaco Delo XLC Antifreeze/Coolant 40/60	Solvent	3,000 litres (stored in a bunded IBC)	Fully contained	Low
White Diesel	Petroleum	3,000 litres (stored in a bunded IBC)	Fully contained	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.

4.3.1 Odour Control Units

UWWTD

There is a new ERG supplied activated carbon unit with direct drive extract fans operating in duty/standby mode which serves the inlet bellmouth chamber. This unit was installed and commissioned May 2018

STC OCU 1 (A7)

There is a refurbished constant irrigation Seashell biofilter media serving the serving the belt thickeners, Primary Sludge buffer (UWWT) , liquor buffer tank 1 and digester feed tanks. There are 2 duty standby fans post bio-filter stage. This unit was refurbished May 2018 we have been advised that the shell media has a life of 15 years.

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 Wargrave STW are summarised in the tables below.

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

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

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

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

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

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

Odour source	Specific odour management tasks	Responsibility	Monitoring	Monitoring Frequency	Trigger Action	Remedial Action and Timescale
General	Ensure site is kept clean and tidy	Site Tech 1s Team Manager	Visual Inspection	Daily	Spillage identified.	Clean up as soon as possible and no later than the end of the day
	Site odour acceptability checked during site walkaround.	Site Tech 1s	Qualitative assessment	Daily	Elevated odour on site identified.	Reports to Performance Manager at team huddle/SAP Plus entry where corrective action identified. For a spillage; immediate/asap resolution
Cess Reception Linked tasks specified in appendix 5 section 2.1	Check Cess reception is operating correctly and is not blocked.	Site Tech 1s	Visual Inspection	Daily	Tank inhibit alarm	Cess logger closed untiled until further investigations
Incoming Sewers & Reception Wet Well	Check site drainage is operating correctly and is not blocked.	Site Tech 1s	Visual Inspection	Daily	Drainage blocked	Raise job on SAP. Job allocated to Tech 1 for review within c. 8 hours. If cannot be resolved, escalate to Site Manager to order tanker/jetter from LMC and try to resolve with 2 days depending on tanker availability. Anything more complex may need up to 3 months to resolve (such as pipe collapse etc). Over

						pumping would be in place within 5 working days.
Storm Tanks Linked tasks specified in appendix 5 section 2.6	Ensure storm tanks drained as soon as flows allow and cleaned out as soon as practicable, ensure no sediment build up on bottom of tank.	Site Tech 1s	Visual Inspection	Daily	Inability to drain empty storm water.	Manual return is possible but unable to complete clean without the use of a tanker
	Check sludge accumulation at bottom of storm tanks after storm event	Tanker driver	Visual Inspection	As required	Build-up of sludge on floor of storm tanks	Bridges and scrapers are redundant in the tanks. They are empty and sludge crust forms. Clean out as required via tanker.
Screens & Screening Conditioning, Drainage & Rag Skip Management Linked tasks specified in appendix 5 section 2.3 and 2.4	Ensure screenings washed and dewatered before discharge to skip	Site Tech 1s	Visual Inspection	Daily	Wash water system not operating to full efficiency	Clean spray nozzles/remove any obstructions blinding/hairpinning); check angle/coverage of delivery; check lubrication. High priority for effective function so timescales would be within 2 working days on identification. Replacement of parts could be up to 6 weeks depending on spares availability.
	Any blockage to be cleared and service resumed as soon as practicable	Site Tech 1s	Visual Inspection	Daily	Impaired screen function for any reason	Attention to blocked screens is immediate/asap on detection since will have significant impact on subsequent process. Timescales of remedial tasks such as repairs to

						screen brushes would be 2 to 8 hours; full replacement over 6 weeks duration. Screens replaced according to wear but within every 7 years typical. Screens are serviced once a year (12 months)
	Ensure skips are covered and removed from site as soon as practicable. Full skips are not to be stored on site	Site Tech 1s	Visual Inspection	As required	Skip identified that is not covered or not watertight. Skips over two thirds full are always prioritised for emptying given potential for odour.	Full skips aim to be removed within 1 week by Biffa.
	Screenings area should be kept clean and tidy	Site Tech 1s	Visual Inspection	Daily	Hard standing has loose screenings outside of skip.	Clearance of any screenings outside of skip is made throughout operational hours given generation of screenings is continuous (potential source of pests as well odour). Skip location will be adjusted slightly in any cases where capture is not sufficient.
Grit Removal Linked tasks specified in appendix 5 section 2.5	Ensure skips are removed from site as soon as practicable. Full skips are not to be stored on site	Site Tech 1s	Visual Inspection	As required	Skips are emptied as soon as they are full	Removal of grit removal skips follows approach for screenings (although odour potential can be proportionally less).

Fats, Oil & Grease Scum Removal System	Ensure there is appropriate scum removal in place and working correctly	Site Tech 1s	Visual Inspection	As required	Scum board function compromised by excess material.	Removal of accumulated material in scum boards within 3 working days – if mechanical or blockage, a tanker/jetter will be needed and this should be done on a bimonthly basis
PSTs Linked tasks specified in appendix 5 section 3	Ensure there is appropriate scum removal in place and working correctly	Site Tech 1s	Visual Inspection	As required	Scum board function compromised by excess material.	Removal of accumulated material in scum boards within 3 working days – if mechanical or blockage, a tanker/jetter will be needed and this should be done on a bimonthly basis
	Ensure fat traps are regularly cleaned and blockages removed	Site Tech 1s	Visual Inspection	Daily	Traps identified as having cracks, breaks or blockages	Removal of accumulated material in scum boards within 3 working days – if mechanical or blockage, a tanker/jetter will be needed and this should be done on a bimonthly basis
	Monitor sludge blanket depths. If levels exceeded report to Team Manager and desludge affected tank	Site Tech 1s	Visual Inspection	As required	Lifting puts more load on biological process. Need to keep below 0.5m to keep solids feeds to drum thickener between 1 and 2%.	Ensure that the PST pumps are unblocked and operating correctly daily
	Check auto desludging operational	Site Tech 1s	Blanket level detector	Daily	Levels in Sludge buffer tank and flows on de-sludging line.	Ensure that the PST pumps are unblocked and operating correctly daily

	Identify any gassing or septicity issues by regular monitoring and prevention of the build-up of solids.	Site Tech 1s	Visual Inspection	Daily	Site can be affected by blocked desludging valves or failed desludging pumps and this will result in increased sludge blanket and rising sludge	Site Manager to investigate with solutions within days/a few weeks depending on whether repairs or replacements.
	Ensure any tank drained down is hosed out as soon as practicable to remove any sludge	Site Tech 1s	Visual Inspection	As required	Residual sludge identified after tank drain down	Manual clearance by hose following identification
		Site Tech 1s	Visual Inspection	As required		
Flow & Distribution to Secondary Treatment	Check for blockages and/or evidence of flow imbalances	Site Tech 1s	Visual Inspection	Daily	Flooding on site	Investigate root cause and repair by operation team as soon as possible
Oxidation Ditch Anaerobic Zones	Checked for failure of mixers & scum build-up.	Site Tech 1s	Visual Inspection	Daily	Rotation mixers not functioning correctly	Investigate root cause; most likely corrective action is tripped motor, and a job needs to be raised on SAP for M/E within 5 working days.
Oxidation Ditches	Ensure dissolved oxygen maintained at the correct levels	Site Tech 1s	Continuous recording on SCADA plus daily spot measurement	Daily	Low D/O alarm within 60 minutes of any problem with blowers which would generate an immediate call out to the tech 1.	If could not be resolved immediately escalation call to M/E. Spare blower would cut in but funding for refurbishment would be needed within 90 days.
Simplex Aeration Plant Linked tasks specified in	Ensure dissolved oxygen maintained at the correct levels	Site Tech 1s	Continuous recording on SCADA plus daily spot measurement	Daily	Low D/O alarm within 60 minutes of any problem with blowers which would	If could not be resolved immediately escalation call to M/E. Spare blower would cut in but funding for

appendix 5 section 4.1					generate an immediate call out to the tech 1.	refurbishment would be needed within 90 days.
Flow & Distribution to Secondary Settlement	Check for blockages and/or evidence of flow imbalances	Site Tech 1s	Visual Inspection	Daily	Flooding on site	Investigate root cause and repair by operation team as soon as possible
Final Settlement Tanks Linked tasks specified in appendix 5 section 5	If tanks are taken out of service, ensure once drained that they are hosed down	Site Tech 1s	Visual Inspection	As required	Debris retained from drain out	Removal by Operational staff within 2 weeks.
Scum Removal System	Ensure there is appropriate scum removal in place and working correctly	Site Tech 1s	Visual Inspection	As required	Scum board function compromised by excess material.	Removal of accumulated material in scum boards within 3 working days – if mechanical or blockage, a tanker/jetter will be needed and this should be done on a bimonthly basis
RAS Chambers & Pumping Linked tasks specified in appendix 5 section 10	Check RAS pumps are running and chamber not overflowing	Site Tech 1s	Visual Inspection	As required	High and high high alarms	Repair within 2 hours, and/or set up an overpumping system. There are two separate streams.
SAS Chambers & Pumping Linked tasks specified in appendix 5 section 10	Check SAS pumps are running and chamber not overflowing	Site Tech 1s	Visual Inspection	As required	High and high high alarms	Turn SAS pumps off and repair within 8 hours, , There are two separate streams.

Inlet OCU Linked tasks specified in appendix 5 section 9	Monthly performance checks by specialist Framework agreed contractors.	Site Tech 1s/Contractor	Monthly Monitoring, see Figure5.1	Monthly	OCU failed alarm to WOCC	Investigate and instruct contractor attendance
Sludge buffer tanks	Waste storage time is minimised prior to digestion, ensure covers/hatches are closed.	Site Tech 1s	Visual inspection	Daily	Ragging and/or blockages identified; covers/hatches damaged or corroded preventing tight fitting	Clear immediately if safe to do so. For larger rag build up/issues with hatches/covers report to Site Manager. High priority so correction needed within 1-16 weeks depending on severity. Introduce temporary covers to achieve continued odour suppression subject to H&S risk assessment.

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 Action	Remedial Action & Timescale (	Odour risk if measure fail
Cess Imports Linked tasks specified in appendix 5 section 2.1	Cess (Low)	Ensure tankers use coupled connections close	Site Tech1s	Visual inspection	Daily	Tanker seen discharging in appropriate manner. Coupling method presents clear odour risk from loose/incomplete fitting and/or release of liquid.	Stop operation and contact Commercial Waste Team	High

						Stop tanking if risk identified on site.		
Sludge import Linked tasks specified in appendix 6 section 1	Sludge (Low)	Ensure tankers use coupled connections close	Site Tech1s	Visual inspection	Daily	Tanker seen discharging in appropriate manner. Coupling method presents clear odour risk from loose/incomplete fitting and/or release of liquid. Stop tanking if risk identified on site.	Stop operation	/Medium
Skip Management Linked tasks specified in appendix 5 section 2.5	Medium	Clean any build-up / spillage of screenings around inlet and compactor.	Site Tech 1s	Visual inspection	Daily	Failure of mechanical Build-up / spillage of screenings around inlet and compactor.	Repair plant. Housekeeping as soon as possible	Low/Medium
		Remove full skips in time	Site Tech 1s/Contractor		Monthly	Full skip	Remove/ replace skip.	Medium
Primary Raw Sludge Thickening & Pumping Linked tasks specified in appendix 5 section 8.3	Septic sludge (L)	Air is abated through the OCU	Site Tech 1s/Contractor		Monthly	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Low
SAS Thickening & Pumping Linked tasks specified in appendix 5 section 8.3	Earthy (L) Residual sulphur compounds (L)	Monitor SAS belt thickener. Following any equipment failure, carry out washdown on belt.	Site Tech 1s	Visual Inspection	Daily	Intermittent running from fouling to belt seizure.	Timescales to correction will vary according to precise issue identified. Immediate response from tech 1 to reset belt and washdown. Washdown of belt and refitting in 5 working days for	Low

							new belts. Critical spares are supplied by framework contractor, and they would expect to get belt back running within 10 working days. In the event of both SA belts failing co-settling in the PSTs would take place after consultation with Process Scientist and raw sludge timers increased to address the additional sludge make.	
Sludge Blending & Mixing Linked tasks specified in appendix 6 section 3	Earthy (L) Residual sulphur compounds (M)	Air is abated through the OCU	Site Tech 1s		Daily	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Low
Liqour buffer tanks	Earthly	Liquor buffer tank 1 Vented through OCU	Site Tech 1s	Visual inspection.	Daily, monitored via SCADA.	SCADA alarm	Investigate and resolve within a day	Low
Primary Digestion Linked tasks specified in appendix 6 section 6	Sulphur compounds (M)	Management of AD process to ensure it remains within parameters.	Site Tech 1s	Visual inspection. See also section 4.4.	Daily, monitored via SCADA.	Visual observations and/or process diagnostics relating to physical/biological/chemical composition indicating abnormal operation identified by Operational Team and/or by Area Process Scientist.	Monitor feed rates, temperatures and pH on a daily basis. In the event of pH dropping below 6.5, reduce feed to digesters and export to support. Digester may need re-seeding after consultation with Process Scientist.	Medium

Secondary Digestion and Mixing Linked tasks specified in appendix 6 section 7	Sulphur compounds (L)	Status of tank is checked and logged daily as part of routine monitoring to maintain compliant sludge operations, as per daily sludge rounds.	Site Tech 1s	Visual inspection. See also section 4.4.	Daily, monitored via SCADA. Daily visual check of tanks.	Approach as above entry.	Approach as above entry. Level of biological action significantly below primary digesters but any leaks/spills to attended to immediately/asap. For all tanks, any potentially significant containment/condition related issues to the tank/pipework/hard standing to be reported to Performance Manager/Health & Safety Team for risk evaluation (HAZID/HAZOP); APS entry and referral to Snr Mgt Team for action plan completion. Management response similar to anaerobic digesters (above).	Medium
Digester Feed Tank	Residual sulphur compounds (L)	Check tanker is covered and odour control working	Site Tech 1s	Visual inspection.	Daily	Failure of roof. OCU failure.	Repair roof. Repair OCU.	Low
Belt thickeners Linked tasks specified in appendix 6 section 12	Earthy (L) Residual sulphur compounds (L)	Monitor SAS belt thickener. Following any equipment failure, carry out washdown on belt.	Site Tech 1s	Visual Inspection	Daily	Intermittent running from fouling to belt seizure.	The site has a duty standby system onsite – investigate and determine whether you need to switch over from duty to standby system.	Low

Centrifuge Linked tasks specified in appendix 6 section 13	Earthy (L)		Site Tech 1s	Visual Inspection	Daily	Spiallge	Clean up ASAP	Low
Liquor Buffer Tank 1	Residual sulphur compounds (M)	Air is abated through the OCU	Site Tech 1s/Contractor		Monthly	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Low
Cake Pad & Drainage (including imports) Linked tasks specified in appendix 6 section 16 and 17	Residual sulphur compounds (L)	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. Drainage goes to the return liquor line	All operators	Visual inspection	Daily	N/A		Medium/high
Vehicle Movements & Wash Down Linked tasks specified in appendix 6 section 16	Digested sludge (M)	Keep movements to a minimum, wheel wash available	Tech 1	Visual	As required	As (ii) above	(As (ii) above	Medium
Biogas Storage Linked tasks specified in	Biogas (L)	Pre-planned maintenance, managed by COP	COP team	Visual inspection, process	3 monthly SHE6M audit	Visual or contractor inspection identifies damage or erosion blocking	Check that gas bag pipework is free of blockages or condensate. APD to carry out	Medium

appendix 6 section 8		team/contractor. Ensure correct operation of biogas handling, including gas bag and flare stack to avoid operation of PRVs. On failure notify TM to contact Maintenance team.		monitoring via SCADA and Cockpit.	carried out by manager.	the valve from fully closing. The resultant 'chattering' occurs where the valve isn't fully opening but opening and closing rapidly. Glycol liquid levels not visible in in sight glass of PRVs.	this check before engaging contractor. This check should be done immediately after finding 'chattering' PRV. Check and re-fill glycol as required.	
Sludge OCU Linked tasks specified in appendix 5 section 9	Residual odours (L) and Earthly odours (L)	Monthly performance checks by specialist Framework agreed contractors.	Site Tech 1s/Contractor	Monthly Monitoring,	Monthly	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Medium
		Check fan operational. On failure notify team leader for notification of maintenance team. Standby fan available.	Site Tech 1s	Visual Inspection	Daily	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Medium
		Routine check of washwater spray system, airflow, condition of drive, pH of drainage	Site Tech 1s	As described in SOM	Monthly	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Medium

		water, drain, surface of media, water filter						
		Media is replaced as per TWUL asset standards.	Site Tech 1s	As described in Equipment Maintenance Standard	As required	See Section 5.1.2 and 5.1.3 for more detailed consideration	See Section 5.1.2 and 5.1.3 for more detailed consideration	Medium

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

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Inlet pumping station	Septic sewage from low flows or sewer cleaning	Int	Investigate upstream blockages (rare event)	Pumps are in dry well which makes it easier for access. The site has rolling critical spares onsite so any failures would be attended urgently.	Low/Medium
	Failure would flood the inlet well	E	Regular contract clearing of rags. Emergency measures to restore pumps.	Investigate and resolve immediately and clean up as required	Low

	Large spillage due to combination of power failure and loss of emergency generation.	E	Emergency measures to restore essential site services. Site incident procedures (SIC) followed.	Investigate and resolve immediately and clean up as required	Low
Inlet screens	Blockage	Ab	Automatic operation of bypass	Blockages dealt with on identification. **Ab/E:** Loss of 2 (3) of the four screens would be significant for process operations. As within building, not particularly odorous but potential odour risk from screening handling present on tanker use.	Low
Detritors	Drainage and cleaning	Int		**Int**: Detritor out of service for cleaning. **Ab/E:** Detritor out of operation. If failed or offline must be emptied within 2 to 4 weeks as potential to become odorous including in transfer off site.	Medium
Screenings and grit skips	Accumulation of skips	Ab	Remove as soon as possible.	1 rag skips and 1 grit skip present**. Ab**: Skips only accumulate due to presence of liquids. Ramps and tankering used as appropriate. Skip removed weekly	Low
Storm tanks	Accumulation of sludge in tanks	Ab	Manual (hose) cleaning	See previous coverage in Table 4.3.	Medium

PSTs	Scraper Failure	Ab	If scraper fails and sewage goes septic, drain and hose tank for repair as soon as possible.	**Ab** operational response from couplings and motor issues within 2 weeks turnaround. **E** operation would be loss of 2 of the 3 PSTs. Response would be to manually de-sludge with increased export.; 1 to 2 weeks to empty and then contractor support for up to 4 months if complicated repair with use of crane. Scraper failure referenced in Table 4.3.	Medium
Primary tanks	Tank drained down for cleaning and maintenance	Int	Ensure any tank drained down is hosed out as soon as practicable to remove any sludge.		Medium
Primary settlement tanks and final settlement tanks	Failure of scrapers, sludge pumps or downstream sludge processes leading to accumulation of sludge in PSTs or FSTs	Ab	Procedures given in SOM.		Medium/high
Oxidation ditch Anaerobic Zones	Scum Build up	Ab	Tanker off as required		Medium

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

Process stage	Event	Status	Ops mitigation	Expansion of TWUL operational response to odour under Int/Ab//E events	Odour risk after mitigation
Sludge import	Spillage	Ab	Clean up ASAP		Medium
Cess reception	Spillage	Ab	Clean up ASAP		High

sludge thickeners	Failure of units. Impact mainly on upstream processes (PSTs). Cover left open	Ab	On failure notify team leader for notification of maintenance team. Close cover ASAP	Failure of the units impacts manually on upstream processes. **Int:** re-set unit. **Ab**: would be operational team re-setting or replacement. If mechanical/electrical part failure, a job raised within next working day to examine. **E:** If extended for more than c. 1 week consider supplementing process through exports. This issue would manifest itself in blanket levels which at c. 1m+ of sludge depth consider tankering out. Limited odour risk present from dismantling thickener; more potential for odour from emptying and cleaning tank or if septicity present	Low
Anaerobic digesters	Problems with digestion leading to part treated sludge passing through to open secondaries and strategic tanks	Ab	Reseeding and re-establishing digesters. Remove part-treated sludge from system ASAP	**Ab/E**: pH is key for process mgt control; monitored on daily basis. If pH drops below a trigger of c. 6.6 tank feed would be reduced & supplemented by tankering in instances of backing up. Temperatures are relatively stable (35-39 degrees as digester average) which minimises the definition of an **Int** event. An **Ab** event might constitute over-feeding of the	High

				digesters. **E:** risk of odour at below 6.6 pH would be responded to by ceasing feeding and likely need to re-seed.	
Biogas handling and use (gasbag, CHP, flare stack	Problems with digestion process or gas handling and use leading to release of biogas from pressure relief valves	E	On failure notify team leader for notification of maintenance team or follow procedures in SOM.	**Int/Ab:** Impaired availability of engine/boilers. **E:** failure of CHP engine &/or ground flare. If repair not possible, response would be recourse to a standby boiler/engine/flare to limit whessoe/PRV releases. Lead in time of c. 4 to 6 weeks. Potential for odour to be present from released biogas.	Low/medium
Secondary digester tanks	Drainage and cleaning	Int		**Int:** drain line being blocked/grit build up but over extended timescales. **Ab/E:** drain or transfer line blocked requiring jetting. Low risk of odour; possibly short term from jetting. Timescales for arranging jetting at 3 working days through LMC. Lower odour risk from being digested sludge ("earthy")	Low
Dewatering equipment	Failure of units resulting in discharge of liquid sludge to sludge holding tanks	Ab	On failure notify team leader for notification of maintenance team. Clean SHT when no longer required	**Int**: TWUL Ops re-set equipment on site but for **Ab/E** Contractor (Bretex) is on a 24hr call out for internal equipment issues	Low

				(bearings/rollers) relating to the klampresses and SAS belts. Timescales up to 4 to 6 weeks for rollers where crane lift needed. Viewed as limited odour risk.	
Cake Pad & Drainage	Disturbing the cake	Ab	Consider the ambient conditions when commencing operation	contact biosolids team	Medium/high
OCU units (Inlet (UWWTD)and Sludge (STC))	Failure of unit or fan	Ab	Standby fan. On failure notify team leader for notification of maintenance team. Odour control units are subject to regular preventative maintenance, checked on a monthly basis monthly by specialist Framework contractors - ERG. Media is replaced as per TWUL asset standards.	**E**: Complete failure the OCU units bigger odour risk relative to cake & liquors OCUs as **Int/Ab.** Consider temporary odour suppressant sprays for OCUs if cannot be re-started.	Medium/high

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
Fire	Failure of fans or sludge building	E	Use of SHTs for storage of sludge. Tanker from site		Low/Medium
Severe weather	Transport of sludge from site inhibited resulting in back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Event unlikely as there is provision for 60days storage on site plus additional storage in the existing sludge holding tanks		Low
Flooding	Flooding causing process or equipment problems	E	Site incident procedures would be followed.	Pumps/tankering arranged through LMC.	Low

Illness/absence of key staff	Accumulation of sludge/loss of odour control etc.	E	Task allocation is independent of individual staff.		Low
Power cuts	Loss of power to fan leading to loss of odour control	E	Emergency power generation for critical activities until power restored.	Greatest risk in persistent inclement weather where temporary external power outages might constitute the most likely externally generated risk. Recourse to temporary generators.	Low
Other incidents	Transport of sludge to land inhibited for other reasons leading to back up of sludge in site resulting in additional odour release from tanks and PSTs	E	Provision for 60days storage on site plus additional storage in the existing sludge holding tanks. Transport to other STWs if necessary	Pumps/tankering arranged through LMC.	Low

4.3.3 Spillages

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

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

4.4 Routine Monitoring

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

The objective of these is 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.

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 conventional digestion site such as Wargrave the processes is maintained around pH 7 but within the range 6.72 – 7.6 (this is % dry solids and digester load dependant) for healthy operation.
- alkalinity: Levels dependant on feedstock characteristics (primary sludge: surplus activated sludge (SAS) ratio). Conventional digestion typically, 3,500 - 5,000mg/litre range.
- temperature: minimum target of 38°C. This is maintained within the range 36-40°C.
- 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. Wargrave fits into the first row of the table.
- Dry solids feed: see table below, Wargrave has a target of 6%DS, but this can vary between 3-8%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 tank is between 50 and 800 mg/L. When VFA concentrations climb above 1000 mg/L, the digester could be overloaded or experiencing other problems.
- Ammonia - Ammonia concentrations of 50 to 1000 mg/L are beneficial, but ammonia levels of 1500 to 3000 mg/L (pH greater than 7.4) could be inhibitory but not always. An ammonia concentration higher than 3000 mg/L for prolonged period is toxic.
- VFA to Alkalinity ratio: Very important parameter to monitor for digestion process. The VFA to alkalinity ratio of below 0.4 is good and above this threshold value means diminishing alkalinity and low pH i.e. sour digester content. As long as this ratio is maintained higher VFA and alkalinity digester content can be acceptable and the digestion process is deemed healthy. Anaerobic digestion process is always controlled based on holistic parameters based but not based on single parameter.

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 eLogbook. Sludge blanket levels are recorded on run charts and electronically via the Cockpit. All records relating to sludge blanket levels on the PSTs and FSTs are kept on site.

There is a SCADA system on this site.

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

4.6 Emergency Response and Incident Response Procedures

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

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

In the event of power failure, the site will run on island mode for critical plant (using standby generators), this doesn't include odour control units and some leakage of odour may occur from below covers until power is restored.

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

Odour mitigation for emergency events have been detailed in Table 4.7. 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 as well as additional site-specific odour issues and mitigation measures associated with process stages identified under the site Odour Risk Assessment.

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

(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 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 secondary digester 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 has 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 are 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

Inlet OCU

- OCU failed alarm sent to WOCC

For periodic 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 H2S 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.

Sludge OCU (A7)

Media type	Seashell
Cells	2
Design airflow rate	4500 m3/hr
Design inlet temperature	20 C
Design inlet humidity range	0-100C
Stack discharge velocity	5.2 m/s
Removal efficiency	98%
Design irrigation rate	4.4 m3/hr

For continuous operational monitoring, system incorporates:

- • mimic showing fans running/stopped to show loss of extraction
- H2S monitoring on the outlet of the OCU

For periodic 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 H2S 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.

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)	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	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		Correct positioning	Daily	X	X	X

are in the correct positions					
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	Monthly	X	-	

	complexity (time of order to mobilisation)				
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

*OCUs covered by STC Permit only

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

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

- Monthly – flow (m^3/h), differential pressure(kPa) and hydrogen sulphide(ppm) at both the inlet and outlet. Where applicable, monitoring may also include fan hours run and removal efficiency of hydrogen sulphide. Inlet carbon filter: 400m3 an hr design flow; 4535 Biofilter equivalent value; diff pressure: carbon filter: 0.54kpa; biofilter: 0.45kpa.

- Quarterly – VOC (ppm) and mercaptans(ppm) at the inlet and outlet.

>50ppb hydrogen sulphide will be used as a threshold value for media change out. More detailed maintenance procedures are located in the SOM.

The OCUs are specifically designed to minimise the release of odour, bioaerosols and microorganisms.

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

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

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

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

All OCUs, irrespective of media type, *will stipulate a minimum of 30 seconds* ***retention time***, for a biofilter to achieve a minimum of 95% removal efficiency. **Surface area** of the biofilter is the other part of the specification ***where the requirement is to achieve a maximum of 300m^3/hr/per m^2*** (for design purposes). It is surface area, and the ductwork values identified within question (i) above, that are the key informants to an evaluation of OCU performance. If this description of efficiency (across the bed) slips this would be raised for attention in the contractor monthly inspection reports. These values are better described as recognised industry standards rather than trigger points.

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 0.5 parts per million on the discharge from the biofilter or carbon filter.

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

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

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

(i) For significant issues relating to any aspect of 'condition monitoring' - including effective function of the biofilters - impacting upon parameter reductions at the inlet/out; differential

pressures or irrigation volumes – the Performance Manager would urgently contact Head of Maintenance at ERG to book in reactive maintenance attention. Timescales would be of highest priority but response times/duration dependent on the issue identified

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

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

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

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

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

- Visibility using local SCADA control panels for Sludge 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 sludge OCU fan, 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 CIF or biofilter,* so this parameter has less relevance. Biofilters post humidification standard being > 90%. Carbon units humidity standard should be set at <70%.

For **temperature**, this is fairly constant throughout the year as this is informed by the need to achieve fairly constant temperatures in the digestion process. A range of 20 to 40°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 Performance Manager who assesses criticality before entering the task into the job scheduling system for allocation to an appropriate person to a timescale appropriate to the criticality.

5.3 Emergency Repairs

24-hour maintenance cover is available at the discretion of the Performance Manager 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 Wargrave 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 Wargrave 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 'Wargrave Sewage Treatment Works'

3. Telephone - Thames Water Customer Services 0800 316 9800

If the customer / resident would prefer to contact either West Berkshire Environmental Health, who are providing this service on behalf of Wokingham Borough Councillor, or the Environment Agency, their contact details are as follows:

West Berkshire Environmental Health
Telephone: 01635 519 192 (Customers), 01635 503242 (Thames Water use only)
Email: ehadvice@westberks.gov.uk

Environment Agency – 0800 80 70 60

Customer contacts regarding Wargrave 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 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 Wargrave 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 CSM will contact to the Performance Manager who will carry out an investigation to determine whether the odour source is coming from the Thames Water site. If the odour is decided to be from the Thames Water site, then the root cause is investigated.

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

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

The root cause investigation may include site walkaround checks, which look for irregularities such as spillages / open doors and hatches, ensuring appropriate measures such as detailed in table 4.3-4.6 are in place. It may also include off-site visits to the Customer location.

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

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

6.4 Notification of Operations with Potential to Cause an Odour Problem

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

The Environmental Health Officer of West Berkshire Environmental Health will be contacted directly if there are risks of odour generation (e.g. digester cleaning, tank cleaning or process issues). NOTE: This will only take place on known sensitive sites where Local Authorities and the EHO are already involved.

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

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

Appendices

Appendix 1. Odour Risk Assessment

Wargrave%20STW%20SERV%20Odour%20

Summary of Critical odour issues:

Appendix 2. Odour Improvement Plan

Odour Implementation Plan Wargrave STW

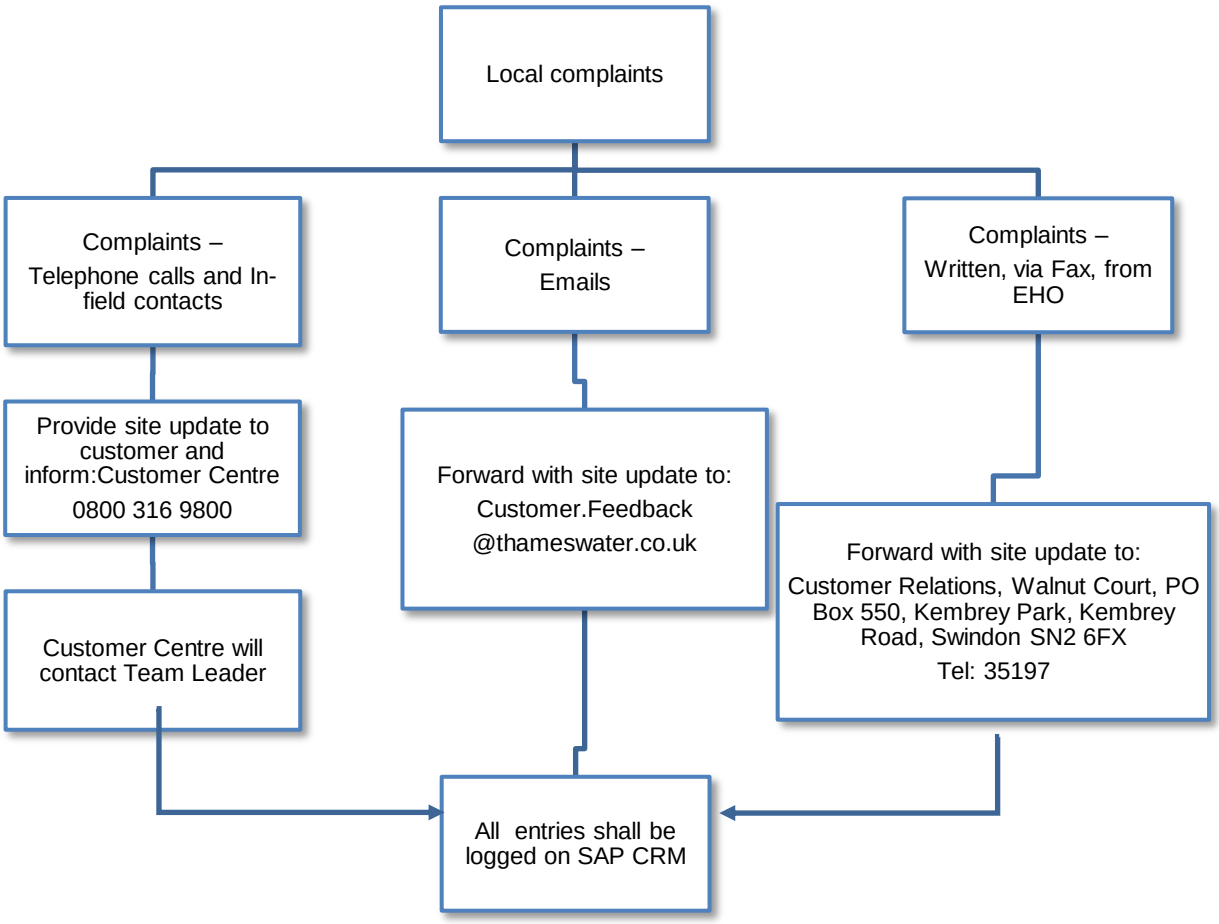
Review Date: Nov-23

Process Stage	Owner	Summary - Plan	Action	Challenges	Measures to mitigate	Timescale for completion
Storm Tanks	Neil Harryman	Washwater fire hydrant system	Review avaliability of washdown hoses next to storm tanks	Funding	Tanker to clean down as and when required	AMP 8
OCU	Neil Harryman	Action recommendations laid out by monthly health checks	Action recommendations laid out by monthly health checks - RAG priority	Funding		Ongoing
Sniff testing	Odour Specialist	Implement sniff testing procedure	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	Site Round, Monthly health checks	6 months from permit issues
Buffer (ageing) Tanks	Neil Harryman		1 sludge ageing tank (SAS buffer tank) is uncovered, 1 is covered (primary sludge buffer tank) and odour controlled. Ensure covered and abated tank is used, Empty and clean uncovered ageing tank.			May-24
OCU Alarms	Neil Harryman		Review OCU alarm avaliability once outstation work is complete		Monthly health checks	May-24

Appendix 3. Customer Communications Plan

Complaints Process

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



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

Communications

Level 1	Stable operations: Compliant with Operational Asset Standards.			
Communications Approach	Standard regular proactive contact with key stakeholders.			
Stakeholders External	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Local council(s) Environmental Health Department	As required but at least quarterly	Telephone / email / meeting	Update on operational activity on site	Performance Manager & Customer and Stakeholder Manager
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
Environment Agency	As required	Telephone / email / meeting	Update on operational activity on site	Performance Manager and environmental permitting team
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
Local residents associations *(if applicable)*	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
Stakeholders Internal	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	Immediately then weekly	Q&A prepared for press office by Operations	To enable the press office to deal with queries from the press (reactive only).	Duty Manager
Customer Centre (Swindon)	Immediately then weekly	Telephone / email	To enable the Customer Centre to deal with queries from the press (reactive only).	Duty Manager
Other areas/stakeholders outside Wargrave 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)
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)
Environment Agency	As required as per notification procedure	As required as per notification procedure	As required as per notification procedure	Pollution desk
Stakeholders Internal	**Frequency of Contact**	**Method of Contact**	**Aim of Contact**	**TW Contact/Level**
Press Office	Immediately then daily	Q&A and press release prepared by press office	To enable the press office to deal with reactive queries from the press and prepare a media strategy if required.	Duty Manager

Customer Centre (Swindon)	Immediately then daily	Telephone / email	To enable the Customer Centre to deal with queries from customers (reactive only)	Duty Manager
Other areas/stakeholders outside Wargrave 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

Figure B - Site Plan of Wargrave STW

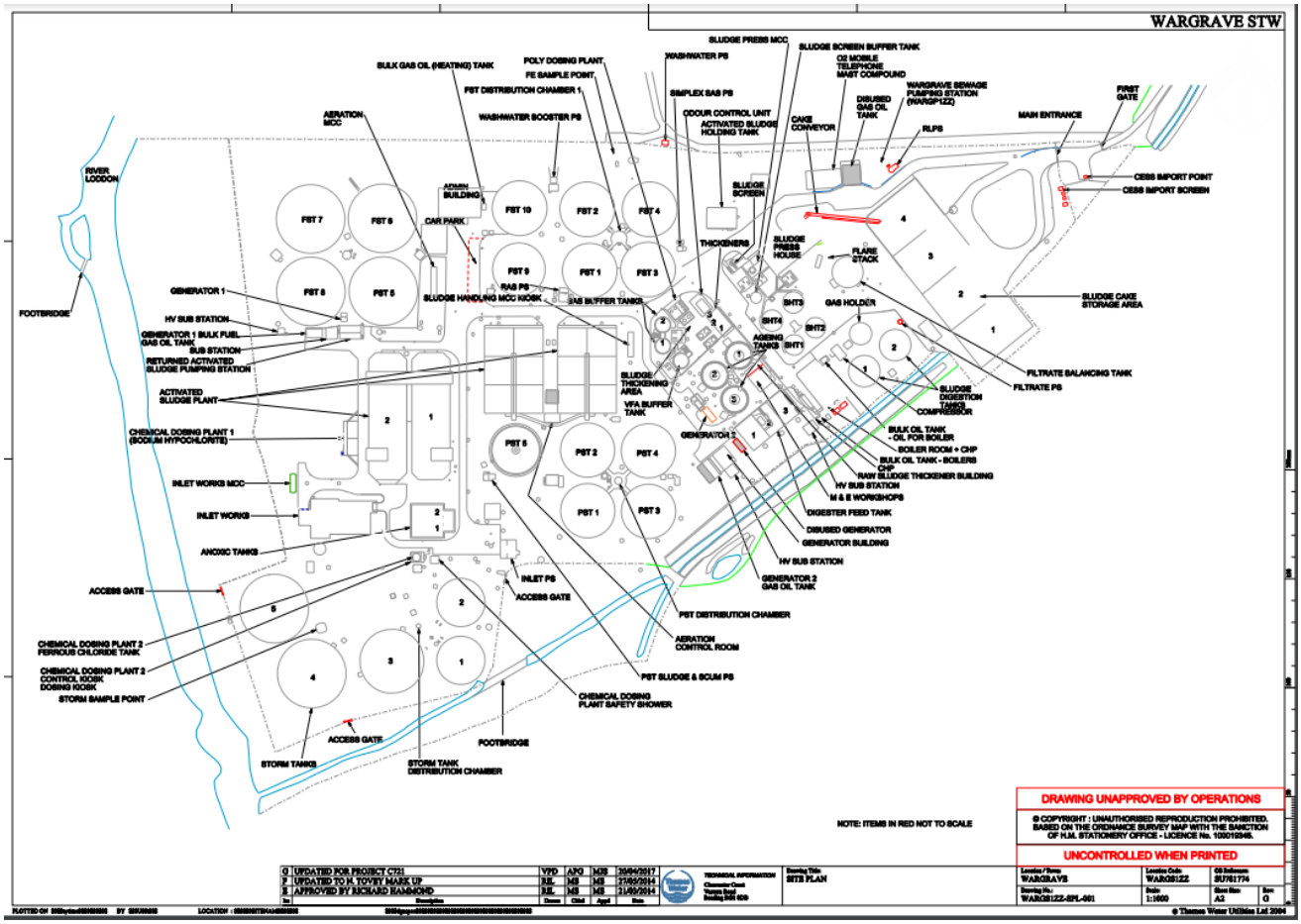


Figure C - Area Permitted Sludge Treatment Centre Permit

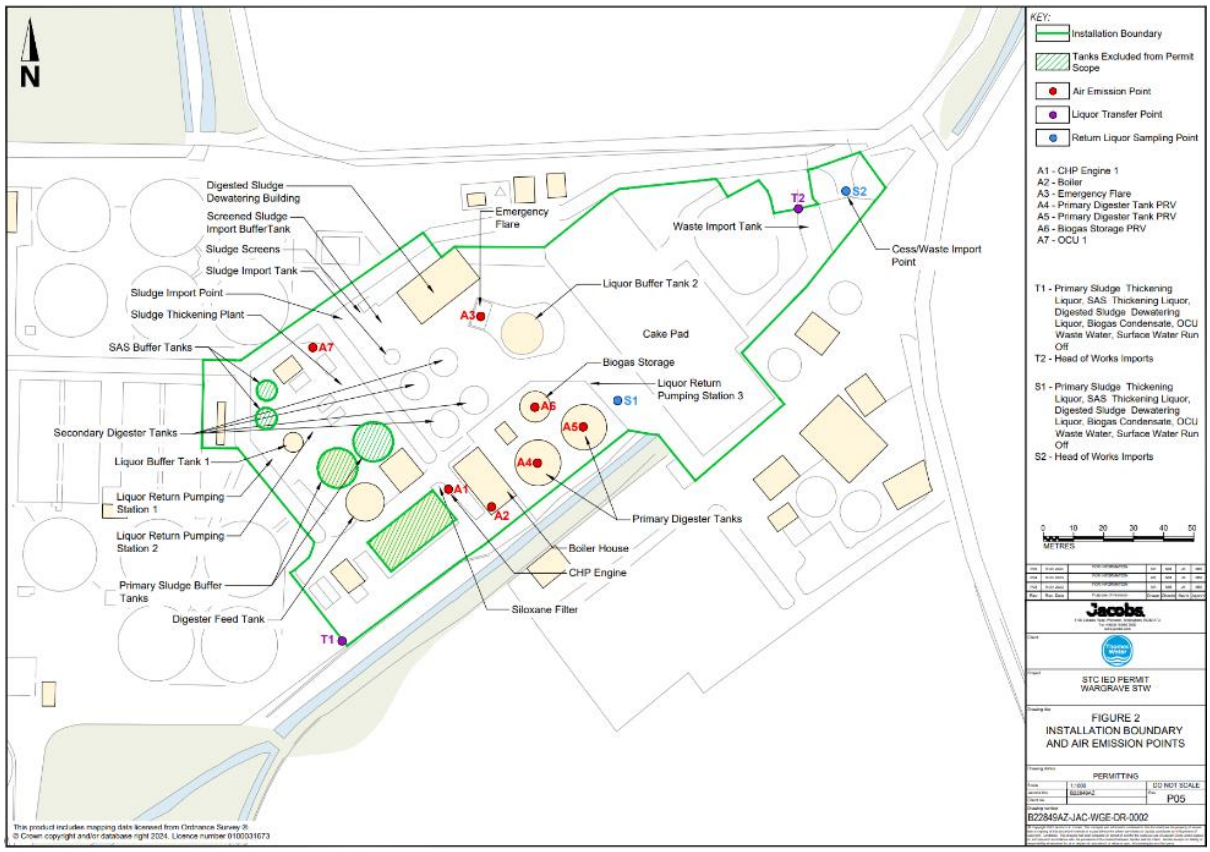


Figure D1 – Process Block Diagram for whole site

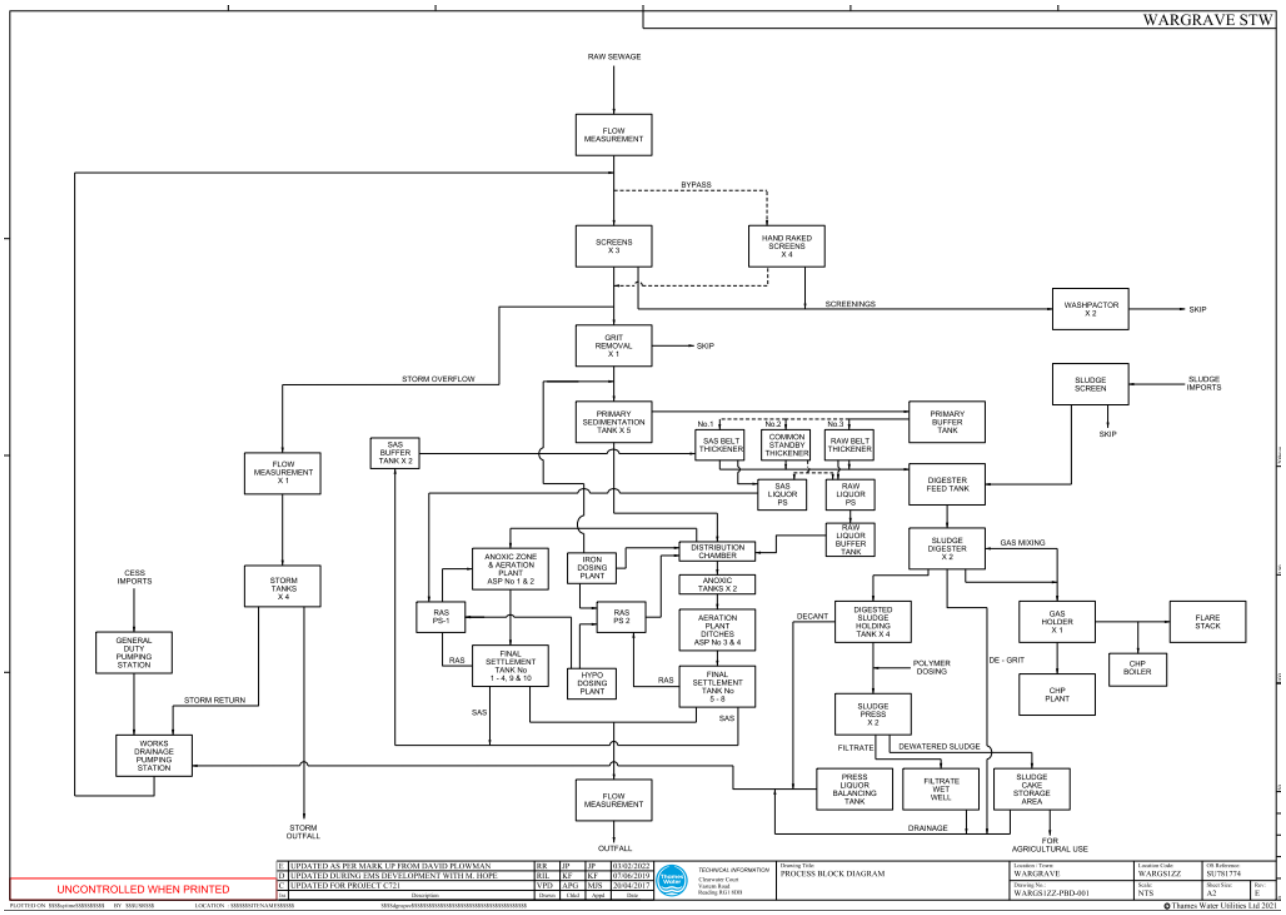
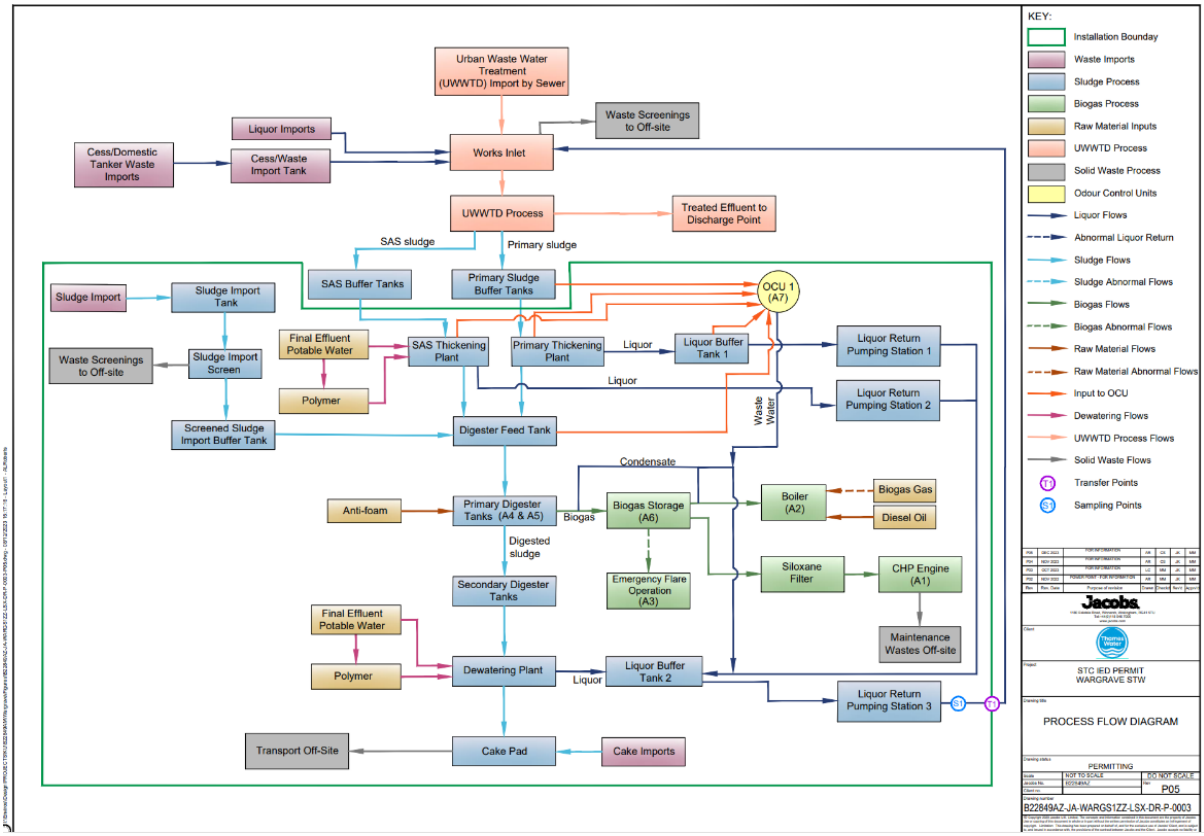


Figure D2 - Process Block Diagram for permitted activities



Appendix 5. Site Rounds

ID	Instruction	Daily	Weekly
1	**Final Effluent**		
a)	Check the effluent quality at the sample point. Sample (ammonia, phosphorus, temperature & turbidity) in accordance with SOM. Record in site log book & via Direct Text.	**X**	
b)	Check final effluent sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
c)	Check storm sampling point is accessible. Highlight to manager if need to clean inline monitor, channel/chamber.	**X**	
d)	Visual check on point of discharge to the watercourse if accessible. Check operability of outfall flap valve if fitted.	**X**	
e)	Check storm discharge point, if shared & if accessible.	**X**	
f)	Compensation water pumps.	**X**	

ID	Instruction	Daily	Weekly
	Check and clear ultrasonic head of cobwebs etc.		
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	
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	

ID	Instruction	Daily	Weekly
f)	Inspect buildings, kiosks and control/switchgear panels for general condition, damage and that they are securely locked. Clean and tidy the interior of the buildings and/or Kiosks. Remove rubbish from site or if large volume arrange for collection.	x	
g)	Listen for undue pump noise and check for undue vibration by safely touching the lifting chain or guide rail.	**X**	
h)	Check non-return valve is operating correctly Non return valves prevent water from flowing back through the pump when it is not in operation. If a weighted arm is fitted is it at the usual angle? If it is low and chattering it could indicate the pump is blocked.	**X**	
i)	Check operation of the ultrasonic level control. Is it reading correctly? Compare the well level with the normal readout from the display. Check hard wired control floats, clean as required. Are floats weighed down with rag or debris preventing them from lifting if the water level rises?	**X**	
j)	Check pumps, pipelines and couplings for leaks where possible.		**X**
k)	Start the cleaning cycle manually where required.	**X**	
l)	Pumps - Log hours run		**X**
m)	Pumps - Log kWhrs		**X**
2.3	**Screen(s) / macerator(s)**	Daily	Weekly
a)	Check inlet channel level is normal taking into account the flow conditions at the time (such as storm conditions & peak flow to site).	**X**	
b)	Check screen operation and check for screenings carryover. 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.	**X**	

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

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

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

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

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

ID	Instruction	Daily	Weekly
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**	
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**	

ID	Instruction	Daily	Weekly
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
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	**X**	

ID	Instruction	Daily	Weekly
	entering the PFT. Sample, analyse and record % dry solids out (Monday, Wednesday, Friday)		
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**	
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**

ID	Instruction	Daily	Weekly
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	
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		

ID	Instruction	Daily	Weekly
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**	
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?		

ID	Instruction	Daily	Weekly
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**	
b)	Ensure any rag is removed, especially from around the penstocks, gate valves and their spindles. Ensure none of this passes over the weir.	**X**	
c)	Check that all valve, penstock and weir operating positions are correctly set.	**X**	
d)	Check chamber for any visible leaks	**X**	

Appendix 6. Sludge Rounds

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

	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	**X**	

	Instruction	Daily	Weekly
	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.		
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**	

	Instruction	Daily	Weekly
f)	Log sludge feed volumes into each digester and establish the retention time (HACCP)	X	
g)	Check operation of sludge and water recirculation pumps Check pumps, pipelines and couplings for leaks where possible.	X	
h)	Monitor water supply where glycol is not used to heat exchanges that are exposed to elements, Ensure water is drained when heat exchanges are not in use.	X	
i)	Log use of secondary fuel within boilers.	X	
j)	Sample sludge into and out of digester. Analyse and record % dry solids. (Monday, Wednesday, Friday.) Analyse and record % volatile matter. (3 times a week Monday – Thursday)	X	
k)	Check digesters for foaming on the top.		X
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	

	Instruction	Daily	Weekly
c)	Check pressure/vacuum relief (whessoe) valves are not passing biogas. Listen for gas passing, note any unusual smell, visual check of valve.	X	
d)	Check for genuine operation of flare stack / waste gas burner, e.g. chp is at full power and there is excessive gas make	X	
e)	Check and record dehumidifier temperature	X	
f)	Log gas volumes: produced, flared, to chp, to boilers	X	
g)	Sample, monitor & record methane composition of biogas	X	
h)	Manually check gas isolation valve handle operation by closing & opening valve.		X
9	**CHP & Biogas Power Management**	Daily	Weekly
a)	Check automatic drain traps working correctly. Use manual drains if automatic drains not working, report defects	X	
b)	Check for genuine operation of flare stack / waste gas burner, e.g. CHP is at full power and there is excessive gas make	X	
c)	Check glycol pressure relief valve and ensure liquid level visible in sight glass	X	
d)	Check & log hours run	X	
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

	Instruction	Daily	Weekly
a)	Check return liquors and return rate	X	
11	**Chemical Dosing**	Daily	Weekly
a)	Check that chemical is discharging, not just dosing pump running (any nozzles blocked?)	X	
b)	Check chemical storage tank level - reorder as required	X	
c)	Check for excessive vibration in the dosing pump	X	
d)	Check the level in the internal bund and empty as required	X	
e)	Check for leaks on visible chemical lines	X	
f)	Check the trace heating system	X	
g)	Check external storage tank bund for rainwater and/or chemical. Empty as appropriate.		X
h)	Check the correct amount of chemical is being delivered for the conditions		X
i)	Check storage tank can take delivery before delivering		X
12	**Sludge Dewatering – Belt Press**	Daily	Weekly
a)	Check poly dosing system, Log polymer usage, note each bag change/delivery, Make adjustments to optimize	X	-
b)	Check sludge feed rate and log	X	
c)	Check sludge on the top belt and assess the conditioning of the sludge, Check belt drainage and filtrate quality	X	
d)	Check product quality & quantity, Check condition of stockpile	X	
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	

	Instruction	Daily	Weekly
k)	Jet wash clean the belt filter.	X	
l)	Use low pressure water hose to clean complete machine, frame, rollers and hoppers.	X	
m)	Check condition of belt filter for blinding / blockages / good filtration	X	
n)	Steering flaps - check condition and correct operation for activation of the hydraulic steering mechanism and check for wear and replace as required	X	
o)	Sample, analyse & record % dry solids on feed and cake, (Monday, Wednesday, Friday)	X	
p)	High pressure steam clean the belt from underside.		X
q)	High pressure steam clean complete machine, frame rollers and hoppers avoiding all electrical and instrumentation equipment		X
r)	Check condition of belt filter for wear i.e. Creasing / condition of seam to avoid failure / breakage and damage to other components		X
13	**Sludge Dewatering – Centrifuge**	Daily	Weekly
a)	Check condition of stockpile, Check quality of product	X	
b)	Check kwh, amps and hours run	X	
c)	Check poly dosing system	X	
d)	Check quality of centrate	X	
e)	Check sludge feed rate, Check quality of product in feed	X	
f)	Visually check auto lubrication systems (grease pot) are functioning correctly, take appropriate action.	X	
g)	Log hours run	X	
h)	Log kwh hours run	X	
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	

	Instruction	Daily	Weekly
14	**Poly Make Up, Storage, & Dosing – Liquid**	Daily	Weekly
a)	Poly make up storage & dosing – liquid - check supply of polymer held in IBC; Top up, replace, order as appropriate	**X**	
b)	Liquid - check dosing pumps & settings	**X**	
c)	Liquid - check dilution water is available	**X**	
d)	Liquid - clean up any spillages of liquid	**X**	
e)	Liquid - log usage of polymer i.e. IBCs level	**X**	
f)	Liquid - log settings of dosing pumps	**X**	
g)	Liquid - log type of polymer	**X**	
h)	Liquid - check polymer flowmeter pressure – if above 3 bar clean filter and mixer		**X**
i)	Liquid - check made up solution appears ok	**X**	
j)	Liquid - check bunded area for spillages	**X**	
15	**Poly Make Up, Storage, & Dosing – Powder**	Daily	Weekly
a)	Dry powder - check dosing pumps & settings	**X**	
b)	Dry powder - check supply of polymer held in silo; Top up, replace, order as appropriate	**X**	
c)	Dry powder - check bunded area for spillages	**X**	
d)	Dry powder - check dilution water	**X**	
e)	Dry powder - check dry room / silo is heated, dry and doors are closed	**X**	
f)	Dry powder - check made up solution appears ok	**X**	
g)	Dry powder - check polymer is dry and flowing, look at screw drive and discharge to wetted head – “JETWET”	**X**	
h)	Dry powder - clean up any spillages	**X**	
i)	Dry powder - log settings of dosing pumps	**X**	
j)	Dry powder - log type of polymer, check using correct polymer.	**X**	
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

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

Appendix 7 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 ---