Derby Sludge Treatment Centre

Odour Management Plan

Revision	Purpose/Description	Originated	Checked	Reviewed	Authorised	Date
1	Original version	Mark McAree	Sam Craig	Mark McAree	Jo Chapman	15/06/21
2	Updated in response to EA comments	Jo Chapman	Simon Whitehouse	Mark McAree	Jo Chapman	03/04/24

Contents

1) Introduction and scope

Odour from the majority of sewage treatment works is regulated by the local authority under statutory nuisance provisions of the Environmental Protection Act 1990.

However, sites that have the capacity to accept over 100 tonnes of imported waste per day for the purposes of anaerobic digestion have been issued with Environmental Permits under the Environmental Permitting (England and Wales) Regulations 2016.

The EA's Guidance 'Biological waste treatment: appropriate measures for permitted facilities' requires for activities which are likely to give raise to odour problems, such as anaerobic digestion, an odour management plan (OMP) should be submitted for approval as part of the permitting process.

Therefore, this document will be submitted as part of the environmental permit compliance for the Sludge Process at Derby Sewage Treatment Works which will be operated by Severn Trent Water.

This OMP has been prepared following guidance from the Environment Agency:

- H4 – Odour Management.
- Odour Management Review Checklist.
- Odour Management Plans for Waste Handling Facilities.

The OMP will form part of the ISO 14001 Environmental Management System (EMS). The Bioresources manager will be responsible for implementation of OMP and its regular review. This odour management plan will be reviewed on an annual basis or more often if any of the following occur:

- Validated odour complaints
- Changes to the sewage or sludge treatment process
- Significant development in the local area

2) Site Overview

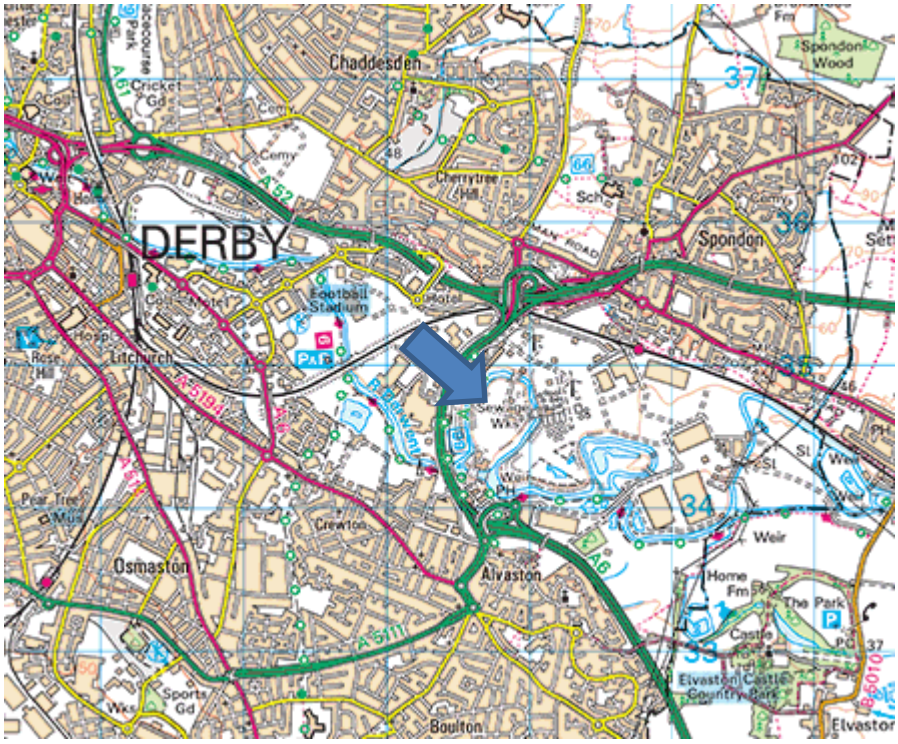
Derby Sewage Treatment Works is located to the east of Derby town centre, on an island in the River Derwent. The approximate site centre is at National Grid Reference (NGR) SK 3894 3463.

Derby STW treats a population equivalent of approximately 325,000. The sludge treatment centre (STC) also treats sludge imports from satellite sites in Derbyshire

The site was previously authorised under a T21 Exemption. This new permit allows site to accept 210,000 tonnes of non-hazardous waste annually (excluding indigenous UWWTD derived sludge from within the waste water treatment works). Import of trade waste for digestion is currently suspended.

The current discharge permit levels (on a 95%ile basis) are 25mg/l BOD, 40mg/l SS, 10mg/l ammonia and 1mg/l Phosphorus. The final effluent is discharged to the River Derwent.

Figure 1: Site location plan



3) Site surroundings

Derby STW is located approximately 3 km east of Derby town centre.

The site is bordered to the north by the Spondon area of Derby, with the east being dominated by the former GEC Alstom site and Derwent power station. To the south (and within the works) is the River Derwent and to the west is industrial properties. Within the loop of the River Derwent where some of the works sits, is the separately permitted, Severn Trent Green Power Derby food waste anaerobic digester plant.

Sensitive receptors include:

- Choices Health Club (200m west)
- Rolls Royce engineering (300m west)
- McDonalds (500m south)
- Raynesway Ambulance station (350m north)
- Asda (750m north)

The nearest residential receptors are located in Bridgeside Way (650m from the permitted area, north east).

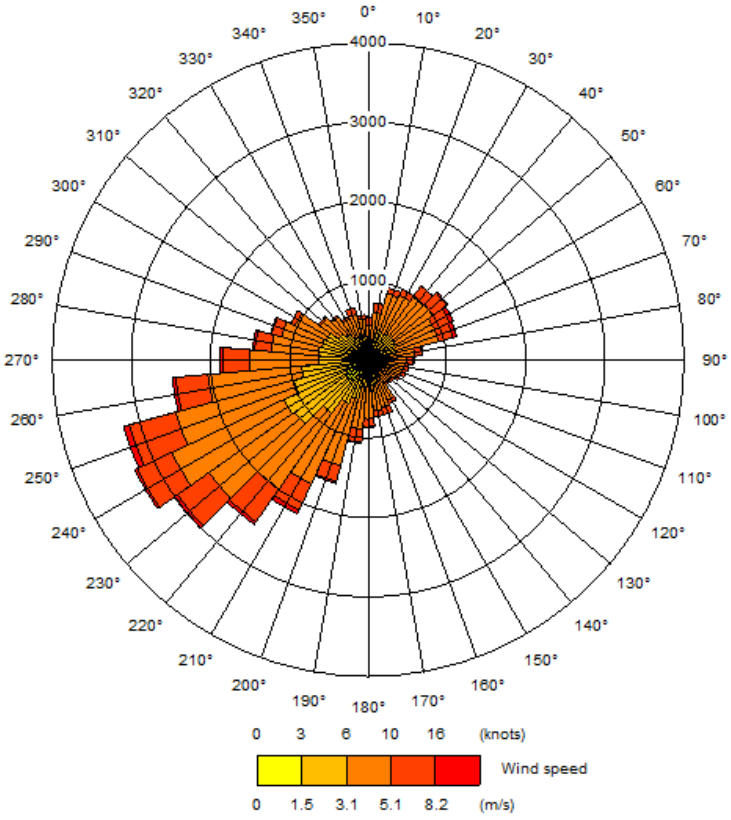
Note that although the Severn Trent Green Power food waste AD plant is adjacent to the site boundary, this is not a sensitive receptor.

Potential commercial and agricultural odour sources in the area:

- Severn Trent Green Power food waste AD plant (west)
- Rayneway HWRC site (south)
- Celanese, plastics production (east)

Historical prevailing wind data below from the Met Office shows the predominant direction is South-West. This wind rose is for the nearest available site (Nottingham / Watnall) and has been used in our dispersion modelling. Derby STW is surrounded by sensitive receptors so the aim is to keep odours to a minimum whatever the wind direction.

Figure 2: Nottingham / Watnall meteorological station combined windrose 2016 – 2020



4) Process Overview

Wastewater Treatment

The majority of wastes received are via the wastewater network of pipes and are regulated under the Urban Waste Water Treatment E&W Regulations, and so do not form part of this Odour Management Plan.

Sludge Treatment

Primary sludge is screened through 1 huber screen and collects within the Primary Sludge storage tank (covered). Primary sludge is then thickened by 2 Gravity Belt thickeners which are covered and connected to the odour control system.

Imported sludge is discharged into a covered well prior to being screened by 2 Huber screens, the sludge then gravitates into the screen sludge well before being pumped into the thickening sludge blending tank. Screenings are held in open skips.

Surplus activated sludge (SAS) is collected in a buffer tank prior to being thickened using 3 gravity belt thickeners (GBTs) and then pumped into the thickening sludge blending tank (TSBT) where it is mixed with the indigenous primary and imported sludge. The GBTs are located in a ventilated building.

From the TSBT,the sludge is pumped into the acid phase digesters (APD). The sludge is then transferred into 3 No. conventional anaerobic digesters. Biogas is collected from the APD's and digesters and utilised in 3 CHPs.

Digested sludge is transferred to 2 No. pathogen kill tanks and then to primary sludge storage tank prior to dewatering using 2 No. centrifuges. Sludge cake is stored in 7 No. cake bays prior to being transferred offsite for spreading on agricultural land.

Centrate from the centrifuges is stored in an open well and is then returned to the inlet of the sewage treatment works.

A process flow diagram is found in Appendix 1.

5) Hours of operation

Waste is processed through the plant 24 hours a day through a computer controlled process. There are no permitted restrictions on the delivery of tankered waste to the site. Severn Trent will aim to only allow waste via tankers to be accepted between normal working hours to minimise odours. Any tankers received out of hours would be for emergency tankering only.

6) Tonnages

Derby STW served a population equivalent of 325,000 in 2018/19. The digestion plant has capacity to treat 327,500 wet tonnes per annum indigenous and imported sludge.

The site was previously authorised under a T21 Exemption. This new permit allows site to accept 210,000 tonnes of non-hazardous waste annually (excluding indigenous UWWTD derived sludge from within the waste water treatment works). Import of trade waste for digestion is currently suspended.

The types of waste accepted for anaerobic digestion (i.e. receipt of digested sludge at the AD plant) are specified in Schedule 2 of the environmental permit.

7) Waste material accepted

Severn Trent Water are currently not accepting any trade wastes into the sludge route for treatment. Tankered domestic waste is accepted into the inlet works, and raw and digested sludges are accepted into the sludge treatment route.

Wet well waste is also accepted to a separate enclosed bay for dewatering (as authorised under NWFD3).

For reference when the plant is fully operational, the full list of EWC wastes we are permitted to accept can be found in permit EPR/CP3638XZ

8) Delivery Vehicles

Liquid wastes will be transferred to and from the site in sealed tankers. Solid waste will be removed from site in sheeted Heavy Goods Vehicles (HGV's).

It is the responsibility of the haulier to ensure that the contents of their load are sheeted when removing waste from site as per our agreement with our approved framework contractors. Vehicles arriving at site that are in poor condition (poor sheeting, leaking seals or dirty) such that they may cause odour issues will be refused re-entry until repairs are made.

The UWWT route is not covered under this permit, however, the permitted area includes the roadway where trade waste tankers discharge to the sewage treatment works inlet. The trade waste tankers are a potential source of odour.

Liquid wastes will only be accepted or exported in sealed tankers. All trade waste loads will be tested on arrival at site as per the trade waste Standard Operating Procedure (SOP) **SOP03 TTW Nonconformance Procedure**. Any loads with odour potential will be assessed by the trade waste technicians during the lab testing process. Tankers can be unloaded using gravity only (no pressure discharge) to reduce potential odour egress. If loads are deemed too odorous for discharge, the trade waste technicians will reject the tanker and send the haulier offsite as per the SOP.

Exiting cake vehicles are cleaned using the wheel wash before leaving site. It remains the responsibility of the haulier to ensure their vehicle is maintained. All foul water then runs into the site drainage and is directed back to the head of the works for treatment.

Trade Waste Rejection Procedure

Any Non Conforming Tankered Domestic or Trade loads will be dealt with appropriately as per Standard Operating Procedure.

Where waste is deemed to contain a level of contamination greater than that set out above or is considered to be a malodorous load, the Trade Waste Technicians will consider the rejection procedure option.

Should a load be considered unacceptable, the Trade Waste Technicians will quarantine that load in a separate area of the reception roadway. The relevant haulier or waste supplier will

be contacted and the reason behind the rejection will be conveyed to them. They will then be requested to remove the load from site, if deemed too malodorous to discharge.

Severn Trent Water's document: SOP03 TTW Nonconformance Procedure addresses:

1. Identified Risks
2. Roles and Responsibilities
3. Training and Competence
4. Duty of Care paperwork
5. Contaminated Loads
6. Differences against approval analysis
7. Other non-conformances
8. Load rejection

A full version of SOP03 TTW Nonconformance Procedure can be found locally on Sharepoint.

Waste imported for dewatering and storage only

Digested sludges are imported from other Severn Trent STFs for dewatering/ storage. All our sludge is treated in accordance with the site HACCP plan & is tested on a regular basis.

Imported digested sludge is discharged into storage tanks which feed the de-watering process & treated in the same way as indigenous sludge – our centrifuges are enclosed units & cake is stored on the pad in specific numbered bays and recorded on the site stock sheet. Cake movement on the pad is minimised to reduce odour.

If the imported cake does not meet the requirements for recycling, it will be quarantined on site for further sampling & investigation. Additional treatment may be required or disposal via other non-agricultural routes. Additional treatment may include mixing with lime. If this is required, odour management will be included as part of the RAMS (Risk Assessment / Method Statement) of the relevant contractor.

The "oldest" cake on site will generally be recycled first but this could be impacted by operational requirements or customer preference. For example, treated cake could be delivered directly from under the chute in preference to cake stored in bays which reduces cake movement on site providing operational benefits and reduced carbon emissions.

Sewage cleaning wastes; Wet well wastes are imported for gravity dewatering, as authorised under NWFD3 (not within scope of this permit). These materials are brought to site and transferred to skips to allow excess water to drain from the bulk, prior to removal from site for disposal. Drained water is captured in the site drainage system and transferred to the inlet for treatment.

9) Permitted Area

The area covered by permit EPR/CP3638XZ is shown in figure 3. It lies entirely within the loop of the River Derwent, with the remainder of the works on the northern and eastern sides of the River Derwent.

Figure 3: Permitted Area

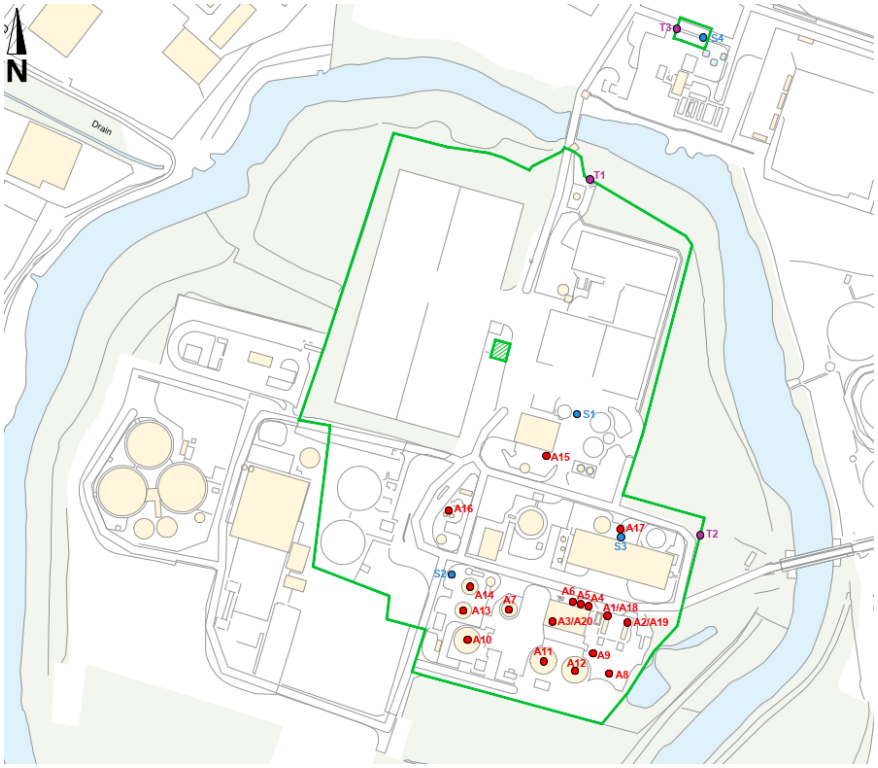


Table 1: Air emission points

Emission point reference	Source	Components	Odour Risk
A1 A2 A3	CHP engine	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A4 A5 A6	Standby Hot Water Boiler	Products from oil/ gas combustion	Low - Boiler is regularly serviced.
A7	Gas storage pressure relief valves	Biogas (mixture of methane & carbon dioxide)	Low - the gas holder is suitably sized to manage biogas generation.

A8	Flare Stack	Products from biogas combustion	Low - the flare is utilised for the safe disposal of surplus gas in the event of plant breakdown, or a surplus of gas above the level that can be safely stored or utilised. Use of emergency flare is recorded.
A9	Vent on gas oil storage tank	Products from oil	Low – Tank is regularly inspected and standard refilling procedures in place.
A10 A11 A12 A13 A14	Digester & APD pressure relief valves	Biogas (mixture of methane & carbon dioxide)	Low - PRVs are only activated in emergency situations to maintain safety within the biogas system and are re-seated/repaired promptly to minimize biogas emissions. PRVs are subject to monitoring via site systems and visual checks by site personnel.
A15, A16, A17	OCU Stacks	Raw sludge odours e.g. H2S	Low - the odour control units are subject to regular preventative maintenance. Media is replaced in line with the manufacturers' recommendations

10) Available on site capacity

The following capacity is available across the site and is indicative of the total amount of waste that can be retained onsite on any given day.

Table 2: Derby site capacity details

Element	Status	Capacity	Total Capacity
Thickening sludge blending tank	Enclosed	2,245 m^3	2,245 m^3
SAS Buffer tank	Open	600 m^3	600 m^3
Acid phase digester	Enclosed	2 x 800 m^3	1,600 m^3
Gas phase Anaerobic digesters	Enclosed	2 x 3,000 m^3	9,159 m^3
		1 x 3,159 m^3	
Pathogen Kill Tanks	Open	2 x 3,663 m^3	7,326 m^3
Primary Sludge Storage Tank	Enclosed	1 x 683 m^3	683 m^3
Cake pad	N/A	34,935 m^3	34,935 m^3
Filtrate returns well	N/A	1 x 143 m^3	1 x 143 m^3
		Total	**56,761 m^3**

11) Our Approach to Odour Nuisance

Prevention of nuisance is preferable to mitigation of its effects so we use a phased approach to dealing with the risk of odours.

Sewage and sludge treatment facilities should be designed with nuisance in mind. Where possible the most odorous activities should be located away from sensitive receptors. Long open channels should be avoided and potentially odorous tanks designed so that they can be covered if required.

On existing sites, the following approach is used to minimise the risk of odour nuisance:

1. Where possible operational methods should be used first e.g. improving housekeeping or increased maintenance and servicing of assets. Odorous activities such as moving sludge cake should be avoided on days when the prevailing wind is towards sensitive receptors.
2. The last resort is to contain the nuisance e.g. by covering odour sources. If covers are required, then small odorous areas such as desludging and return liquor wells should be addressed first.
3. Ventilation may be required to prevent the build up a corrosive atmosphere. Odour abatement equipment should be sized to cope with any variations in odour levels.

We assess odour risk using FIDOL (Frequency, Intensity, Duration, Offensiveness, Location) and the source/ pathway receptor model. See Inventory of odorous materials.

Odour risk is assessed if the treatment processes on site are altered, in this case odour control measures are paid for as part of the capital scheme. If the need for odour control is identified under other circumstances, e.g. development close to the site, then the site manager adds the issue to STORM and a capital project is created to install odour control.

Severn Trent Water is also committed to the following principles of H4 guidance:

- The integrity of the site infrastructure (including roads, buildings, ducts, pipes, drainage/sewerage, process equipment and controls) are regularly inspected and maintained.
- A high level of site cleanliness is maintained and is enforced by the site management
- Company will engage with the neighbours to minimise their concerns including responding to their complaints effectively

The Environment Agency will be notified in the event of odorous releases detected outside of the site that are or may be caused by the activities authorised by the environmental permit. In the event of an olfactory egress, the Environment Agency will be informed using a Schedule 5 Notification Form, located in Schedule 5 of the permit.

Training

The Environmental Policy is communicated to all persons doing work under the organisations control. Policies, Standards and procedures around permit compliance and operational controls are available and accessed through an online system.

Environmental Management Systems (EMS) basic level awareness e-learning is mandatory to all operational staff. EMS e-Learning Nuisance module includes odour pollution and the Site Permit module includes understanding permits. EMS e-learning is recorded as a skill on SAP.

Competency Management Systems (CMS) Technically Competent Persons are trained on requirements of Environmental Permits including nuisances, control measures and Schedule 5 reporting. CMS Technical Competence is recorded as a skill on SAP.

Severn Trent also schedules regular training modules throughout the year. CABWI (Diploma in Water and Wastewater Engineering) can be undertaken by Operators and Managers wishing to upskill across aspects of wastewater and includes reference to odour issues and mitigation within the training.

Training is monitored and managed by line managers in the first instance.

Site visitors are inducted and made aware of relevant issues or reporting requirements.

12) Inventory of Odorous Materials

Waste Sources and Odour Mitigation

The following list provides an inventory of wastes which may give rise to increased odour on site and their mitigation measures following assessment using **FIDOL** (Frequency, Intensity, Duration, Offensiveness, Location and Annoyance Factor).

Table 3: Inventory of Odorous Materials

Stage of treatment	Nature of source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Inlet works Sewage treatment	• Raw sewage (not part of this permit) • Imported tankered wastes. (various EWCs • Liquor returns from onsite thickening & dewatering processes.	Dry weather flow for the site is 91,500 m^3/d Minimal retention time - inlet works are designed to process flows not store them.	**Risk before mitigation - Moderate. Risk after Mitigation - Low** **Risks (before mitigation) -** Liquor returns & imports have moderate FIDOL score. Inlet channels are open **Source mitigation** - We do not accept odorous wastes (see acceptance criteria). Return liquors are processed as soon as possible after production. Import pipes are extended to reduce splashing. Raw sewage dilutes the other wastes. **Pathway/receptor mitigation** - Inlet works is located away from residential properties & is screened by trees
Sludge handling and treatment Raw sludge imports	• Raw sludge imports from satellite STWs. (EWC 190805) • Screenings from raw sludge imports • Liquors from the consolidation process	• 2 x Huber screens • 1x screening skip	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) -** raw sludge can have a high FIDOL score. **Source mitigation** – Screens enclosed, Wells covered. All connected to an ERG odour control system. Skips emptied regularly via contract with Biffa. Liquors are returned to the head of the works as soon as possible. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment Raw	• Raw sludge imports from satellite STWs. (EWC 190805)	• 2x Primary GBT's • 1x Surplus activated sludge buffer tank	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation)** - raw sludge can have a high FIDOL score **Source mitigation** – SAS building ventiliated. Tanks are covered and connected to an odour control system.

sludge & SAS handling	• Primary and SAS from onsite sewage treatment processes.	• 1x Thickening Sludge Blending tank • 3 x SAS belts Maximum 1 day retention time - time is required to ensure a homogenous mix to the digesters.	**Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment Digesters	• Blended raw sludges (raw sludge imports from satellite STWs. Primary & SAS from onsite sewage treatment). • Antifoam may be added. • Biogas is produced as part of the digestion process.	• 3 x Gas Phase Anaerobic Digesters • 2 x Acid Phase Digesters Design manual minimum retention time is 12 days. The current site HACCP plan will state the latest minimum retention time.	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digestion takes place in enclosed tanks. Antifoam is not odorous. **Source mitigation -** Digesters are enclosed tanks. Pressure relief valves (PRVs) are a fail-safe mechanism to prevent an unsafe increase in pressure in the digesters and are designed to only activate in an emergency once all other failsafe routes have been utilised. They are inspected weekly by the operational teams and twice yearly by an external contractor. Our upstream processes ensure that sludges are processed in a timely manner and therefore releases from PRVs are unlikely to cause odour nuisance. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment Path Kill Tanks	Digested sludge from onsite digestion process	• 2 x Pathogen kill tanks Sludge is held in the tanks asspecified in the HACCP plan. The current site HACCP plan will state the latest minimum retention time.	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL score **Source mitigation -** Odour is minimised through process control. We optimise digester operation to ensure that digested sludge has a low FIDOL score. Sludge is only kept in the path kill tanks for the time required by the site HACCP plan. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment Dewatering	• Digested sludge from onsite digestion process. • Polymer is added to aid the dewatering process.	• 1x Primary sludge storage tank • 1x SAS sludge buffer tank • 1x sludge liquor pumping station • 3x centrifuges	**Risk before mitigation - Moderate. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL score. Polymer is odourless. Liquors may have a moderate FIDOL score. **Source mitigation -** The centrifuge is an enclosed unit, controlled by Odour Control Unit. Centrates are returned to the head of the works as soon as possible after production. **Pathway/receptor mitigation** - n/a odour controlled at source

	• Dewatering liquors are produced.	Maximum 1 day retention time - time is required to even out the ammonia load to the sewage treatment process.	
Sludge handling and treatment Cake pads	Dewatered cake from the onsite digestion process	• 1 x day pad • 7 x cake storage bays The intention is to ensure that cake is not stored on the pad for >12 months	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digested sludge has a low FIDOL score **Source mitigation -** Digested cake forms a firm crust after 1 -2 days, which is essential to ensuring that odours are minimised. Cake is stored on site before being sent to land. Once compliance tests are passed it can be moved offsite to farmers fields for storage. The site HACCP plan can be found in Waterpedia. **Pathway/receptor mitigation** - cake is not moved on windy days.
Biogas utilisation CHP engines	Combustion of biogas produced onsite	2 x Jenbacher combined heat and power units 1 x Perkins combined heat and power unit (850kW each and 836kW)	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmosphere **Source mitigation -** Engines are specifically sized for the sites operation to minimise the amount of excess gas produced. If there are problems with the CHP engines, sludge imports will cease until the CHPs are back online. This minimises gas production on site **Pathway/receptor mitigation** - n/a odour controlled at source
Biogas utilisation Flare stack	Combustion of biogas produced onsite.		**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** Unburnt gas is released to atmosphere **Source mitigation -** At times when the CHP engines are down, the imports have ceased, and the storage within the digester roofs and gas holder is maximised, the excess gas will be flared. **Pathway/receptor mitigation** - n/a odour controlled at source

13) Odour Abatement Systems

There are 5 odour control units at the site, 2 areas are outside of the permit: inlet channels and PST desludge chambers.

Parameter	Inlet Channels & Screening Skip (outside of permit)	Sludge Reception Building System	Sludge Blending Tank, Buffer Tank, Liquors P.S. and 3 No. Centrifuges / Thickeners	Sludge Import Area	4 No. PST Desludge Chambers (outside of permit)
OCU Type	ERG dry scrubber	2 x Dry Scrubber System in parallel	2 No. C.I.F. Modules in parallel followed by Carbon Filters in series	2 x Peacemaker PP8000 in series	Jones & Attwood C.I.F. Pre-Filter Sulfatreat Polishing System
System details	Fully enclosed systems, vent to atmosphere via a single exhaust point				
Media type	Oxidising Chamber - pellets impregnated with stabilised chlorine dioxide. Polishing stage - Absorptive (carbon) media.				
Media Quantity (kg)	-	-	-	-	-
Media Life (Years)	Media pro-actively replaced every 5 years. ME30 specifies design life of 5 year minimum				
Design Inlet Parameters					
Airflow (m3/hr)	1500	16,300	1500	900	320
Hydrogen Sulphide	Average 50mg/m3, Peak 200mg/m3 (design manual)				
Stack Outlet Performance					
Odour Conc. (OUE/m3)	95% reduction (design manual & ME30)				
Hydrogen Sulphide	99% reduction (design manual & ME30)				

Site operators carry out regular checks on the odour abatement equipment. Performance checks for the odour control units are described in section 13) monitoring plan and Appendix 3.

Design Parameters

Odour control units are designed according to the principles in these documents (copies are available on Sharepoint):

- ME30 Odour Control Equipment and Building Ventilation (version 4.01). ME30 is based on the industry standard WIMES 805.
- STW design manual – Sewage Treatment Odour Control (version 1.1).

The Severn Trent design standard for odour abatement equipment (ME30) requires 95% total odour reduction and 99% hydrogen sulphide reduction.

Exact sizes for OCUs will be determined by the manufacturers depending on inlet data provided by Severn Trent.

The moderator/ Peacemaker odour abatement systems are manufactured by Air-Water Treatments Ltd (AWT). They are fully enclosed units with exhaust points. The moderator is a pre-treatment stage. Peacemakers are a package unit form of dry chemical scrubber that consists of two internal stages. The first stage consists of pellets impregnated with stabilised chlorine dioxide which oxidise hydrogen sulphide, mercaptans and other odorous compounds. The second polishing stage serves to remove ammonia and other compounds not oxidised by chlorine dioxide.

The biofilter contains a media that supports biomass for odour removal. The media is kept moist using an irrigation system.

Diagrams of the odour control units are found in Appendix 2.

Figure 4: Peacemaker System in series at sludge import area

14) Monitoring Plan

Monitoring is essential to our operational control. These are some of the benefits it provides:

- Assessing the nature and extent of a potential risk of odour pollution
- Investigating sources and pathways
- Measuring releases
- Showing patterns that can be used to plan the timing of operations and predict potential risks of odour pollution
- Aiding management and control of the process, including in exceptional circumstance the diversion of waste to a similar facility

Some of the monitoring methods that we use are as follows:

- All Tanker trade waste is booked into the site to enable the Site Manager and Operatives to understand the daily and weekly expected tonnages and potential gas production.
- Monitoring the process controls of the Anaerobic Digestion and Urban Waste Water process. For example digesters are monitored for %DS, feed rate (both recorded on JRP), temperature, pH, VFA, gas quality and H2S (site manual readings) as part of the “golden measures” programme.
- We have established a time-based media change programme whereby media in our odour control units is replaced every five years in accordance with manufacturers specifications and ME30. We also carry out regular checks to ensure that our odour control equipment continues to be fit for purpose (see Appendix 3 Odour Management Tanks).
- We measure the performance our odour abatement equipment on a regular basis. Tasks are assigned to site operators on the SAP/ Sitemate system (See Appendix 3 Odour Management Tasks).
- We review our OMPs annually. This includes a review of the FIDOL and source/ pathway/ receptor assessment found in Table 3 Inventory of Odorous Materials.
- We have a series of control and reactive measures identified for areas of site that have the potential to be odorous. See Table 5 for control measures.
- ***As part of the new IED permit, we commit to carrying out a review of our abatement plants, to determine whether measures have been effective, and to further characterising emissions from the odour control units in line with BAT 3 and 8 to demonstrate that H2S, NH3, TVOC and HCI are not present in the waste gas stream. If H2S, NH3, TVOC or HCI are found to be present, or any improvements to equipment required, a monitoring and improvement plan will be put in place in agreement with the EA.***

If we were to receive odour complaints or suspected that there was a risk of odour nuisance, then reactive monitoring would be implemented:

- Sniff testing (as described in H4) would be carried out by members of staff from the offices/ other areas of the business (who are less sensitised to sewage treatment odours) in order to pinpoint the source of the odour nuisance. This assessment would focus on the works perimeter as well as the sewage and sludge treatment routes. Sniff testing would include the non-permitted area of site in order to ensure that all potential sources of nuisance are accounted for. Forms for recording observations can be found in the Appendix 4 (Forms).

- Results from the sniff testing assessment would be evaluated and if necessary, further investigation would be carried out via gas bag testing, or GCMS if required. A specialist contractor would be hired to undertake this work.

15) Odour risk assessment

Table 3 Odour risk assessment

Cause of elevated odour	How the severity is measured	Likelihood (pre controls)	Control measures
Delivery of waste under normal conditions and acceptance of wastes with a strong offensive odour	Inspection, sample and analysis of waste	Low	Follow site procedures for pre-acceptance assessment of waste and quarantine/ rejection of nonconforming loads. Deal with loads promptly after acceptance. As specified in EA-approved Waste Acceptance Procedures for Trade Waste, a full assessment of waste is undertaken before first delivery, including laboratory analysis/sampling. Then, sampling of each load before allowing discharge at site. Delivery in contained vehicles. Scheduling of waste to allow immediate processing. Site staff reject odorous loads. Tanker drivers clear up any spills promptly.
Removal of sludge cake from site under normal conditions	Odour assessment of cake	Low	Use competent haulage contractors Collection in sheeted vehicles. Minimise agitation of cake during loading. Consider weather conditions when moving cake.
Damage to tank roofs	Digesters and gas holders are alarmed to indicate loss of pressure	Medium	Routine inspection & maintenance regime of digester roofs, in line with Gas Holder Regulations. Digesters & gas holders are alarmed to indicate loss of pressure. Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget.
Damage to fabrication of sludge building	Visual inspections	Medium	Visual inspection of the sludge building fabrication. Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget.

Digester pressure valves activate & biogas is released	Digesters are alarmed to indicate pressure	Medium	Control digester feeds and volumes to maintain safe biogas level Site manager investigates the cause of gas release.
Valves, pipes or pumps damaged or malfunctioning	Routine site checks Detected by site staff	Low	Selection of correct pipework for pressure and flow loads. Frequent on site checks Clean any spills promptly. Site manager investigates cause of failure & arranges for maintenance, either by recording the issues on Severn Trent Operational Risk Matrix (STORM) or using the site OPEX budget. Site staff ensure that any spills are cleaned promptly.
Processing equipment damaged or malfunctioning	Regular checks. Detected by site staff	Medium	Any equipment failures and associated risks requiring capital maintenance recorded on Severn Trent Operational Risk Matrix (STORM). Short term maintenance issues resolved through site manager OPEX budget.
Failure of electricity supply resulting in CHP engines flaring/ failing to ignite	CHP engines and flare will fail to work/ ignite	Medium	Dual electricity supply to site.
Human error – staff, managers, visitors	Regular checks Detected by site staff	Medium	Staff training and supervision. Visitor inductions. Regular checks. Clean any spills promptly. Near miss reporting on SafetyNet.
Loss of pressure vessel containment	Detected by systems Detected by site staff	Low	Selection of correct pipework for pressure and flow loads. Frequent on site checks Maintainence in accordance with pressure vessel requlations Batch process

Malfunction or damage caused by unauthorised visitors	Regular checks Detected by site staff	Medium	Security measures are in place including controlled access gates operated in accordance with our Closed gate policy. Perimeter fence and CCTV. Near miss reporting on SafetyNet.
Fire and/or explosion resulting in sludge spill/ odour release	Detected by systems Detected by site staff	Medium	Staff training and supervision. DSEAR zones identified on map and on site. Fire extinguishers placed for quick access and checked regularly. Established contact with local Fire Service who have undertaken a site specific assessment. Site manager reports issues on Safety Net & investigates causes. Site staff clean any spills promptly and carry out checks on affected equipment.
CHP gas engine emissions	Odour detected by site staff.	Low	Scheduled stack emissions testing in accordance with requirements set out in the Environmental Permit. Serviced by STW CHP trained technicians as per manufactures recommendations and after each 1000hr service the emissions are monitored using calibrated handheld Testo unit. 3rd party MCerts approved contractor monitors the exhaust emission once per year in line with permit requirements. If emission are found to be outside of the expected range then they are investigated and rectified by replacement of parts or bringing forward the service interval.
Poor housekeeping on site	Detected by site staff.	Low	Regular checks carried out by site staff who complete the Site Standards Records App. Spill training is undertaken by Wholesale Ops and spill kits/hoses are readily available. Ensure spills are cleaned up promptly.

Flooding from river/ blocked drains results in sludge spills	Detected by site staff.	Low	The general site has wider works designed to minimise risk of localised works flooding due to storm surges. Site wide drainage system linked to main sewage works, which includes additional capacity in storm tanks within the works to manage additional flows Site staff follow the site incident response plan & inform relevant authorities Clean up any sludge spills as soon as possible to minimise odour nuisance.
Staff absence	Detected by planning/site staff.	Low	Staff from other sites will cover the work of the absent staff Ensure site log is up to date so that returning member of staff knows what is going on.

16) Responding to Odour Concerns and Complaints

Severn Trent Water takes any incidents, non-compliances and environmental complaints very seriously and have procedures in place to record and investigate these. Incidents are managed through standard procedures which ensure that all incidents are logged and that necessary preventative and/or corrective actions are taken.

Complaints are managed by Customer Services, where all complaints are logged on the Complaints Records Online Storage System (CROSS). Customer complaints can be received via phone, email, letter or social media. Customer services operatives follow a script to ensure that standard details are recorded. If a complaint is made directly to the site operators, then they contact Customer Services to ensure that the issues are recorded centrally.

Site Managers are responsible for

- investigating complaints using the reactive monitoring measures described in section 10. The results of their investigations can be recorded on the report form in Appendix 4.
- providing a timely response to the complainant detailing the reason behind the issue and the actions taken to resolve the matter.
- liaising with the relevant regulatory bodies (where appropriate)
- ensuring that work is undertaken to resolve the issue. See section 7 Our Response to Odour Nuisance for more details of possible actions.

Information regarding complaints is recorded to allow determination of an appropriate response (corrective action) and to determine what measures need to be taken in the future to prevent its reoccurrence (preventive action). Please see Appendix 5 for a full version of the Complaints Response SOP.

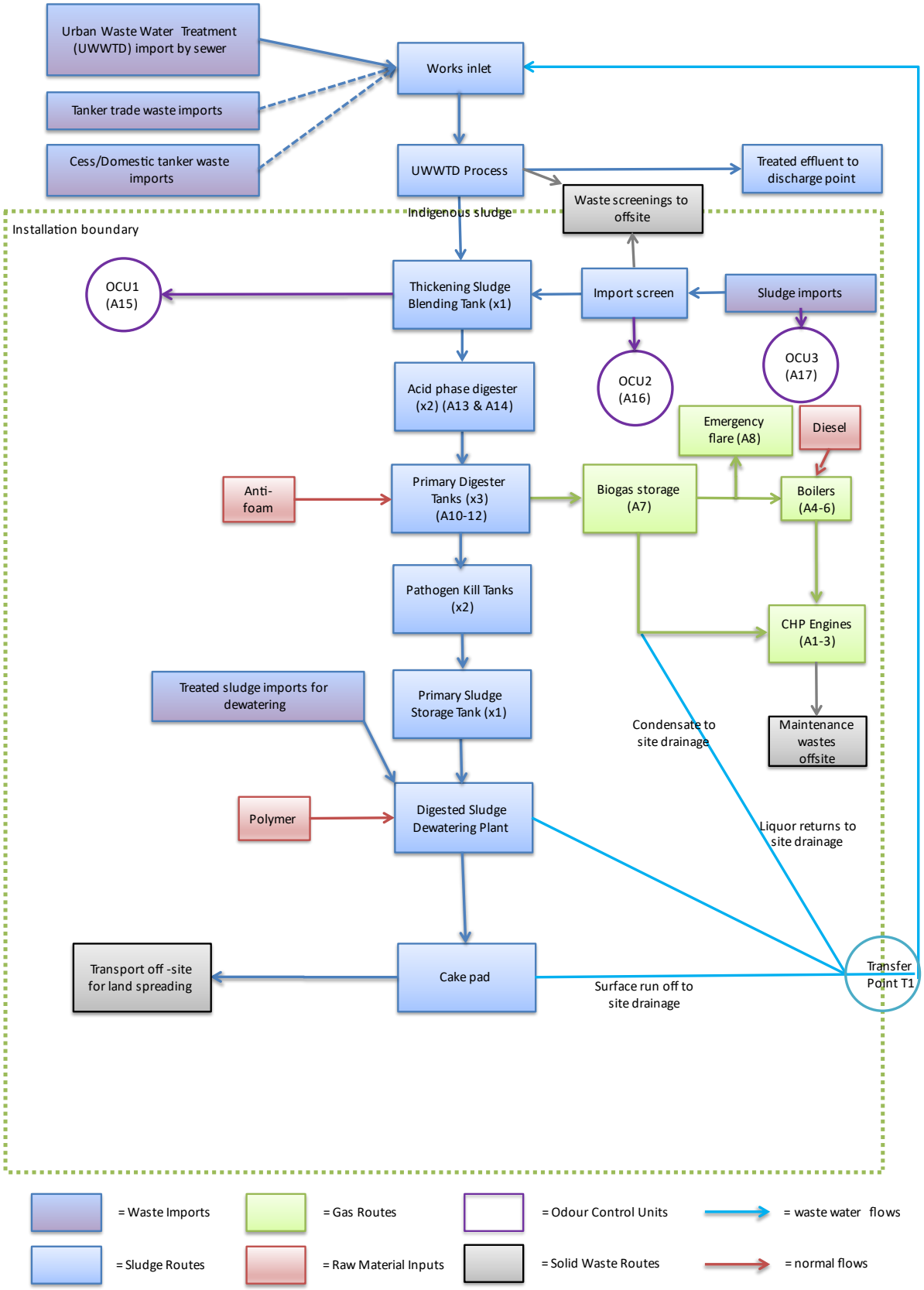
The EMS management review team review the MI (Management Information) data, which will include odour complaints.

Recurring odours may require investigation by our Process Design Engineering teams (PDE). FIDOL assessments (Frequency, Intensity, Duration, Offensiveness and Location) are undertaken to assess whether any changes to the process are required.

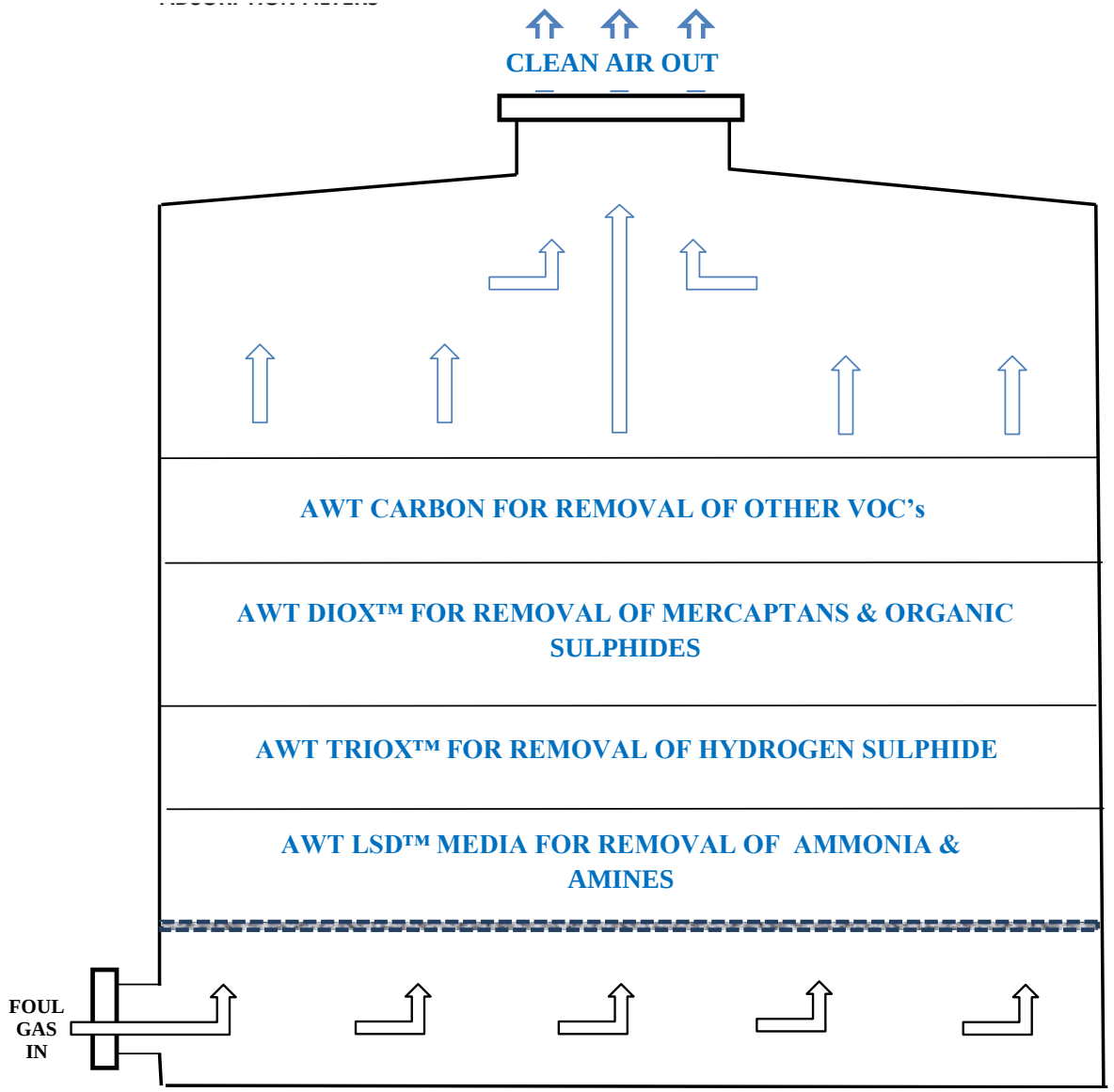
Where odour issues are prevalent, we would adopt the stance taken at Wanlip Sewage Treatment Works during 2017/18. Live odour surveys were set up weekly with the local Council. Severn Trent also engaged with local residents and invited customers to site to investigate the locations on site and potential odour olfactory variances.

Engagement with the Environment Agency for process issues or pollutions that could cause odours, would be through either a Schedule 5, or a phone call to the Local Environment Officer as per the contacts section (Appendix 4).

Appendix 1: Process Flow Diagrams – SludgeTreatment Process



Appendix 2: Odour Abatement System: Peacemaker



Appendix 3: Odour Management Tasks

Task	Frequency	Performance Indicators	Method	Remedial Actions
Extraction fan visual inspection	Weekly	No damage/ leakage/ signs of corrosion	Visual inspection	If fan is damaged raise a job via site OPEX or STORM
Extraction fan noise	Weekly	Increase noise or vibration from the fan motor	Listen	If fan is damaged raise a job via site OPEX or STORM
Check physical integrity of ducting and covers	Weekly	No signs of degradation or other damage and no holes. Covers on tanks closed	Visual inspection	Close covers If ducting/ covers are damaged raise a job via site OPEX or STORM
Check media pressure drop	Monthly	As per O&M		Check fan performance
Check fan motor, belt condition and tension	Annually	As per O&M	As per O&M	Adjust tension. If parts need repair/ replacement raise a job via site OPEX/ STORM
Measure hydrogen sulphide in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 doesn't mention H_2S)	External contractor CEN TS 13649 for sampling NIOSH 6013 for analysis	Check functionality of odour control unit & if necessary arrange for media replacement
Measure ammonia in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 requires 0.3 - 20mg//Nm^3)	External contractor EN ISO 21877	Check functionality of odour control unit & if necessary arrange for media replacement
Measure odour in the outlet gas stream	6 monthly or as agreed in writing by the Environment Agency	tbc (BAT 34 requires 200-1,000 ouE/Nm^3)	External contractor BS EN 13725	Check functionality of odour control unit & if necessary arrange for media replacement

Appendix 4: Forms
Odour Report Form for Sniff Testing

Odour Report Form for Sniff Testing				Date	
Report completed by					
Time of test					
Location of test (area of site)					
Weather conditions (dry, rain, fog, snow etc.)					
Temperature (warm, mild, cold or degrees if known)					
Wind strength & direction					
Odour Intensity (see below)					
Duration of test					
Constant or intermittent odour in this period?					
Describe the smell					
Is the source evident?					
Other comments					

Odour Intensity:
0 - no odour
1 - very faint odour
2 - faint odour
3 - distinct odour
4 - strong odour
5 - very strong odour
6 - extremely strong odour

Odour Complaint Investigation Report Form

Odour Complaint Investigation Report Form	
Time and date of complaint	
Name & contact details of complainant	

Date of odour	
Time of odour	
Location of odour	
Weather conditions (dry, rain, fog, snow etc.)	
Temperature (warm, mild, cold or degrees if known)	
Wind strength & direction	
Weather conditions (dry, rain, fog, snow etc.)	
Complainant's description of odour: • What does it smell like? • Intensity • Duration (time) • Constant or intermittent? • Other comments?	
Are there any other complaints in relation to the installation/ location (either historically or at the same time)	
Any other relevant information	
Do you accept that the odour is likely to be from your activities?	
What was happening on site at the time the odour occurred?	
Operating conditions at the time the odour occurred	
Actions taken	
Form completed by	

Odour Intensity:

0 - no odour 1 - very faint odour 2 - faint odour
3 - distinct odour 4 - strong odour 5 - very strong odour
6 - extremely strong odour

Appendix 5: Standard Operating Procedure for Complaints Responses

Standard Operating Procedure (SOP)

Title	*Odour Customer Complaints On-site (Waste)*

Why	*To improve our ODI SIM (Service Incentive Mechanism) Compliance and improve the customer experience, also this will provide Severn Trent with a procedure for any odour complaints if Enviromental Health ask for evidence.*
Who	The Wholesale Operations Non Infra Team Manager shall have overall responsibility for implementing this procedure. The procedure must be followed by Technical Operators and Senior Technicians responsible for the day to day operation of sewage treatment works.
Scope	This SOP covers how to respond on-site to customer complaints relating to odour at a sewage treatment works.

Must Have's (H&S, Quality, Quantity, Environment, Training, Resources)

- Standard PPE
- Up to date site odour checklist highlighting areas on site that have odour issues
- Access to CROSS
- Must have a Wind Sock on all occupied sewage treatment sites

Remember – 'Stop, Think, Take 20'

Summary Must Do's

Enter here no more than 10 key points / requirements of this SOP

1. Contact the customer within 24hrs of complaint (Team Manager)
2. All customer complaints must be investigated via reactive site odour check within 3 days of complaint (Operative)
3. Proactive site odour checklist once a month, except once a week June-August
4. Pass on completed site odour checklist to Environmental Health
5. All complaints recorded on CROSS (Team Manager)
6. Detailed report of customer complaints sent to COSC to form central record (Team Manager)
7. Must complete next steps/actions from site odour check (Team Manager/Operative)

Detailed step-by-step guide: Proactive

Step	Procedure	Why
1	If possible liase with Environmental Health and walk around site to identify areas where odour is present	Developing good working relationship with external regulators
2	Create a site odour checklist and site map highlighting areas with odour issues (see Wanlip STW as an example in references)	It provides a structured and consistent approach to checking site odour levels
3	Every month a site operative must complete a site odour checklist, every week during summer months	This is to create an audit trail to act as evidence of site odour
4	Carry out site odour checklist using site map of highlighted areas where historic odour issues have occured and record next steps throughout the process	If assets are out of service or not operating correctly this can affect odour levels
5	Check wind direction using on site wind sock where present	Is customer complaint up wind or down wind of site
6	Check weather conditions	Dry or misty conditions will increase the likelihood of odour issues
7	Record flows into works	Higher flows can flush septic sewage out of the network
8	Check site golden measures for action limit breaches and specify any that could influence odour levels	For example high sludge levels in a primary settlement tank can lead to septic sludge
9	Check if there is a increase in odour levels around plants operated by other companies on a Severn Trent site (e.g. Biffa food waste plant at Wanlip STW)	
10	Check if there are any other operational issues potentially effecting odour	There could have been a change in circumstances on site (e.g. an incident has occurred or new assets/processes installed)
11	Check if there are any factors outside of the site that are influencing site odour levels	E.g. Trade discharge customers discharging high strength waste into the network
12	Carry out and complete next steps	
13	Store proactive site odour reports electronically and forward onto Environmental Health (if applicable)	To create records to refer to, to build relationship with Environmental Health and allow customers to view a public record

Detailed step-by-step guide: Reactive

Step	Procedure	Why
1	Team manager/site operative receive customer complaint via COSC or direct customer contact	
2	Record customer details in actions/next steps of the site odour check list	Help track and keep a record on site of customer odour complaints
3	If contacted by COSC, must contact customer within 24 hours of complaint	To ensure that we maintain a good relationship with our customers
4	If direct customer contact then liase with COSC and inform them of the odour complaint	To ensure that Severn Trent have a central record of customer odour complaints
5	Create site odour checklist if not already produced as part of proactive work	
6	Carry out site odour checklist using site map of highlighted areas where historic odour issues have occured and record next steps throughout the process (follow from step 4 in proactive process)	If assets are out of service or not operating correctly this can affect odour levels
7	Carry out and complete next steps	
8	Store reactive site odour reports electronically **and forward onto Environmental Health (if applicable) CROSS**	To create records to refer to, to build relationship with Environmental Health and allow customers to view a public record
9	**What do we do now? Who contacts the customer? (COSC or team manager is it COSC unless direct contact?)**	
10	If persistent or compliant is escalated (Severn Trent heirachy or local MP) then invite customer for site visit	

Records, Appendices & References
Site specific odour checklist form

Document Control & Governance:		
Owners Name		James Stalbow
Owners Role		Non-Infra Improvement Manager
Date of Next Review		*TBC*
Version Number		*Draft1*
Revision History		*First draft*
Version 1	*Date* *04/05/2017*	*Notes* *First issue*
The only valid version of this SOP is the electronic version held in Waterpedia. If this is a printed version it is only valid on the date of printing. Ensure this SOP is still within the current review period If not 'DO NOT USE' and contact your line manager for the new version		

Appendix 6: Derby Site Contact Details

Area of Site	Company Responsible	Contact Name	Phone Number
Sludge Screening Rag Skips		REDACTED FOR EA ISSUE	
Odour Control Units			
CHP Units			
Trade / Domestic Waste			
Biosolids / Cakepad			
Permit Compliance			
Bioresources Operations			
Production Operations			
Derby City Council Council			
Environment Agency			