Barnhurst Sludge Treatment Centre

Odour Management Plan

Revision	Purpose/Description	Originated	Checked	Reviewed	Authorised	Date
1	**First Issue**	**Liz Cherry**	**Kay Daily**	**J Chapman**		**20/12/21**
2	**Resubmission**	**Liz Cherry**	**J Chapman**	**M McAree**		**15/12/23**
3	**Updated due to EA comments**	**M McAree**	**S Whitehouse**	**J Chapman**		**14/05/24**

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 Barnhurst 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

Barnhurst Sewage Treatment Works is located in the north of Wolverhampton.

A plan of the proposed permitted site boundary can be seen in figure 4 (section 8) of this Odour Management Plan.

The approximate site centre is at National Grid Reference (NGR) SJ 8990 0180.

Barnhurst STW treats a population equivalent of approximately 150,000. The current discharge permit (S/06/55227/R) levels (on a 95%ile basis) are 10mg/l BOD, 15mg/l SS, 3mg/l ammonia and 1mg/l P. The final effluent is discharged to both the Shropshire Union Canal and the Staffordshire and Worcestershire Canal.

3) Site surroundings

Barnhurst STW is located in the north of Wolverhampton. The site is bordered to the north east by the Shropshire Union Canal, to the east by the Staffordshire and Worcestershire Canal and to the south west by a railway line.

Figure 1: Site location plan

The site is in an urban area with areas of housing in all directions. There is a housing estate immediately west of the sewage treatment works. Houses in Alderford Close, Eastney Crescent, Bebington Close, Hisea Close, Catisford Crescent and Gainford Close are adjacent to the site boundary. The sewage works side of the fence is planted with trees to provide some screening. Dovecotes Primary School is approximately 300m northwest of the site and Aldersley High School is 600m west.

The canals are used by canoeists and other leisure craft - there are narrow boat moorings and a canoe club on the banks of the canal adjacent to the sewage works.

Pendeford is approximately 500m north of Barnhurst STW, this area is a mixture of housing and industrial units. Rakegate Primary School and Ormiston New Academy are within 1km of the site.

Oxley Park Golf Club and Oxley are 200m east of the site. South of the STW, there is a park that includes Wolves Football Academy, beyond that, 1km from Barnhurst STW is Wolverhampton Racecourse. Beyond the racecourse there is more housing in Whitmore and Tettenhall.

Barnhurst has a history of odour complaints from local residents. As result odour mitigation measures have been put into place and the raw sludge route and parts of the wastewater route are covered and vented to odour control units.

Figure 2: Sensitive Human Receptor Locations

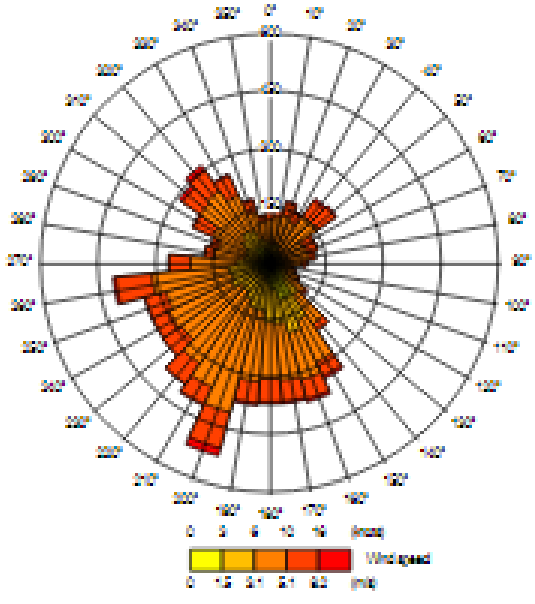
Sensitive receptors table, as included in the air emissions modelling:

Receptor	Description	Grid reference		Distance from CHP engine stack (km)	Direction from CHP engine stack
		Easting	Northing		
R1	Residential property on Portswood Close	389966	302418	0.33	NNE

Receptor	Description	Grid reference		Distance from CHP engine stack (km)	Direction from CHP engine stack
		Easting	Northing		
R2	Residential property on Chandlers Close	390027	302392	0.33	NE
R3	Residential property on Chandlers Close	390100	302359	0.36	NE
R4	Residential property on Renton Road	390334	302273	0.52	ENE
R5	Residential property on Renton Road	390314	302194	0.48	E
R6	Residential property on Renton Road	390315	302104	0.48	E
R7	Residential property on Renton Road	390326	302025	0.50	E
R8	Residential property on Renton Road	390347	301948	0.54	ESE
R9	Residential property on Renton Road	390378	301864	0.60	ESE
R10	Residential property on Oxley Moor Road	390246	301736	0.56	SE
R11	Residential property on Oxley Moor Road	390184	301734	0.52	SE
R12	Residential property on Green Lane	389846	301487	0.63	S
R13	Residential property on Blakeley Avenue	389761	301553	0.57	S
R14	Residential property on Alderford Close	389703	301723	0.42	SSW
R15	Residential property on Eastney Crescent	389701	301831	0.32	SSW
R16	Residential property on Eastney Crescent	389694	301911	0.25	SW
R17	Residential property on Bebington Close	389666	301997	0.21	SW
R18	Residential property on Coldridge Close	389672	302065	0.175	WSW
R19	Residential property on Coldridge Close	389665	302138	0.175	W
R20	Residential property on Hilsea Close	389706	302182	0.15	WNW
R21	Residential property on Catisfield Crescent	389751	302233	0.14	NW
R22	Residential property on Catisfield Crescent	389773	302260	0.16	NNW
R23	Residential property on Gainford Close	389798	302278	0.16	NNW
R24	Residential property on Gainford Close	389821	302298	0.18	N
R25	National Cycle Route 81	389897	302342	0.23	NNE
R26	National Cycle Route 81	389971	302267	0.20	NE
R27	National Cycle Route 81	390044	302199	0.22	ENE
R28	National Cycle Route 81	390096	302137	0.26	E

Historical prevailing wind data below from the Met Office shows the predominant direction is South-West. This windrose is for the nearest available site (Birminham Airport) and was used in our dispersion modelling. This data has been collected from January to December 2020 and is seen to be representative of the wind direction for the location. Approximate location of met station at Birmingham Airport is E 417209 N 284115

Figure 3: Wind rose for Birmingham Airport 2020



4) Process Overview

A sludge process flow diagram is found in Appendix 1.

Under the Urban Wastewater Treatment Regulations, sewage that has been screened and degritted is settled in 6 No. circular primary settlement tanks. A further 2 primary tanks can be used to store contaminated sewage in an emergency. Settled sewage is split between 3 No. activated sludge plants. ASPs 1 and 2 each have 8 No lanes containing surface aerators followed by 4 No. FSTs. ASP 3 has 6 No. lanes containing diffused aerators followed by 6 No. final tanks. Effluent from the ASPs is combined and treated further in deep bed sand filters before discharge into either the Shropshire Union Canal or the Staffordshire and Worcestershire Canal. Storm flows are held in 8 rectangular storm tanks. These are fitted with Amajet systems to aid cleaning.

Under the installations environmental permit, indigenous primary sludge is held in 1 No. primary sludge buffer tank before being thickened on 3 No. belt thickeners and transferred into 1 No. pre-digestion thickening blending tank. Polymer is added to aid the thickening process

Indigenous SAS is held in 1 No. SAS buffer tank before thickened on 3 No. belt thickeners and transferred into the pre-digestion thickening blending tank. Polymer is added to aid the thickening process.

Raw sludge imports are pumped via the sludge import well, and screens to the pre-digestion thickening blending tank.

Blended sludge is fed to one of 3 No. mesophilic anaerobic digesters. Sludge is held in the digesters for the required time stated on the HACCP plan. Biogas is collected from the digesters, stored in 1 No. telescopic roof gas holder and used in 1 No. CHP engine.

Digested sludge is held in 2 No. centrifuge feed tanks prior to being dewatered using 3 No. centrifuges. Polymer is added to aid the dewatering process and centrate is returned to the head of the works for further treatment. Digested cake is transferred off site for storage at Hatton's Farm prior to being recycled to agricultural land.

The location of these process units on site is shown below:

Figure 4: Barnhurst STW and STC

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

Barnhurst STW served a population equivalent of 148,968 in 2020/21. The digestion plant has capacity to treat 8,824tds/annum.

7) Waste material accepted

Barnhurst currently does not accept any tankered trade wastes into the sewage treatment works or the sludge treatment route. Raw sewage sludge is accepted under a T21 waste exemption.

For future reference when the plant is permitted under IED, the full list of EWC wastes we are permitted to accept at the site will be found in Schedule 2 of the new permit, and any imported wastes will be accepted under the approved waste acceptance procedures. The new permit will be available to site staff.

Waste imported for dewatering and storage only

As the treated dewatered sludge cake from Barnhurst is transferred off site, it is unlikely that the site would receive imports of cake.
Barnhurst does not generally receive imports of digested liquid sludge though it does have the facility to do so. Imports would be discharged into the storage tanks on site. The site would only receive imports from other sites that were BAS certified.

8) Delivery Vehicles

Currently only wastes listed on the T21 exemption are accepted at site.

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.

Liquid wastes will only be accepted or exported in sealed tankers.

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.

9) Permitted Area

The area covered to be covered by the new permit is shown in figure 4.

Figure 5: Permitted Area

Table 1: Emissions Points to Air

Emission Point ref and NGR	Source	Components	Odour risk
A1 SJ 89839 02118	CHP engine 1 – Jenbacher 1	Products from biogas combustion	Low - Combustion plant is regularly maintained and appropriately sized to manage volumes of gas
A2a SJ 89846 02079	Standby Hot Water Boiler 1 - Broxley	Products from oil/ gas combustion	Low - Boiler is regularly serviced.
A2b SJ 89846 02079	Standby Hot Water Boiler 2 – Broxley		
A2c SJ 89846 02079	Standby Hot Water Boiler 3 – Broxley		
A3 SJ 89801 02110	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.
A4 SJ 89857 02120	Digester tank 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.
A5 SJ 89862 02110	Digester tank pressure relief valves		
A6 SJ 89872 02086	Digester tank pressure relief valves		
A7 SJ 89850 02004	Centrifuge Feed tank pressure relief valves		
A8 SJ 89858 01984	Centrifuge Feed tank pressure relief valves		
A9 SJ 89820 02113	Gas holder pressure relief valve		
A10 SJ 89868 01969	Imported sludge tank Odour Control Unit (OCU)	Raw sludge odours e.g. H_2S	Low - the odour control units are subject to regular preventative maintenance. Media is replaced in line with the manufacturers' recommendations
A11 SJ 89899 01967	Imported sludge well OCU		
A12 SJ 89927 01988	Screen room and centrifuge tank OCU		
A13 SJ 89825 01993	Pre-digestion blending and primary sludge buffer tanks OCU		
A14 SJ 89852 02024	Primary sludge thickeners OCU		

A15 SJ 89827 02068	Centrifuge OCU		
A16 SJ 89778 02084	Centrate return well OCU		
A11 SJ 89899 01967	Imported sludge well OCU		

10) Available onsite 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: Barnhurst site capacity details

Element	Capacity	Total Capacity
Pre-thickening tank	1 x 300m^3	300m^3
SAS buffer tank	1 x 600m^3	600m^3
Thickening blending tank	1 x 900m^3	900m^3
Digested Sludge Holding Tank	1 x 300m^3	300m^3
Digesters	3 x 2,800m^3	8,400 m^3
Dewatering tanks	2 x 600m^3	1,200m^3
	Total	**11,700m^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 Success Factors.

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.

BAT Improvements

We are committed to covering tanks to limit odour further where required in line with BRef. Our plan is based on a 3-stage approach to covering and abating emissions from tanks.

- The first approach is for the most active tanks, for example the pre-centrifuge tank. We aim to cover, then harvest the additional gas from the covered tanks and recycle this into the existing CHP engines situated on site.
- For less active tanks, our second approach will be looking at options of covering tanks and then abating emissions via methane/carbon filters and/or OCU's, we are also looking at additional methane removal via new technology (for example Elovac system)
- Lastly, for the low level emissions, we are looking at clay ball style covers (similar to approaches listed in Appendix 9 Guidance on Slurry Lagoons).

In reality we will utilise an amalgamation of all 3 across the sites and are already carrying out some trials with contract partners to help us define the right options.

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 4: Inventory of Odorous Materials

Stage of treatment	Odour source	Nature of source	Quantities & Retention Time	Odour risk/ mitigation using source/ pathway/ receptor model (Risk assumed during normal operation)
Sewage treatment	Inlet works	Open & covered channels. Covered skips	Dry weather flow for the site is 47,500m^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 covered by odour control units.
Sludge handling and treatment	Raw sludge handling	Enclosed well & tanks	Import wells, primary sludge tank, belt thickeners & thickening blending tank (720m^3 total capacity) Retention time is minimised to ensure sludge is kept fresh.	**Risk before mitigation - High. Risk after Mitigation - Low** **Risks (before mitigation) -** raw sludge can have a high FIDOL score. **Source mitigation** - Import facility is enclosed and connected to a 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** - Tanks are covered and vented to odour control. Belt thickeners are in an odour controlled building.
Sludge handling and treatment	Raw sludge handling	Open SAS tank	SAS tank and belt thickeners (600m^3 total capacity) Minimal retention time - belts process sludge rather than storing it.	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** raw SAS has a low FIDOL score. polymer is odourless. Belt thickeners are located in a building. SAS tank is covered. **Pathway/receptor mitigation** - n/a odour controlled at source
Sludge handling and treatment	Digesters	Enclosed tanks with pressure relief valves	3 x mesophilic anaerobic digesters (8,400 m^3 total capacity)	**Risk before mitigation - Low. Risk after Mitigation - Low** **Risks (before mitigation) -** digestion takes place in enclosed tanks. Antifoam is not odorous.

			Design manual minimum retention time is 20 days. (Check HACCP plan on Waterpedia for the latest requirements)	**Source mitigation -** 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	Digested sludge dewatering	Open tanks	2 x dewatering tanks, 3 x centrifuges (1,200 m^3 total capacity) Minimal retention time - sludge may be held in the balancing tank to ensure an even flow to the 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 centrifuges and screens are enclosed units. Skips emptied regularly via contract with Biffa. Odour from liquors is minimised through process control - they are returned to the head of the works as soon as possible after production. **Pathway/receptor mitigation** - Cake is removed from site as soon as possible and stored at Hatton's Farm which is situated in a rural area.
Biogas utilisation	CHP engines	Engine emission stacks	1 x Jenbacher combined heat and power unit (830 kW)	**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

The following odour abatement systems have been installed on the Barnhurst sludge route:

Table 3: Barnhurst Odour Abatement Systems

Element	Odour Abatement Equipment	
Imported sludge tank	Moderator/ 3000 Peacemaker system	(OC1) Enclosed dry chemical scrubber, vents to atmosphere
Screened imported sludge well	Moderator/ 2000 Peacemaker system	(OC2) Enclosed dry chemical scrubber, vents to atmosphere
Screens room & centrifuge feed & sludge holding tanks	Biofilter	(OC3) Enclosed biofilter, vents to atmosphere
Thickening blending & primary sludge buffer tanks	P500 Peacemaker	(OC4) Enclosed dry chemical scrubber, vents to atmosphere
Primary sludge thickeners	1 x CIF 6000/ 6000 Peacemaker	(OC5) Enclosed dry chemical scrubber, vents to atmosphere
Centrifuges	Dry chemical scrubber	(OC6) Enclosed dry chemical scrubber, vents to atmosphere
Centrate returns	Moderator/ 2 x P500 Peacemakers	(OC7) Enclosed dry chemical scrubber, vents to atmosphere

There are also odour control units fitted on the wastewater treatment route. These are covered by the UWWD and so do not form part of this permit application.

Exact sizes for OCUs will be determined by the manufacturers depending on inlet data provided by Severn Trent. The Severn Trent design standard for odour abatement equipment (ME30) requires 95% total odour reduction and 99% hydrogen sulphide reduction. The following documents are used for the design and operation of the OCU's, which are available upon request:
- ME30 Odour Control Equipment and Building Ventilation (version 4.01) - Design manual ME30 for Odour control is adhered to for all Tier One supply chain partners.
- STW design manual – Sewage Treatment Odour Control (version 1.1)

The CIF (catalytic iron filter) is a pre-treatment unit that contains iron media.

Peacemakers are a form of dry chemical scrubbers. These are package units consisting of two 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 biofilters contain a media that supports biomass for odour removal.

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

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 pro-active 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 Incident/ emergency 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 5 Odour risk assessment

Cause of elevated odour	How the severity is measured	Likelihood (pre controls)	Control measures	Reactive Measures/ Actions
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 causing release of odorous gases	Digesters and gas holders are alarmed to indicate loss of pressure	Medium	Digesters & gas holders are alarmed to indicate loss of pressure. Digester roofs are routinely inspected & maintained in line with Gas Holder Regs.	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	Regular 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	Digesters are alarmed to indicate pressure 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	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.
Odour scrubber damaged or malfunctioning	Detected by site staff	Medium	Regular checks carried out by site staff. Media pro-actively replaced.	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 carry out checks to ensure that the odour control unit is working correctly once repairs are carried out.

Sludge processing equipment damaged or malfunctioning	Regular checks. Detected by site staff	Medium	Regular checks carried out by site staff	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.
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 procedure.
Malfunction or damage caused by unauthorised visitors/vandalism	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.	Report issues on Safety Net
Fire and/or explosion results 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 emissions 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 check list (found on Sharepoint) 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 on-call or 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.

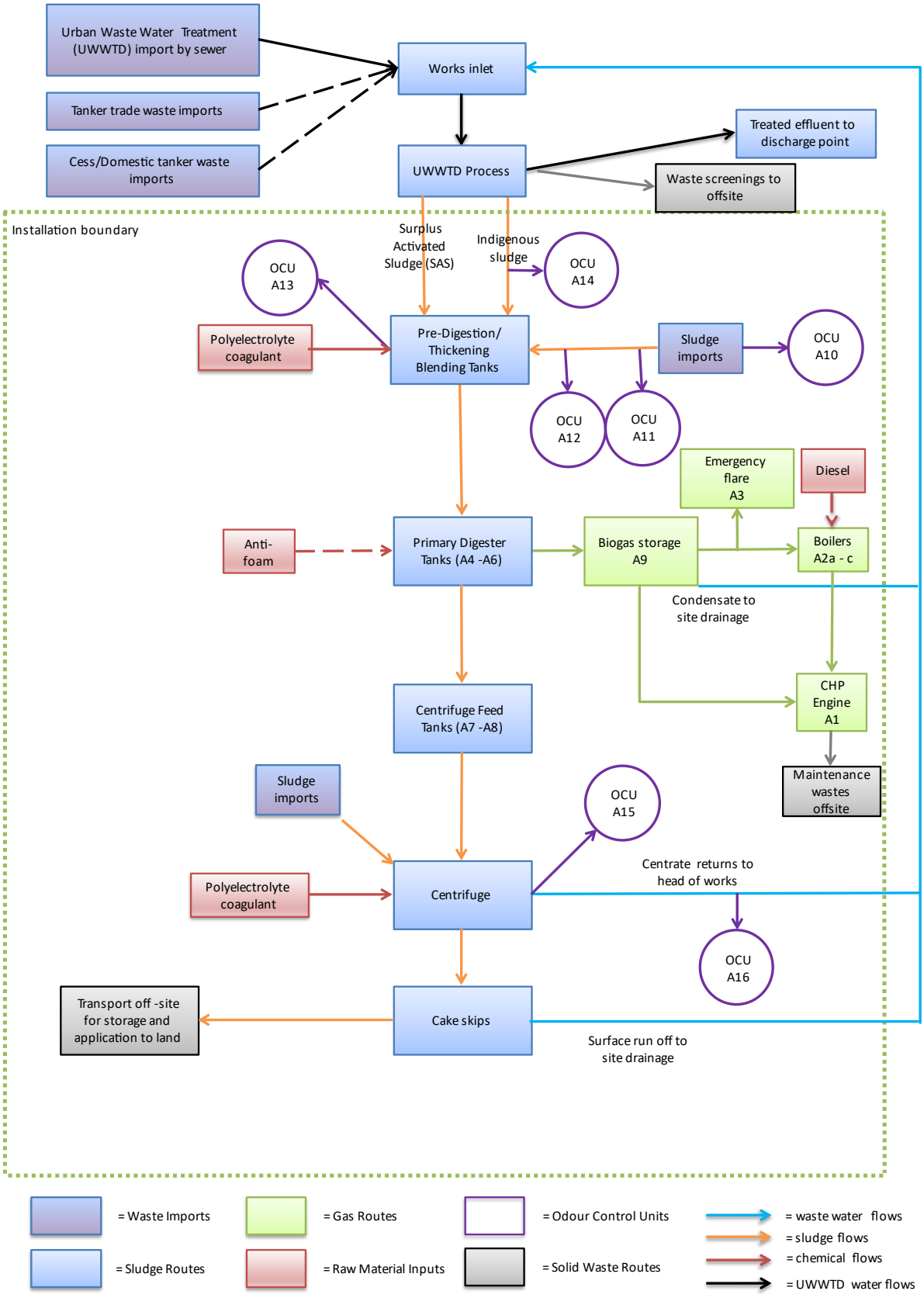
The EMS management review team review the MI (Management Information) data, which will include odour complaints.

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 our 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.

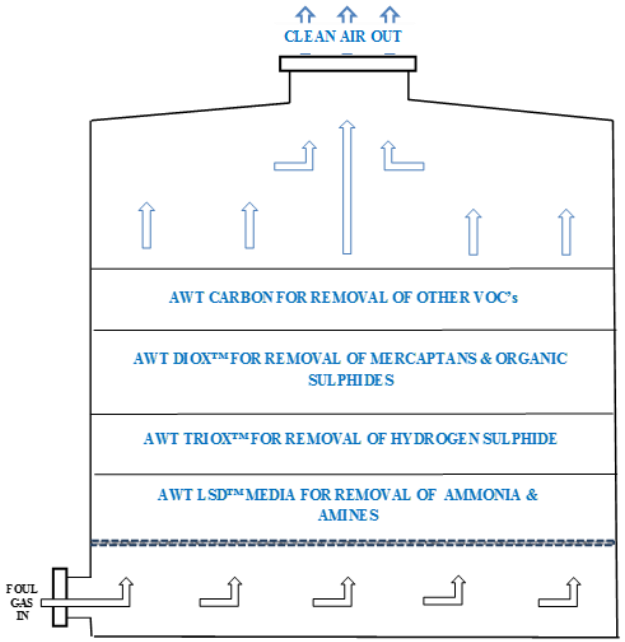
Engagement with the Environment Agency for process issues, pollutions that could cause odours or validated odour complaints would be through either a Schedule 5/6, or a phone call to the Local Environment Officer as per the contacts section (Appendix 6).

Appendix 1: Sludge Process Flow Diagram

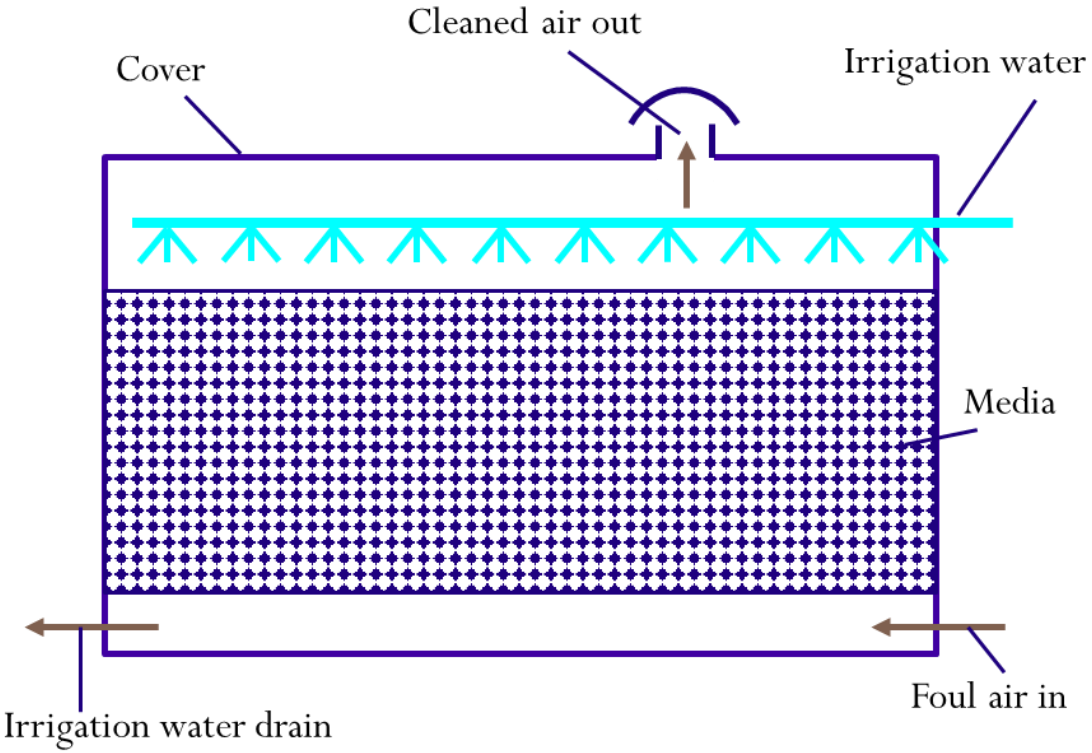


Appendix 2: Odour Abatement Systems

Peacemaker



Biotrickling filter



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	***Bioresources - Customer Odour Complaints***

Purpose	To ensure that our neighbours do not suffer from odour nuisance from our sludge treatment centres and to ensure compliance with our environmental permits.
Who	The Bioresources Team Manager has responsibility for implementing this procedure. The procedure must be followed by Technical Operators and Senior Technicians responsible for the day-to-day operation of sludge treatment centres.

Must Have (H&S, Quality, Quantity, Environment, Training, Resources)
• Standard PPE when carrying out site odour assessments • Up to date odour management plan for the site • Access to CROSS complaints database • Weather station should be installed at sludge treatment centres
Remember – 'Stop, Think, Take 20'

Summary Must Do
1. Ensure that each sludge treatment centre has an up to date Odour Management Plan. 2. Aim to prevent odour nuisance by ensuring good housekeeping and process control. 3. If complaints are received, ensure that the customer is kept informed of the actions that are taken to address their issue.

SOP - Proactive Measures

1. Ensure that the site has an odour management plan (OMP) in place and that this is available to all site staff. The OMP includes an odour risk assessment in the "Inventory of Odorous Materials" table. The OMP should be reviewed annually 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. We aim to proactively prevent odour nuisance by ensuring good housekeeping and process control. Ensure that Golden Measures are recorded and any issues acted on. Ensure that good housekeeping practices are used - sludge spills should be cleared up as soon as possible.
3. Where odour control units are installed, ensure that regular checks are carried out and the results of these checks are recorded. Details of the required checks are included in the OMP.
4. The steps in the incident/ emergency control table in the OMP can be used to develop a response to any issues that are picked up as part of the regular monitoring.
5. Be aware of weather conditions such as wind direction when carrying out potentially odorous operations such as moving cake.

SOP - Reactive Measures

Complaint received via COSC or direct customer contact

1. Customer complaints can be received via phone, email, letter or social media.
2. If a complaint is received directly by the site, then COSC should be contacted so that the complaint can be recorded centrally.
3. If a complaint is received via COSC, then site staff should contact the customer directly within 24 hours.
4. Customer details should be recorded on the odour complaint investigation report form (found in the appendix of the OMP).
5. Keep the customer informed at all steps of the odour investigation.

Carry out odour investigation

6. Use the odour complaint investigation report form. Record the following information:
   - time & date of odour complaint
   - Weather conditions at time of complaint
   - Operating conditions at the time of the complaint.
7. Walk the sewage and sludge treatment route and carry out a sniff testing assessment. If possible, use office based staff to carry out this assessment (they will not be accustomed to the odours on site). Record details of the assessment on the odour report form for sniff testing (in the appendix of the OMP).
8. If necessary, engage a specialist contractor to carry out further testing using olfactometry.

9. If a persistent odour issue is identified, then further engagement with local residents may be required. The process used at Wanlip STW in 2017/18 could form a basis for actions taken. 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.
10. Inform the EA via a schedule 5 where necessary.
11. Store investigation reports electronically.

Develop a Solution

12. The steps in the incident/ emergency control table in the OMP can be used to develop a response to any issues that are picked up as part of the odour investigation.
13. Where possible operational methods should be used to control odours e.g. improving housekeeping or increased maintenance and servicing of assets.
14. The last resort is to contain the nuisance e.g. covering odour sources. Ventilation may be required to prevent the build up of a corrosive atmosphere under the covers.
15. Update the OMP to reflect the findings of the investigation.
16. Continue to monitor the odours to ensure that the solution is successful.

Appendix 6: Barnhurst Site Contact Details

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