Avonmouth Bioresource Centre (BC)
Site ID: 11800

Odour Management Plan

(Version 3)

No changes or modifications are to be made to this Odour Management Plan without informing the Regional Process Scientist (Odour Management Co-ordinator).

Relevant Documentation:

ENVS120 15: Odour Policy.
TRTWG669: Odour impact and odour risk assessment procedure for existing WRCs/STC/SPS, proposed new expansion/development of a site and potential encroachment around/near a site.

Contents

1. Document Control

Document Control Ref:	Version 1
Document Location:	TRTWP157
Document Custodian:	Regional Scientist/Odour Management Co-ordinator
Review Period:	This OMP will be reviewed and updated at a minimum annually.

Version	Date	Revised By	Reviewed By	Amendment Details
1	30/09/2022	Regional Process Scientist	Technical and Compliance Manager	First version
2	18/12/2023	Regional Process Scientist	Bioresources Operations Manager	2.3 Review of Wessex Water Odour Management section that all Bioresources Centres (BC) will be categorised as Site Specific Category 1 2.5: List of Waste Codes updated. 3.3: Updated Customer complaints with 2022 and 2023 data. 3.4 Update with 2022 NWP wind direction data. Plus addition of figure 3.4.3. 3.5: Update to Process Description and figures 3.5.1 and 3.5.2 3.6: Updated Table 3.6.2: Avonmouth BC Inventory of Odours Material. 5.1 and 5.2: Update to Odour Dispersion and Olfactometry Surveys sections. Requirement to olfactometry sample Consolidation Tank (I) 5.4: Update to PORA with 2022 and 2023 data. 5.5: Update to BAT conclusion section with addition of Odour Improvement Column. 6.1: Sniff Testing requirements updated to be more specific when off site sniff testing to be carried out and to confirm procedure is in line with H4 Odour Management Guidance. 6.3: Updated to include monitoring of Consolidation Tanks. 6.4: Addition of TVOC and Hydrogen Chloride (HCL) monitoring requirements. 7.1: Key Process Monitoring updated. 9.0 Chapter and procedure updated. 12.0: Addition of Odour Improvement Plan. Appendix:2: Revamp of sniff testing recording sheet
3	29/01/25	Regional Process Scientist	Bioresources Operations Manager	Table 3.3.1: Update to include most recent data. 3.5 Process description update. 3.5.1: Process Flow diagram updated. 3.5.2: Schematic updated. Table 3.6.2 Addition of S7 and S8 Table 4.1.1 Addition of S7 and S8. Figure 5.4.1 PORA updated Table 5.5.1 Addition of S7 and S8 6.1 Update to sniff testing procedure. Figure 6.1.1 Update to figure. Table 7.1.1 Addition of S7 and S8 12: Updated: Reviewer referenced by job title and addition of S7 and S8 Appendix 1: Updated contact list.

2.0 Introduction

This Site Specific Odour Management Plan (OMP) has been produced to comply with the environmental permit application and covers the Avonmouth Bioresources Centre (BC) (11800). Please note there is a separate odour management plan for Avonmouth Renewable Energy Site (RES) (10409). Whilst there are two Odour Management Plans covering the activities within the installation area, all activities are currently under one operator, Wessex Water Services Ltd (WWSL). This Odour Management Plan focuses only on the Sludge Anaerobic Digestion (AD) activities.

The OMP has been written using the following documents for guidance.

Environment Agency: Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011).

Environment Agency: Appropriate measures for the biological treatment of waste (consultation draft July 2020).

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning (2018).

2.1 Environmental Permitting

Avonmouth BC is subject to Environmental Permitting Regulations. This is regulated by the Environment Agency.

The following documents should be consulted in relation to Environmental Permitting in Wessex Water;

ENVS 120/7: Environmental Permit Plan
EPP001: Environmental Permit Procedure

Where the regulated facility has an environmental permit to treat organic waste the following documents must be consulted:

- Appropriate measures for the biological treatment of waste:
- Additional guidance for H4 Odour Management; How to comply with your environmental permit (March 2011). Environment Agency.

"The provisions of the OMP are treated as part of your permit and must be complied with. H4 informs that the effectiveness of the odour control measures should be reviewed once a year".

Detailed in the H4 guidance an OMP should:

- *Employ appropriate methods, including monitoring and contingencies, to control and minimise odour pollution*
- *Prevent unacceptable odour pollution at all times; and*

- *Reduce the risk of odour releasing incidents or accidents by anticipating them and planning accordingly.*

2.2 Statutory Nuisance

"A statutory nuisance is defined as a premises which are deemed to be detrimental to health or a nuisance, or are emitting dust, steam, smells, effluvia or noise with this effect. Every Local authority has to inspect the area it covers to check for statutory nuisances, if a complaint of statutory nuisance is made by a resident then the local authority must investigate. If a statutory nuisance is deemed to exist, then a notice will be served requiring the abatement of the nuisance and this notice shall include a list of steps that should be taken to reduce the nuisance."

Under the statutory nuisance regime there is a defence available in the event of either an appeal against an abatement notice, or prosecution for having contravened, or failed to comply with, an abatement notice, for statutory nuisance on industrial, trade or business premises, of having used "best practicable means" to abate the nuisance.

The interpretation of "best practicable means" is described at section 79(9) of the Environmental Protection Act 1990:

a) "practicable" means reasonably practicably having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications:
b) the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures:
c) the test is to apply only so far as compatible with any duty imposed by law;
d) the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances:

From webpage Gov.UK Guidance: Nuisance smells; how councils deal with complaints.

"Councils must look into complaints about smells from industrial, trade and business premises that could be a 'statutory nuisance' (covered by the Environmental Protection Act 1990).

The Environment Agency (EA) controls some potential smell nuisances with environmental permits as part of pollution control.

Councils need to work closely with EA to make sure that people aren't penalised twice for the same activity. If a facility has an environmental permit councils must get the Secretary of State's permission before prosecuting for breach of an abatement notice"

2.3 Wessex Water Odour Management

Wessex Water has adopted the following Odour Policy (ENVS120/15)

Wessex Water shall ensure that new assets are assessed for odour risk and shall be designed and operated to minimise risk of causing odour nuisance to receptors in consultation with planning authorities and environmental regulators.

Existing assets with the potential to generate odours must comply with either generic or site-specific odour management plans to limit risk of causing an odour nuisance.

All Water Recycling Centres (WRCs), Bioresource Centres (BC), Sludge Treatment Centres (STCs) and Sewage Pumping Stations (SPSs) are allocated an Odour Management Plan. The type allocated will be dependent on the type of site and regulations applicable to the site.

There are two types of odour management plan within Wessex Water to demonstrate "best practicable means", or BAT where applicable is being applied:

Generic odour management plan: Applicable to all sites which have a small source odour potential and have low levels of odour complaints. These sites are generally small in size and have a small source odour potential. They would usually include small to medium WRCs and SPSs where there is a small source odour potential and there have been low levels of odour complaints received.

Site specific odour management plan: Applicable to the following:

- Sites that have an environmental permit and BAT compliance is applicable.
- Sites that have a large source odour potential where there is the high potential for odour complaints to be received.
- Sites that have received an odour abatement order.
- Sites that have planning restrictions applicable to odour where specific operational measures have to be applied.
- A review of the history of odour complaints requires additional mitigation/management above that stated in a generic odour management to prevent further odour complaints being received.

All Bioresources Centres (BC) which are subject to Environmental Permitting Regulations and BAT are to be categorised as Odour Management Plan Site Specific Category 1:

The odour management plan will define what odour management exists and ensure that "best practice" occurs to minimise odours. Where the site has an Environmental Permit BAT compliance will be detailed. A copy of this odour management plan will be held on site and on the intranet.

Site specific odour management plan sites are identified by an odour sensitive site poster being displayed on site.

The type of odour management plan given to a site is reviewed on an annual basis:
Site specific odour management plan sites are placed into one of three categories depending on a number of factors. The specific category for a site is reassessed on a yearly basis.

- **Category 1**:

- All sites that are subject to Environmental Permitting Regulations and associated BAT requirements.
- All sites that have received an odour abatement order.
- Sites that have a history of odour complaints (>20 complaints per year or previous complaint history deems it necessary)

There must be a review of the odour management plan at a minimum twice a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the site meeting. At a minimum a boundary sniff test must completed once a year.

Note: Bioresource Centres with Industrial Emissions Directive Environmental Permits require <u>weekly boundary sniff tests</u> to be carried out. There will also be further monitoring requirements. Please see chapter 6 of the OMP.

- **Category 2**:

- Sites that have a history of odour complaints (>10 but <20 complaints per year or previous complaint history deems it necessary).

There must be a review of the odour management plan at a minimum once a year, which includes a meeting to discuss odour complaints received. Site Manager/Area Scientist must minute the meeting. At a minimum a boundary sniff test/H_2S survey must completed once a year.

- **Category 3**:

- Sites that have less then <10 complaints per year but previous complaint history requires more than a generic odour management plan to be in place.
- Site has Odour Control Units (OCUs) on site extracting via a fan from wastewater or sludge assets.
- Planning restrictions applicable to odour where specific operational measures have to be applied.
- Sites that have a large odour source potential. (For example "*large STW, material usage hundreds of thousands of tonnes/m^3 per year, area sources of thousands of m^2. The compounds involved are very odorous having very low Odour Detection Thresholds." extract* from IAQM Guidance on the assessment of odour for planning)

There must be a review of the odour management plan at a minimum once a year.

Avonmouth BC

This site has been categorised as category 1:

Reason: Environmental Permit

2.4 Background

There are four steps generally required to create an odour nuisance. These are:

1) The formation of odorous compounds
2) The transport of odorous compounds in the liquid phase
3) The transfer of odours to the atmosphere
4) The transport of odours to potential complainants.

The most common reason for the formation odours at a Water Recycling Centre (WRC)/ BC is due to the formation of septicity. Septicity occurs as a result of the action of micro-organisms on a sewage, effluent or sludge (see Odour Control Operation Manual: TRTMAN007 section 2.1.1.1).

Dissolved sulphide, which forms when septic conditions occur, produces hydrogen sulphide (H_2S) gas. H_2S is a colourless gas which is highly odorous and smell like rotten eggs. It can be smelt at very low concentrations. H_2S is often the compound most responsible for odour nuisance from a WRC/BC. The amount of sulphide which stays in solution and the amount which is released as H_2S gas are primarily determined by:

- The pH of the effluent or sludge: the lower the pH the more H_2S which will be formed
- The amount of turbulence: the greater the degree of turbulence the more H_2S (and other gases) will be released to atmosphere.

It is important to remember that there are many other odorous compounds and sometimes odours do not contain H_2S at all. Other odours could include:

- Mercaptans (cabbage-like odour)
- Ammonia (urine-like odour)
- Amines (urine, rotten fish-like odour)
- Organic Acids (vinegar-like odour).

The ability of the released odour to cause an odour nuisance will depend on:

- How much and where they are released.
- The volume of air in which they become dispersed.
- The proximity and sensitivity of potential complainants.
- The frequency, duration and time of day of such a release.

2.5 List of Waste Codes

Table 2.5.1 Avonmouth BC Waste Codes

Waste Code	Waste description
19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05
19 08 05	sludges from treatment of urban waste water

19 06 06	sludges from treatment of urban waste water
20 03 04	Septic tank sludge

3.0 Site Location

3.1 Site Location Description

The Avonmouth BC site is approximately 10km north-west of Bristol City Centre. The surrounding land use is generally industrial or commercial receptors located to the west and the north. The motorways M49 and M5 are located to the south-east. Lawrence Weston residential area is approximately 1.3km to the south-east and south. Figure 3.1.1 displays the regional setting of the BC. The BC is the area within the green line on the map.

Figure 3.1.1 Site Setting - Regional

3.2 Site Receptors

The surrounding land use is generally industrial or commercial receptors located to the west and the north. Lawrence Weston residential area is approximately 1.3km to the south-east and south. Figures 3.2.1, 3.2.2 and 3.3 3 highlight the sensitive receptors surrounding Avonmouth BC.

Figure 3.2.1 Location of Sensitive Receptor - Residential

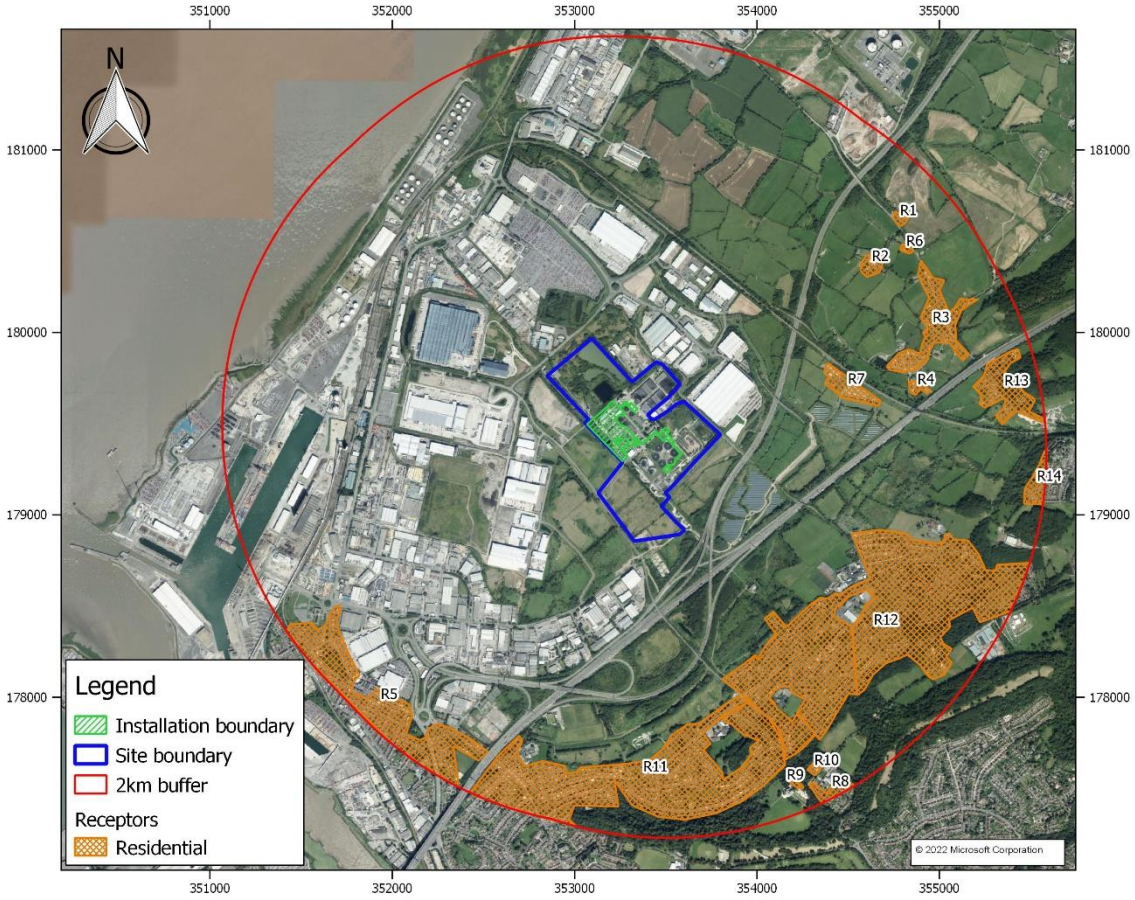


Figure 3.2.2 Location of Sensitive Receptor – Commercial/Industrial

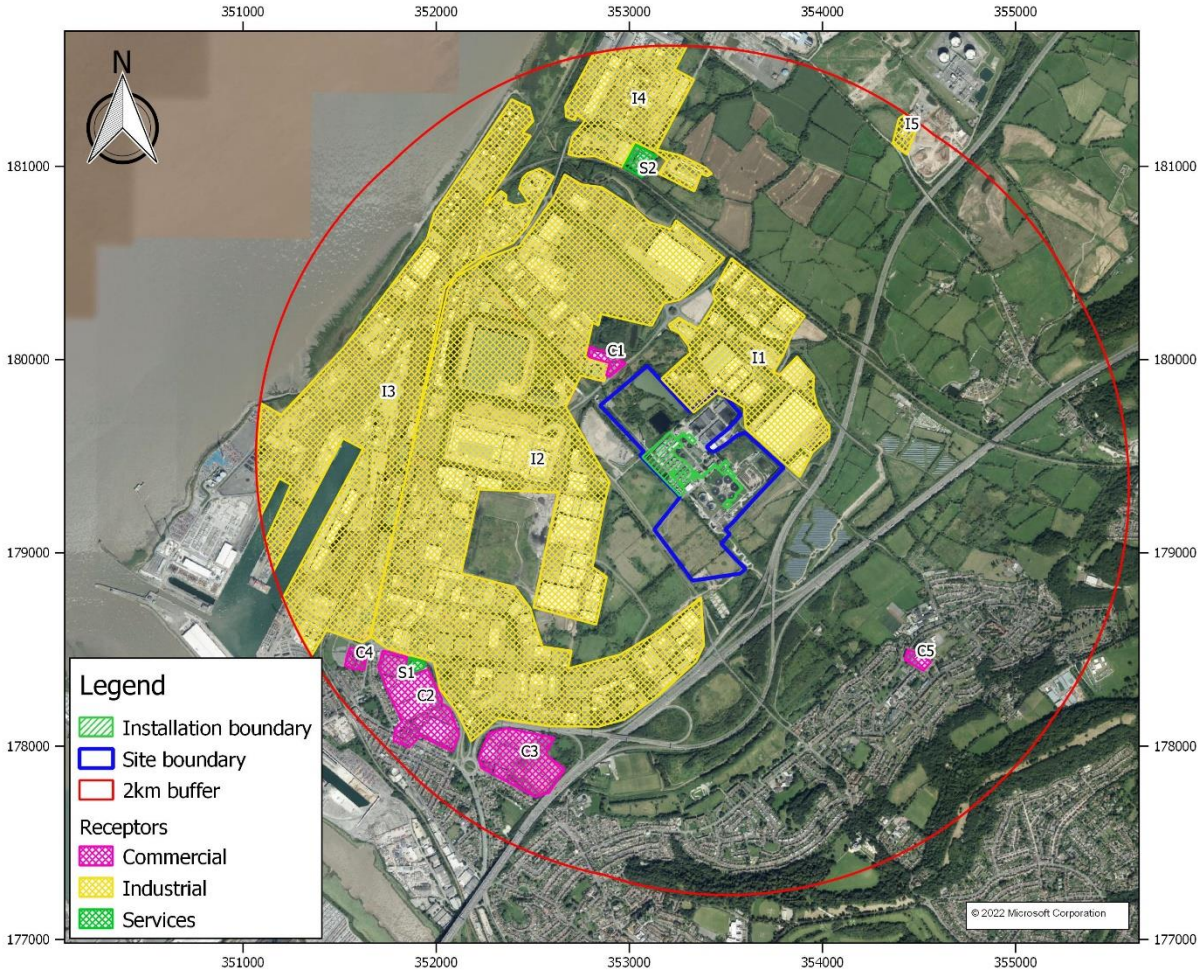


Figure 3.2.3 Location of Sensitive Receptor – Education/Healthcare/Leisure

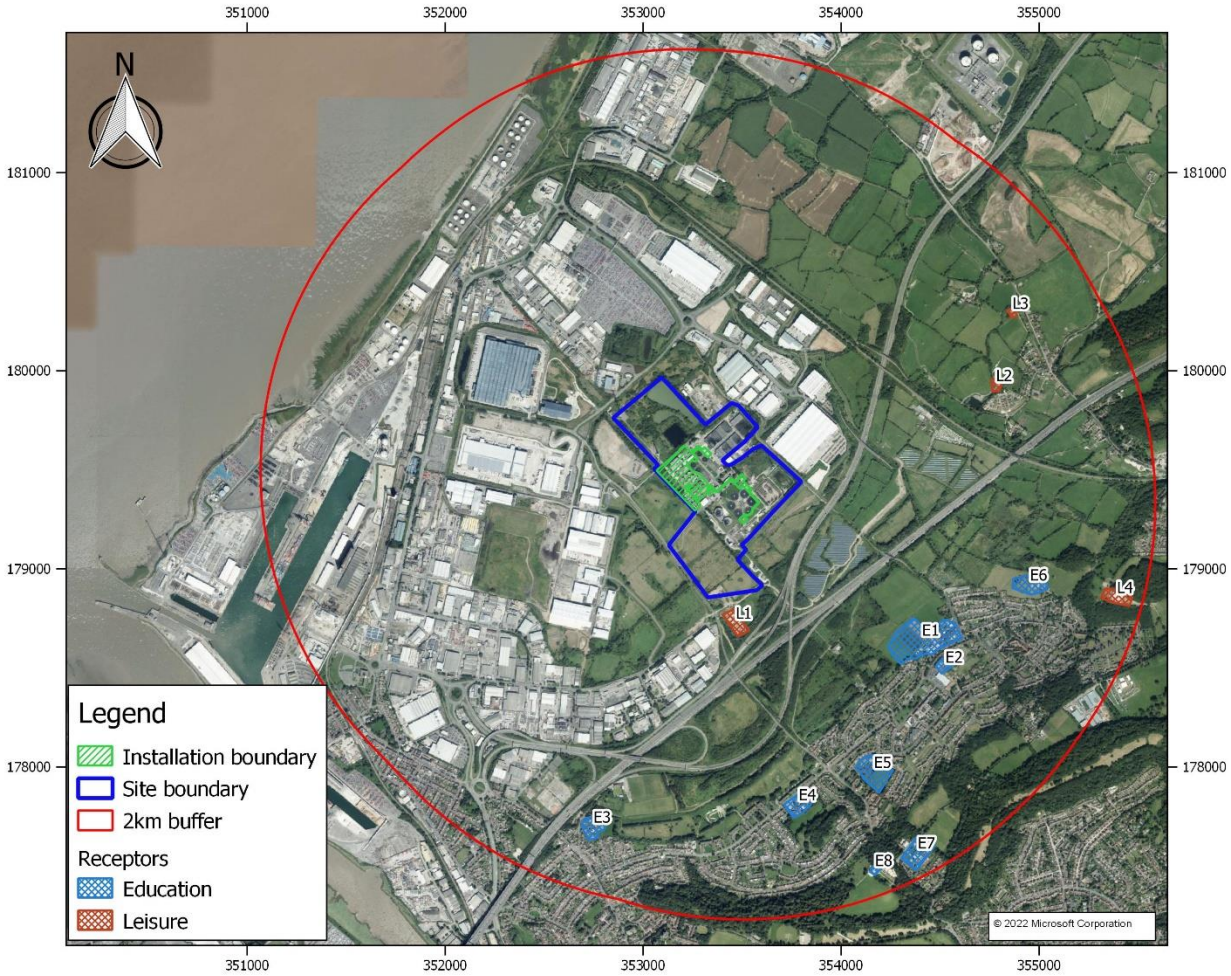


Table 3.2.1 Avonmouth BC Surrounding Receptors

Receptor Name	Receptor Map Reference	Distance from Site (m)	Receptor Type	Receptor Sensitivity
Residential properties to north-east	R1	1,765	Residential	High
Residential properties to north-east	R2	1,440	Residential	High
Residential properties to north-east	R3	1,250	Residential	High
Residential properties to north-east	R4	1,335	Residential	High
Residential properties to south-west	R5	1,685	Residential	High
Residential properties to north-east	R6	1,605	Residential	High
Residential properties to north-east	R7	895	Residential	High
Residential properties to south-east	R8	1,895	Residential	High
Residential properties to south-east	R9	1,810	Residential	High
Residential properties to south-east	R10	1,780	Residential	High
Residential properties to south	R11	1,290	Residential	High
Residential properties to south-east	R12	965	Residential	High
Residential properties to north-east	R13	1,665	Residential	High
Residential properties to east	R14	1,895	Residential	High
Commercial businesses to north-west	C1	420	Commercial	Medium

Receptor Name	Receptor Map Reference	Distance from Site (m)	Receptor Type	Receptor Sensitivity
Commercial businesses to south-west	C2	1,550	Commercial	Medium
Commercial businesses to south-west	C3	1,410	Commercial	Medium
Commercial businesses to south-west	C4	1,745	Commercial	Medium
Commercial businesses to south-east	C5	1,190	Commercial	Medium
Industry to north-east	I1	115	Industrial	Low
Industry to west	I2	210	Industrial	Low
Industry to west	I3	1,180	Industrial	Low
Industry to north	I4	1,250	Industrial	Low
Industry to north-east	I5	1,840	Industrial	Low
Schools to the south-east	E1	980	Education	Medium
Schools to the south-east	E2	1,215	Education	Medium
Schools to the south	E3	1,635	Education	Medium
Schools to the south	E4	1,395	Education	Medium
Schools to the south-east	E5	1,330	Education	Medium
Schools to the east	E6	1,345	Education	Medium
Schools to the south-east	E7	1,815	Education	Medium
Schools to the south-east	E8	1,855	Education	Medium
Leisure to the south	L1	440	Leisure	Medium
Leisure to the north-east	L2	1,310	Leisure	Medium
Leisure to the north-east	L3	1,575	Leisure	Medium
Leisure to the east	L4	1,800	Leisure	Medium
Services to the south-west	S1	1,550	Services	Medium
Services to the north-west	S2	1,345	Services	Medium

3.3 Odour Complaints

Table 3.3.1 shows the odour complaints data received by Wessex Water in respect of the wider Avonmouth Water Recycling Centre (WRC), Avonmouth BC and Avonmouth Renewable Energy Site (RES) that have been recorded over the last 5 years. Please note that odour complaints received may not be valid as being associated with the BC and RES and may be due to the WRC, other Wessex Water assets, local sewage network or due to external reasons outside Wessex Water control. There are a number of other potential odorous industrial processes in the surrounding area. For further odour complaint information for the site please contact the Wessex Water Odour Management Co-ordinator.

Table 3.3.1 Avonmouth BC Complaint Frequency

Year	No. of Complaints
2024	3
2023	4
2022	55
2021	4
2020	1

*Complaints received are for WRC/BC/RES site as a whole and not specifically for the BC site.

The higher level of odour complaints received in 2022 appears to be in association to a planning application submission for an extension of the WRC plus a higher percentage of NE winds from normal.

3.4 Meteorological Conditions

In the UK, the prevailing wind directions are commonly from the west and south-west. The wind direction and speed will impact the dispersion of odour emissions from site. Wind direction is continually monitored on site. If an odour complaint is received for the site this data should be checked to see if the wind was in the correct direction for an odour nuisance to be caused from site.

Avonmouth meteorological station is the closest representation station for Avonmouth BC. The station closed though in 2021 and is the reason why 2020 met station data is displayed. Due to the meteorological station closing the 2020 wind rose has been compared against NWP data for 2020. This provided a very similar pattern and therefore going forward NWP data will be used for the site as there is no comparable met data station. The meteorological data for Avonmouth BC is adopted for the site for any odour risk assessments that incorporates metrological conditions whereby wind direction and frequency are used to determine the ”pathway effectiveness” from source to receptor. The wind rose plot for Avonmouth meteorological station is included in Figure 3.4.1 and the Avonmouth NWP data is included in Figure 3.4.2. The main wind direction for this site is west and south-west. 2022 NWP data is displayed in figure 3.4.3. This indicated during 2022 an unusual dominance of a NE wind direction as well as the normal SW prevailing wind direction.

Figure 3.4.1 Wind Rose Plot for Avonmouth 2020 (met station)

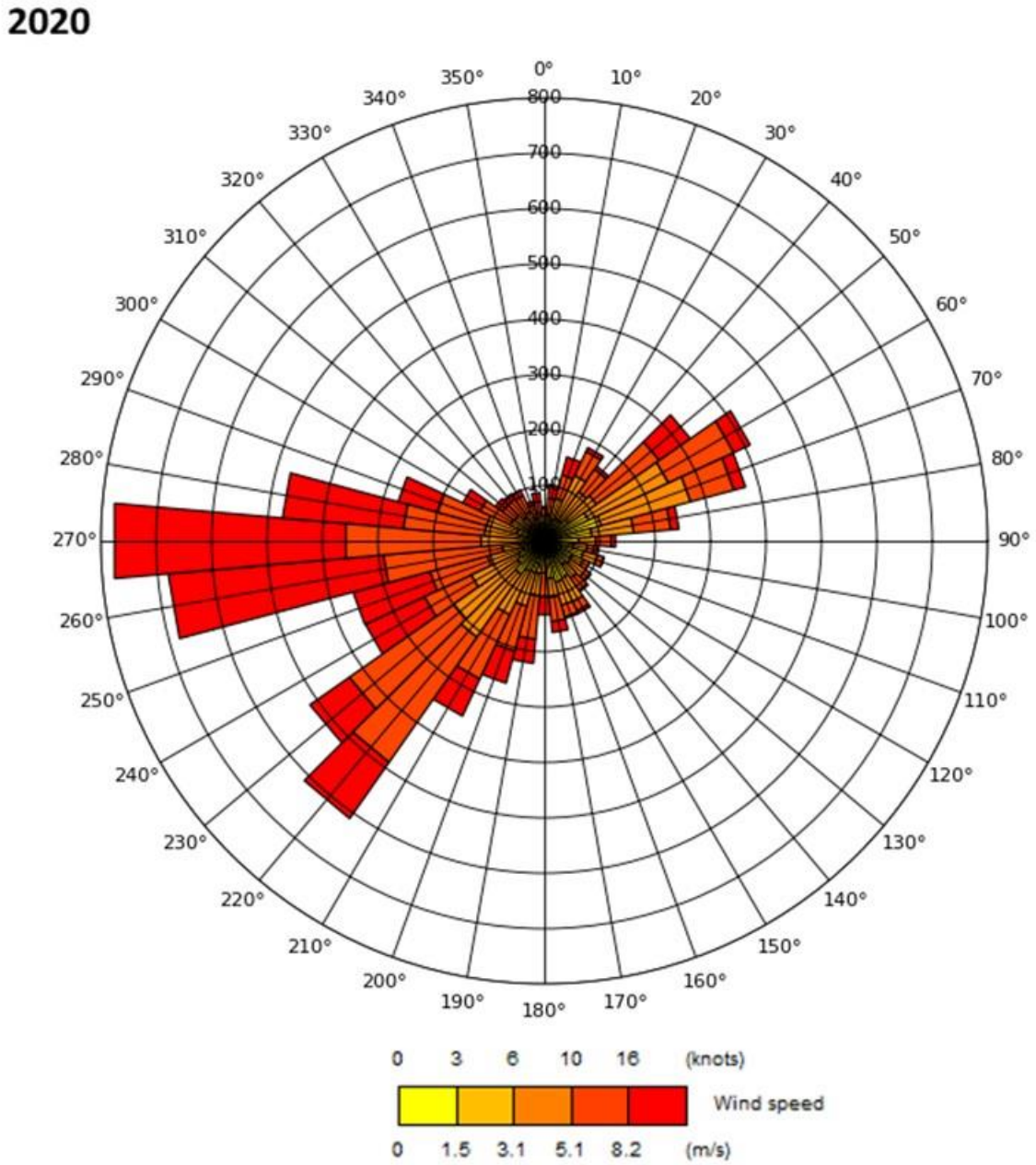


Figure 3.4.2 Wind Rose Plot for Avonmouth 2020 (NWP data)

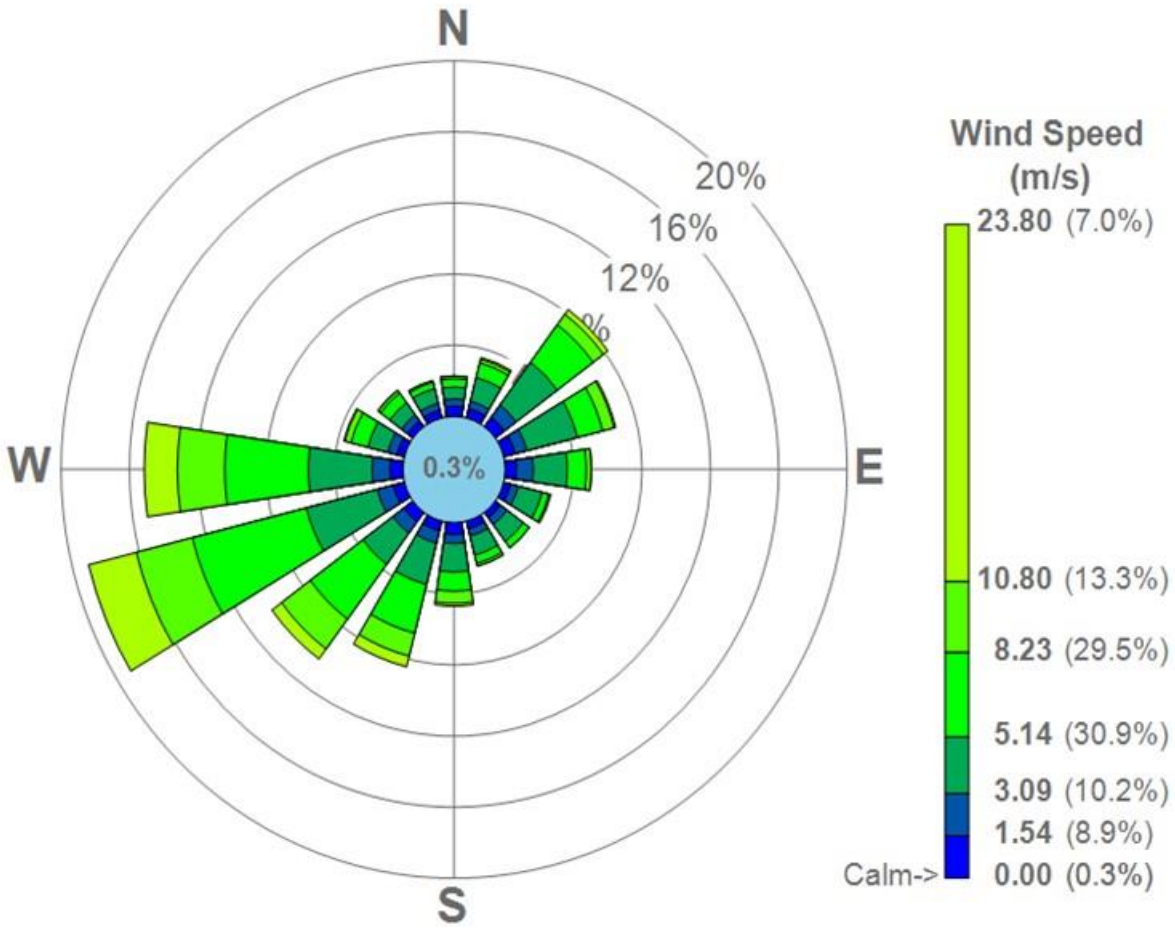
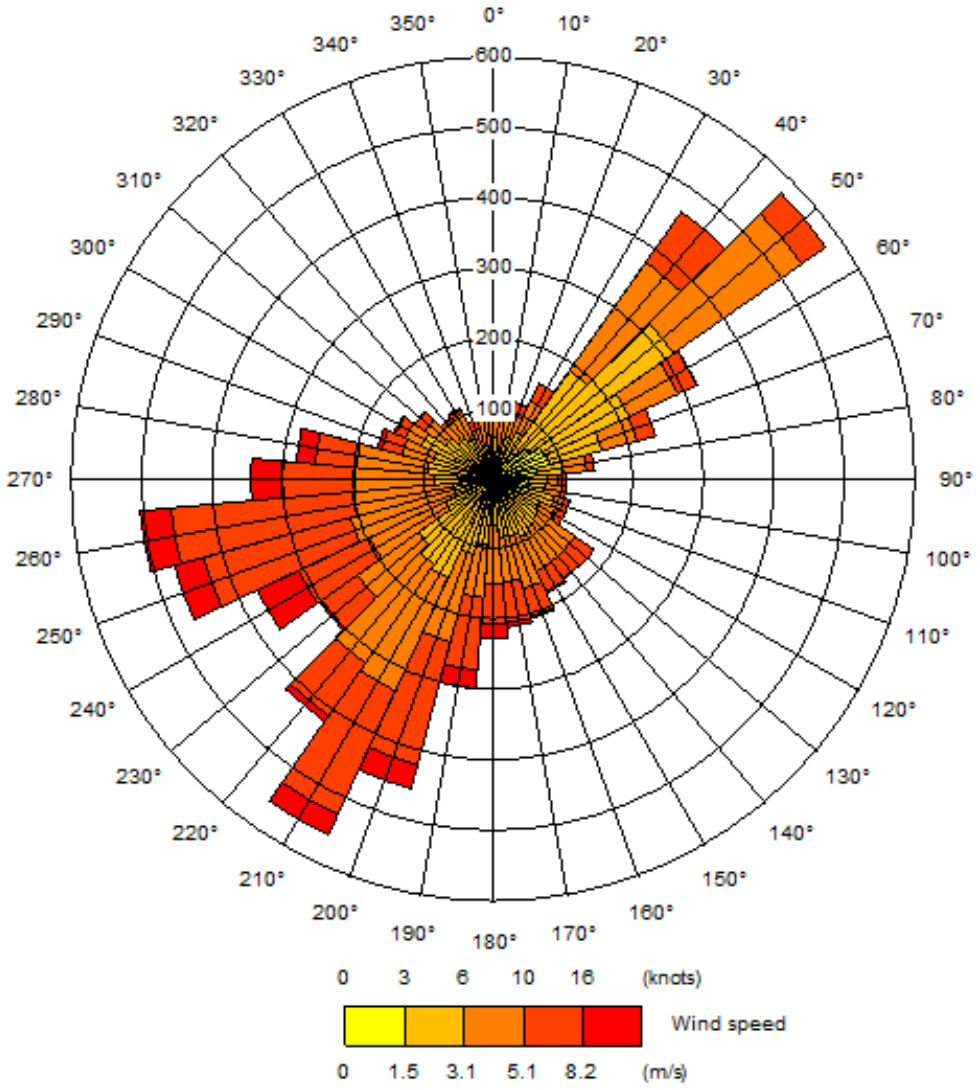


Figure 3.4.3 Wind Rose Plot for Avonmouth 2023 (NWP data)



3.5 Process Description

Process Description Avonmouth

The following text provides a summary description of the sludge treatment process at Avonmouth BC. Each asset in the summary description is provided with a corresponding letter which is referenced in the Avonmouth Asset Plan to show its location within the installation.

- Sludge from the Primary Sedimentation Tanks, located at the wider wastewater treatment works, flows into the internal pumping station (IPS) and into the strain press feed sump [B1].

- Raw sludge is then processed through the 3no primary sludge strain presses [C], the strained sludge is delivered to the strained sludge sump at the IPS [B3].

- Imported sludge from satellite sites across the Wessex Water portfolio are transported by road tanker and are discharged into the import sludge reception tank [D].

- The imported sludge is then pumped to 2no imported strain presses [E] and transferred to the IPS [B3] strained sludge sump.

- The screenings from the strain presses are collected in a skip and taken for composting. Any liquors removed are returned to the head of the works via the liquor sump in the internal PS [B2].

- Strained sludge from the IPS [B3] can then take 2 routes, the primary route is to Acid Phase Digestion (APD) GBTs 1, 2 and 3 feed tank [F].

- Sludge is passed forward and thickened in the 3no APD GBTs [G1], assisted by polymer addition from the poly makeup plant [G2]. It is then pumped to the APD feed tank [H].

- The IPS strained sludge sump [B3] can also pump to the 2no consolidation tanks [I]. These tanks then pump to the Bellmer Feed Tank [J]. The tank supplies the 2no Bellmer GBTs [K1] which, with the aid of polymer injection [K2], thickens sludge before it is fed into the thickened Bellmer tank [L]. Thickened raw sludge is then pumped to the APD feed tank [H].

- SAS originates from the SBRs and passes through the SAS balancing tank [M1] before being thickened by injecting polymer from [M2] into the feed sludge to the SBR SAS GBTs [M1]. It is then transferred via the thickened SAS transfer tank [N] to the APD feed tank [H] where it is mixed with thickened raw sludge from the Bellmer thickened tank [L] and APD GBT feed GBTS [G1].

- The liquors from all sets of GBTs are collected and returned through the site foul water drainage into the liquor sump at the IPS [B2] to be returned to the head of the works for re-treatment through the WRC plant.

- Sludge from the APD feed tank [H] is fed to APD vessel 1 [O1] and heated via a hot water/sludge heat exchanger. The feed is batch fed through a series of 6no tanks forming the APD (Acid Phase Digestion) [O1-6] process.

- The APD sludge is pumped to 8 concrete mesophilic anaerobic digesters (MAD) [P1-8]. 6 digesters [P1-6] form what is known as MAD 1, whilst 2 digesters [P7+ P8] form MAD 2.

- Digested sludge is gravity fed to the 2 x Secondary Sludge Storage Tanks (SSST) [Q].

- Digested sludge from the SSST [Q] is dewatered to cake using the three road centrifuges [S8] and poly system [S9]. Digested sludge is also transferred to the centrifuge feed sludge tank [R] where the digested sludge is dewatered using centrifuges 5 & 6 [S1] and 7 & 8 [S2].

- Digested dewatered cake is transported using the digested trailers [S6] out of the permitted boundary for recycling.

- All sludge is destined for digestion treatment but if indigenous sludge production from the Avonmouth WRC, is high then the raw sludge is dewatered using the Flottweg centrifuges [S7] which are fed from the strained sludge sump [B3]. Raw dewatered cake is transferred using the raw trailers [S5] which are transported out of the permitted boundary for treatment.

- Raw sludge and raw sludge cake are kept completely separate from the digested cake dewatering, signage, handling and transport. Any raw cake produced is then sent off-site for lime treatment at the adjacent Lime treatment plant, which is also subject to a permit application. There is no storage of raw sludge cake. For this physical treatment, we have requested an additional 1.16.12 activity within the applications forms and have included a charge.

- There are rare occasions, when a digested centrifuge needs to be used for raw sludge dewatering, there is a complete drain down and clean between the batches to prevent contamination. In this situation the raw break tank [T] will be used as a feed tank for the centrifuges. We accept that the EA will require further reassurances over the separation and a sampling IC will be included in the future permit.

- Centrate from all centrifuges [S1] and [S2] is returned to the centrate pumping station [U] before returning via the site foul water drainage into the internal pumping station [B2]. All other centrate liquors are returned via foul drainage system to the IPS which are returned to Avonmouth WRC for treatment.

- Heat is primarily supplied to the APD and MAD digesters from a natural gas boiler [BH], or 5x combined heat and power engines (CHPs) [BI1-5].

Figure 3.5.1 Sludge Treatment Process Flow Diagram

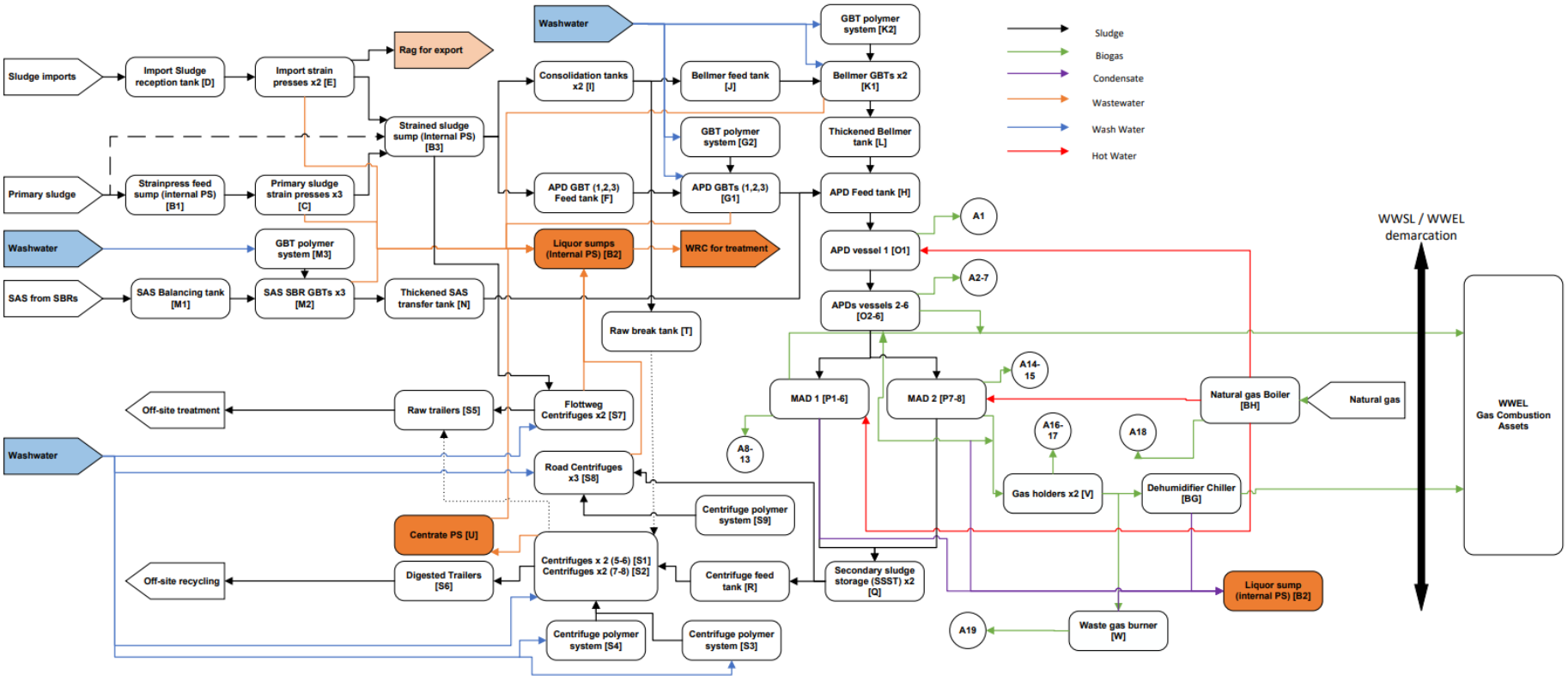
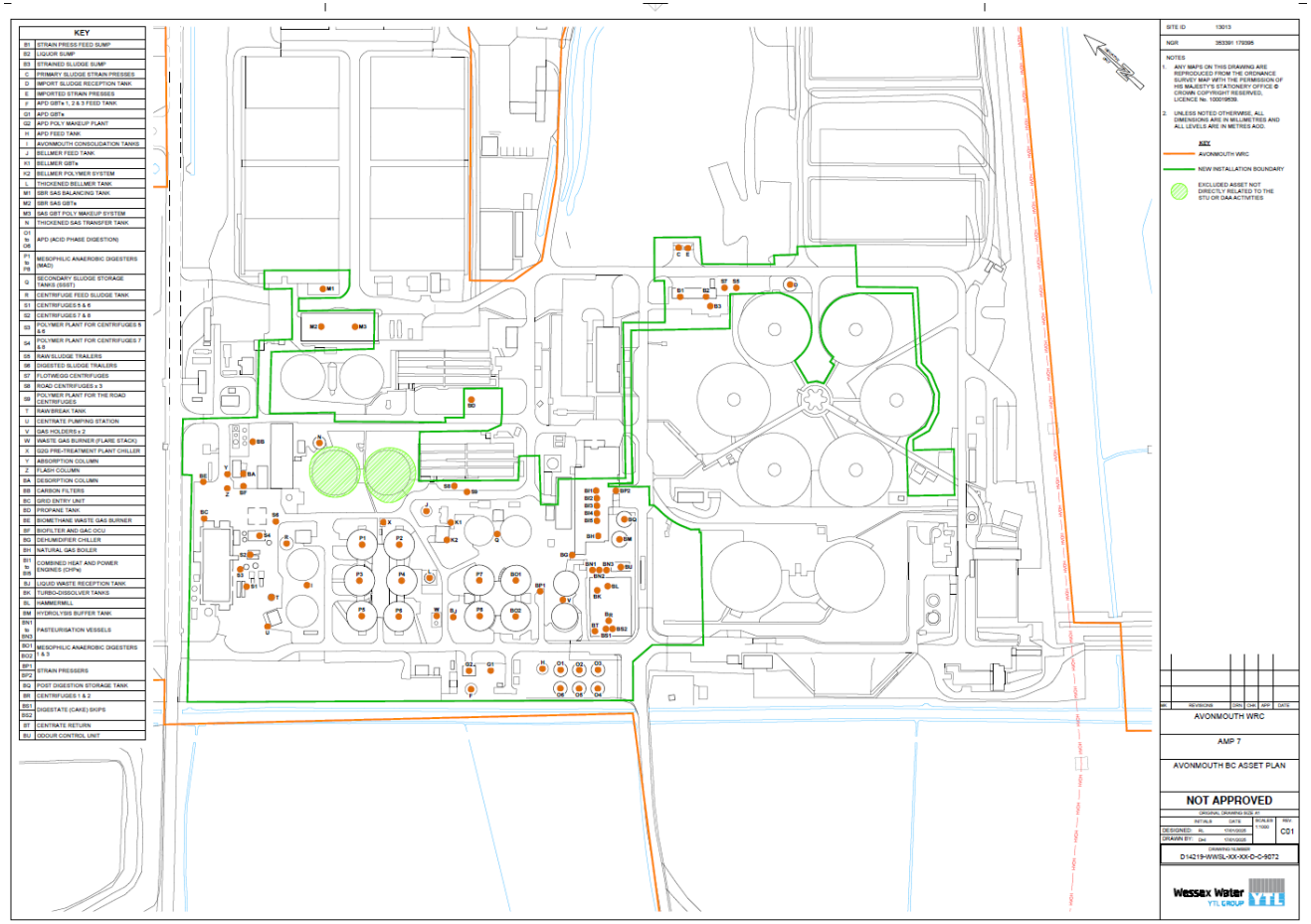


Figure 3.5.2 Schematic of Current BC Assets



3.6 Process Odour Sources

The odour potential of a source can be broken down into three key considerations:

How inherently odorous the compounds present are.
The unpleasantness of the odour.
The magnitude of the odour release.

When trying to determine the offensiveness of an odour source, site-specific odour sampling should be considered in the first instance. In the absence of source odour emission data, the assessment criteria will consider the Environment Agency's Horizontal Guidance Note (H4). H4 looks to categorise how offensive odours are with sources/processes/activities that are considered 'most offensive' odours include septic effluent or sludge and biological landfill odours. All raw sludge treatment processes would be considered to have a high odour offensiveness unless source-specific odour sampling is undertaken demonstrating a low level of odorous compounds. Processes containing the below material are considered to represent a high odour offensiveness:

- Raw indigenous sludge.
- Raw sludge imports.
- Raw sludge liquors.

Processes containing the below material are considered to represent a medium odour offensiveness:

- Rags and screenings.
- Digested sludge.
- Digested sludge liquors.
- Digested sludge cake (stored)
- Digested sludge liquors.

No processes on Avonmouth BC are considered to store material that represents a low odour offensiveness unless supported by source-specific odour sampling.

The unpleasantness of an odour can be used in defining the source odour offensiveness. This is typically achieved through source material hedonic tone assessments, however; these types of assessments are not typically available for a site without source-specific sampling.

The risk source odour potential critical risk scoring for odour offensiveness and mitigation / control adopted is summarised in Table 3.6.1.

Table 3.6.1 Source Odour Potential Risk Scoring.

Source	Risk Rating		
	High	**Medium**	**Low**
Odour Offensiveness	Very odorous compounds (H_2S, Mercaptans) with low odour threshold. Unpleasant odour - "Most Offensive". Unpleasant hedonic tone. Large, permitted process / Surface Area.	Compounds involved are moderately odorous. Unpleasantness - process classed in H4 as "Moderately Offensive" or where odours have neutral or slightly unpleasant hedonic tone. Smaller permitted process / Surface Area.	Compounds involved are only mildly offensive. Unpleasantness - process classed in H4 as "Less Offensive". Neutral to positive hedonic tone.
Emission Risk (Mitigation / Control)	Open air operation with no containment. Reliance solely on good management techniques and best practice.	Some mitigation measures in place but significant residual odour remains.	Effective mitigation measures in place (e.g. BAT, BPM) leading to little or no residual odour.

Table 3.6.2 Avonmouth BC Inventory of Odorous Materials.

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
Strain press feed sump (internal PS)	B1	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Liquor PS	B2	Liquors	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Strained Sludge Sump (internal PS)	B3	Raw Sludge/	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Primary Strain Press (x3) Import Strain Press (x2)	C and E	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Primary Strain Press (x3) Import Strain Press (x2)	C and E	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Import Sludge Tank	D	Raw Sludge Imports	269	<12hrs	Daily	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
APD GBT (1,2,3) Feed Tank)	F	Raw Sludge	483	<12hrs	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
APD GBT 1-2-3	G1	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
APD Feed Tank	H	Raw Sludge	336	<12 days	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Avonmouth Consolidation Tank (x2)	I	Raw Sludge	1127	1.4 days	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Open to atmosphere	Diffuse	High
Bellmer Feed Tank	J	Raw Sludge	341	<24hrs	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Open to atmosphere	Diffuse	High
Bellmer GBT (x2)	K	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
Bellmer Thickened Sludge Tank	L	Raw Sludge	313	<12hrs	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered	Diffuse	Medium
SAS Balance Tank	M1	Secondary Aerated Sludge	511	1 day	Continuous	Aerated sludge, earthy	-1 Mildly unpleasant	Medium	Open to atmosphere	Diffuse	High

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
SAS GBTs (Vent in side of building)	M2 SAS GBTs 1,2 and 3	Secondary Aerated Sludge	N/A	N/A	Daily Intermittent	Aerated sludge, earthy	-1 Mildly unpleasant	Medium	Contained within building and covered but with extraction to vent on side of building.	Point	High
Thickened SAS Transfer Tank	N	Secondary Aerated Sludge	719	<24hrs	Continuous	Aerate sludge, earthy	-1 Mildly unpleasant	Medium	Covered	Diffuse	Medium
APD	O1 O2 O3 O4 O5 O6	Digesting Sludge	813	2.33 days (9.12hrs in each)	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered and extracted to biogas storage Full containment of biogas is a critical safety consideration	Abnormal - fugitive only as biogas is collected for use on site.	Low
APD Biogas Relief Valves	O1 O2 O3 O4 O5 O6	Digested Sludge	N/A	N/A	Emergency operation	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Critical process safety requirement. Operates only as required under abnormal process conditions	Point	Low (Used in emergency only)
Digester Nr 8	P1 P2 P3 P4 P5 P6 P7 P8	Digesting Sludge	2728	11 days	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Covered and extracted to biogas storage Full containment of biogas is a critical safety consideration	Abnormal - fugitive only as biogas is collected for use on site.	Low
Biogas Relief Valves	P1 P2 P3 P4 P5 P6 P7 P8	Digested Sludge	N/A	N/A	Emergency operation	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Critical process safety requirement. Operates only as required under abnormal process conditions	Point	Low (Used in emergency only)
Secondary Sludge Storage Tank Nr 2	Q	Digested Sludge	1840	24hrs (per tank)	Continuous	Digested sludge / earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Open to atmosphere	Diffuse	High

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
									(DSEAR requirements)		
Centrifuge Feed Tank	R	Digested Sludge	552	<24hrs	Continuous	Digested sludge / earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Open to atmosphere (DSEAR requirements)	Diffuse	High
Centrifuge 5 & 6	S1	Digested/ Raw Sludge	N/A	N/A	Daily Intermittent	Digested sludge / earthy Septic sludge, sulphide	-1/-2 Mildly/ Moderately unpleasant -3/-4 Unpleasant/Very unpleasant	Medium High	Contained	Diffuse	Medium
Centrifuge 7&8	S2	Digested Sludge	N/A	N/A	Daily Intermittent	Digested sludge / earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Contained	Diffuse	Medium
Raw/ Digested Sludge Skips (x7)	S5 S6	Raw Sludge or Digested Sludge	15 tonnes per skip	1 day	Continuous	Raw sludge cake sulphide Digested sludge (earthy)	-3/-4 Unpleasant/Very unpleasant -1/-2 Mildly/ Moderately unpleasant	High Medium	Open to atmosphere	Diffuse	High
Flottweg Centrifuges (x2)	S7	Raw Sludge	N/A	N/A	Daily Intermittent	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Contained	Diffuse	Medium
Road Centrifuges (x3)	S8	Digested Sludge	N/A	N/A	Daily Intermittent	Digested sludge / earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Contained	Diffuse	Medium
Raw Break Tank	T	Raw Sludge	61	<12	Continuous	Septic sludge, sulphide	-3/-4 Unpleasant/Very unpleasant	High	Contained	Diffuse	Medium
Centrate PS	U	Centrate	N/A	NA	Daily / Intermittent	Earthy	-1/-2 Mildly/ Moderately unpleasant	Medium	Open to atmosphere (DSEAR requirements)	Diffuse	High
Gas Holders (x2)	V	Biogas	1800	<24hrs	Continuous	Biogas, Methane/ sulphide	-3/-4 Unpleasant/Very unpleasant	High	Enclosed vessel. Full containment of biogas is a critical safety condition	Abnormal-fugitive only as biogas is	Low

Source	Asset ID	Source Type	Storage capacity (m^3)	Average retention time	Frequency of Operation	Odour Description	Hedonic Tone	Odour Offensiveness	Mitigation Measures	Emission Release Type	Emission Risk
										collected for use on site.	
Waste Gas Burner/Flare	W	Combusted Biogas	N/A	N/A	Emergency Operation	Combustion	Neutral	Low	Biogas is combusted	Point	Low

4.0 Odour Critical Plant Operation

4.1 Odour Critical Sources

Given the control measures that are in place during operation of the facility, these contributions (if any) are unlikely to increase the odour impact on the receptors outside of the site boundary.

Management of releases includes reducing turbulence, containment and abatement. Where odorous gasses are finally released, controlling the height of release through a stack or the timing of releases through management of activities can influence dispersion before there is an impact on people. Potential on site odour releases associated with Avonmouth BC are given in Table 4.4.1.

Table 4.1.1 Avonmouth BC Odour Critical Sources- Operational Mitigation

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Strain press feed sump (internal PS)/Strained Sludge Sump (internal PS)	B1/B2/B3	Raw Sludge/Liquors	Covered	Unlikely given control measures in place.	Damage to wet well covers.	Arrange for repair	Same day as incident.	Site Manager/Site Operator.
Import Sludge Tank	D	Raw Sludge Imports	Covered. Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
Import Strain Presses (x2) Primary Strain Presses (x3)	C and E	Indigenous and Raw Sludge Imports	Covered. Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Sludge Screening Skips	C and E	Screenings	Odour management techniques in use rather than specific containment measures Replacement of full skips. No excess storage of screenings	Unlikely given control measures in place.	Screenings spill local to skip. Odour complaint(s) received and odour sniff tests identifies sludge screenings as the potential cause.	Daily check on skip by Operator to check skip levels. Spill to be cleaned up. Skip to be covered with temporary cover e.g, tarpaulin. Arrange for an early removal/replacement of skip.	Same day as observed. Same day as observed.	Site Operator/Site Manager. Site Manager.
APD GBT (1,2,3) Feed Tank	F	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
APD GBT 1 2 3	G1	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed.	Site Manager/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
					Damage to cover with missing sections.	Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed.	Site Manager/Site Operator.
APD Feed Tank	H	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
Avonmouth Consolidation Tank (2)	I	Raw Sludge	Odour management techniques in use rather than specific containment.	No previous odour complaints received for the site identified the cause to be due to these tanks.	Increase in complaint frequency and odour sniff test identifies asset I to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.
Bellmer Feed Tank	J	Raw Sludge	Odour management techniques in use rather than specific containment.	No previous odour complaints received for the site identified the cause to be due to these tanks.	Increase in complaint frequency and odour sniff test identifies asset M to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Bellmer GBT (x2)	K	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
Bellmer Thickened Sludge Tank	L	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
SAS Balance Tank	M1	Secondary Aerated Sludge	Odour management techniques in use rather than specific containment.	No previous odour complaints received for the site identified the cause to be due to these tanks.	Increase in complaint frequency and odour sniff test identifies asset O to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
SAS GBT (vent in side of building)	M2	SAS Sludge	Contained within building with covers. Extracted via a ventilation to a vent in the side of building/	Unlikely given the size of the point source	Damage to covers	Arrange for repair	Same day as incident.	Site Manager/Site Operator.
Thickened SAS Transfer Tank Tank	M3	SAS Sludge	Covered. Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
APD	O1 O2 O3 O4 O5 O6	Digested Sludge	Tanks are covered and biogas extracted	Unlikely given control measures in place.	Loss of digester performance (see table 7.2.1 for monitor parameters).	Investigate Digester performance and schedule reactive maintenance.	Same day as incident.	Area Scientist/Site Manager.
Biogas Relief Valves	O1 O2 O3 O4 O5 O6	Biogas	Planned maintenance on equipment. Monitoring of digester pressures.	Unlikely given the control measures in place. Critical safety system.	Prolonged/frequent use of safety valve.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
			Flare available to burn excess gas.					
Digester Nr 8	P1 P2 P3 P4 P5 P6 P7 P8	Digested Sludge	Tanks are covered and biogas extracted	Unlikely given control measures in place.	Loss of digester performance (see table 7.2.1 for monitor parameters).	Investigate Digester performance and schedule reactive maintenance.	Same day as incident.	Area Scientist/Site Manager.
Biogas Relief Valves	P1 P2 P3 P4 P5 P6 P7 P8	Biogas	Planned maintenance on equipment. Monitoring of digester pressures. Flare available to burn excess gas.	Unlikely given the control measures in place. Critical safety system.	Prolonged/frequent use of safety valve.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.
Secondary Sludge Storage Tank Nr 2	Q	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset 14 and 15 to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Area/Development Scientist, Site Manager, Site Operator.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Centrifuge Feed Tank	R	Digested Sludge	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies assetE to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.
Centrifuge 5 and 6	S1	Digested/ Raw Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance	Same day as incident. Immediately.	Site Manager/Site Operator. Area/Development Scientist Site Manager.
Centrifuge 7&8	S2	Digested Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance	Same day as incident. Immediately.	Site Manager/Site Operator. Area/Development Scientist Site Manager.
Raw/Digested Sludge trailers (x7)	S5/S6	Raw/Digested Sludge	Skips to be covered before leaving site.	Unlikely given the control measures in place.	Skip not covered when leaving site.	Ensure skip is covered before leaving site	Immediately	Skip Operator
Flottweg Centrifuges (x2)	S7	Digested/ Raw Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance	Same day as incident. Immediately.	Site Manager/Site Operator. Area/Development Scientist Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Road Centrifuges (x3)	S8	Digested/ Raw Sludge	Centrifuges are contained assets.	Unlikely given the control measures in place.	Damage to centrifuge covers.	Arrange for repair. Review the digester performance	Same day as incident. Immediately.	Site Manager/Site Operator. Area/Development Scientist Site Manager.
Raw Break Tank	T	Raw Sludge	Covered Inspection hatches kept closed.	Unlikely given control measures in place.	Access hatch removed/ unable to close. Damage to cover with missing sections.	Cover access hatch with temporary cover (e.g. tarpaulin). Arrange for a permanent fix Cover damage section with temporary cover (e.g. tarpaulin). Arrange for a permanent fix	Same day as observed. Same day as observed.	Site Manager/Site Operator. Site Manager/Site Operator.
Centrate PS	U	Centrate	Odour management techniques in use rather than specific containment.	Unlikely due to hedonic tone and odour offensiveness given to source type.	Increase in complaint frequency and odour sniff test identifies asset U to be the cause of the complaint.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager/Area Scientist/Site Operator.
Gas Holder (x2)	V	Biogas	Planned maintenance on equipment.	Unlikely given the control measures in place.	Prolonged/frequent use of safety valves	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.

Source	Asset ID	Potential Odour Source	Odour Control Measures	Odour Risk	Mitigation Trigger	Mitigation Measures	Timescale	Responsible Person(s)
Waste Gas Burner	W	Combusted Biogas	Planned maintenance on equipment.	Unlikely given the control measures in place. Critical safety system.	Prolonged / frequent use of safety valves.	Failures are investigated and reactive maintenance undertaken.	Same day as incident.	Site Manager.

5.0 Odour Impact

5.1 Odour Dispersion Model

Odour modelling can be a way to establish a sensitive receptor(s) potential exposure to odours from a site. Dispersion modelling is inherently uncertain but is nonetheless a useful tool to predict potential odour risk. Odour modelling is only likely to characterise normal conditions. It will not usually consider unexpected events (e.g. breakdowns) and abnormal operations which can account for a number of odour episodes.

An odour dispersion model has not been developed specifically for Avonmouth BC as part of this OMP due to the infrequent nature of valid odour complaints in 2023 and perceived low risk of potential odour impact (see chapter 5.4). The 2022 odour complaints received appear to be in association with a planning application submission for the extension of the WRC. Therefore, these complaints are not perceived to be specifically related to assets in the BC area.

Odour dispersion modelling including site specific olfactometric surveys shall be undertaken in the event of increased frequency of valid odour complaints or operational changes with a perceived increase in odour impact risk.

5.2 Olfactometry Surveys

Olfactometry sampling of a Consolidation Tank (I) is carried out on a six monthly basis due to the risk identified by the Preliminary Odour Risk Assessment(see chapter 5.4).

5.3 Odour Risk Assessment

All EA permit areas must have a Preliminary Odour Risk Assessment (PORA) and odour radius calculation completed as detailed in TRTWG669.

The PORA assesses potential odour impact and odour risk of the BC site on sensitive receptors. The PORA appraises the following information:

- The type of Odour Management Plan in place.
- Specific odour prevention already in place (see table 3.6.2).
- Historical odour complaints for the site (see table 3.3.1)
- The odour radius calculation for the site. The odour radius calculation will list the following information:
  - Each process stage of the site.
  - Indicates process stages with potential hedonic tones scores of -3/-4 (See table 3.6.2).

- Number of units within each process stage (see table 3.6.2)
- The exposed surface area per unit.
- Specific odour emission rate for each unit (library values are used, see TWTG669).
- Whether the emission rate is low, typical or high (typical values are used unless there is has been specific olfactometry sampling carried out on the site that demonstrates a low or high value can be used).
- Total odour emission rate (see 5.4).
- Expected radius distance odour may be detectable (see 5.4).

  (note: This does not necessary mean a complaint will be received as this will also depend on the offensiveness and hedonic tone of the odour)
- Details the % of total BC emission rate that has a hedonic tone score of -3/-4)
- Source-Pathway-Receptor Model (see table 5.4.2).

The odour radius calculation is a “worse case” prediction under normal operating conditions. It is a simple calculation not using meteorological data to predict potential odour risk. The higher the percentage emission rate at predicted hedonic tone -3/-4 the greater the risk of a sensitive receptor is of being impacted by odour if within the odour radius calculated contour.

(Note: The PORA is only assessing potential risk of odour complaints. BAT conclusions are assessed in chapter 5.5)

The completion of the PORA identifies whether further odour modelling of the site with different scenarios is required. It also identifies to the business where there is potential odour risk and indicates where there is the potential for future odour improvements. The identified odour risks can be then placed on the company risk management system. The company risk management system tool is used operationally to manage risk at sites and their related processes.

5.4 Preliminary Odour Risk Assessment (PORA) Results

Table 5.4.1 Avonmouth BC PORA results

Type of Odour Management Plan	Site Specific
2024 received odour complaint locations	R5 2 I1 1
2023 received odour complaint locations.	R5 1 R12 3
2022 received odour complaint locations. (This is number of complaints received for the WRC, BC and RES areas and not whether they have been classified as valid to be caused by the BC).	Only 30 different addresses supplied from the 55 odour complaints received. R5 7 R11 4 R12 12 R13 2 5 complaints were received from outside the 2km radius from the BC site. Therefore, due to distance it is extremely unlikely these complaints are valid to be caused by the BC assets. In 2022 a planning application was submitted for an extension of the WRC. Figure 3.4.3 NWP meteorological windrose data also indicates an unusually high % of winds from the NE. This would have potentially affected R5 receptors. The level of complaints received in 2022 appears to be associated by these two events
Predicted total library odour emission rate for site (ou_E/s^{-1})	23,328
Higher Warren Spring Laboratory Constant 2.2 (m)	670
Lower Warren Spring Laboratory Constant 0.7 (m)	337
Predicted % that is potentially hedonic tone -3/-4 odours	78%
Largest odour emission source	Avonmouth Consolidation Tanks Asset ID (I)
Note: Avonmouth Renewable Energy Site (RES) Site ID 10409: PORA Assessment	This gave a predicted total library odour emission rate for the area of 18,284 ou_E/s^{-1}. Predicted percentage of these assets that were considered to have a potential hedonic tone of -3/-4 odours was 0%.

Table 5.4.2 Avonmouth BC Source-Pathway-Receptor Model

Receptor	Source of Odour Potential	Pathway Effectiveness	Receptor Sensitivity	Risk of Odour Exposure	Likely Magnitude
R1	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R2	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R3	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R4	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R5	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R6	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R7	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R8	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R9	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R10	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R11	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R12	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R13	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
R14	High	Ineffective Pathway	High	Negligible Risk	Negligible Effect
C1	High	Moderate Effective Pathway	Medium	Medium Risk	Slight Adverse Effect
C2	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C3	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C4	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
C5	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
I1	High	Highly Effective Pathway	Low	High Risk	Slight Adverse Effect
I2	High	Highly Effective Pathway	Low	High Risk	Slight Adverse Effect

I3	High	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
I4	High	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
I5	High	Ineffective Pathway	Low	Negligible Risk	Negligible Effect
E1	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E2	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E3	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E4	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E5	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E6	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E7	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
E8	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
S1	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect
S2	High	Ineffective Pathway	Medium	Negligible Risk	Negligible Effect

The PORA is predicting for all Residential Receptors a **Negligible Effect.** Therefore, the risk of receiving odour complaints for the Avonmouth BC site under normal operating conditions is **Low** when following this OMP. A **Slight Adverse Effect** is predicted for some of the Commercial and Industrial Receptors. No odour complaints have been received from these specific receptors. Odour complaints received for the WRC/BC/RES have been low with the exception of 2022 that appears to be associated with the submission of a planning application for the extension of the WRC. The PORA has identified the Consolidation Tanks x2 (asset I) as the highest odour emission risk on the BC site. On completion of covering and extracting to an odour control unit the Consolidation Tanks x2 (asset I) as part of the Odour Improvement Plan Requirement 2 the PORA would predict a **Negligible Effect for all Sensitive Receptors**.

Due to the result of this specific assessment, there is currently a requirement to periodically monitor odour emissions (BAT 10). Therefore, every 6 months a duplicate olfactometry sample from one of the Consolidation Tanks (I) in accordance with EN 13725 will be taken in order to determine the odour concentration if safe to complete. An action has been recorded on the company risk management system to cover/replace these tanks. This has also been identified in the odour improvement plan. A reassessment will be required if:

- Valid odour complaints are received for the Avonmouth BC site.
- If there is planned new process or site expansion for the Avonmouth BC site.
- Proposed encroachment of high sensitive receptors around the Avonmouth BC site.

5.5 BAT Conclusions

BAT Conclusion 14 describes specific measures which may be appropriate for the prevention or reduction of diffuse emissions to air. BAT Section 14d is associated with the "containment, collection and treatment of diffuse emissions" and includes techniques such as:

- Storing, treating, and handling waste and materials that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g. conveyor belts);
- Maintaining the enclosed equipment or buildings under adequate negative pressure;
- Collecting and directing emissions to an appropriate abatement system via an air extraction system and/or air suction systems close to the emission sources.

In terms of the applicability of this technique it is noted that: "The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste."

An assessment of BC processes carried out at Avonmouth BC has been undertaken against BAT 14d. Table 5.5.1 provides a summary of compliance for diffuse and untreated odour sources. Abnormal / fugitive only release (associated with failure of the OCU or off gas collection system) have not been considered here.

Table 5.5.1 BAT 14d Compliance/Alternative Techniques

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Strain press feed sump, Liquor sump, Strained sludge sump (internal PS)	B1, B2, B3	Wet wells are covered without foul air extraction. Wet well will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1
Strain Presses (x3 PSTS, x2 Imported Sludge Tanks)	C and E	Strain press contained process without foul air extraction. Sludge screens, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Enclosed process, but without extraction and abatement of process air. Small size of source, intermittent use. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	N/A

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Sludge Screening Skips	C and E	Skips open to atmosphere with no containment or treatment of emissions.	Area subject to regular inspection and management. Source not considered to contribute to off-site odour nuisance potential. Adequate measures considered to be in operation.	Risk of creating a corrosive atmosphere if covered without extraction.	N/A
Import Sludge Tank	D	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1
APD GBT 1,2,3 Feed Tank	F	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1
APD GBT 1-2-3	G1	Thickeners, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	Requirement Number 1
APD Feed Tank	H	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Avonmouth Consolidation Tank (x2)	I	Tanks open to atmosphere with no containment or treatment of emissions.	Area subject to regular inspection and management, No sensitive receptors in close proximity. Low levels of odour complaints received for the whole of Avonmouth WRC, Avonmouth BC and Avonmouth Renewable Energy area during 2023 indicating these open tanks are not causing odour to be detected offsite from these specific assets.	None	Requirement Number 2
Bellmer Feed Tank	J	Tanks open to atmosphere with no containment or treatment of emissions.	Area subject to regular inspection and management, No sensitive receptors in close proximity. Low levels of odour complaints received for the whole of Avonmouth WRC, Avonmouth BC and Avonmouth Renewable Energy area during 2023 indicating these open tanks are not causing odour to be detected offsite from these specific assets.	None	Requirement Number 2
Bellmer GBT (x2)	K	Thickeners, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	Requirement Number 1

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Bellmer Thickened Sludge Tank	L	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1
SAS Balance Tank	M1	Tanks open to atmosphere with no containment or treatment of emissions.	Area subject to regular inspection and management, No sensitive receptors in close proximity. Low levels of odour complaints received for the whole of Avonmouth WRC, Avonmouth BC and Avonmouth Renewable Energy area during 2023 indicating these open tanks are not causing odour to be detected offsite from these specific assets.	None	Requirement Number 3
SAS GBTs (vent in side of building)	M2	GBTs are covered and contained within a building. Air is extracted via vent in side of building for personnel safety working in the building.	Area subject to regular inspection and management. Source not considered to contribute to off-site odour nuisance potential. Adequate measures considered to be in operation.	None	Requirement Number 4
Thickened SAS Tank	N	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 4
APD	O1-O6	Tanks covered and gas collected.	N/A	None	No
Digester	P1-P8	Tanks covered and gas collected.	N/A	None	No
Secondary Sludge Storage Tank Nr 2	Q	Tank open to atmosphere with no containment or treatment of emissions.	Tank contains digested sludge only which is inherently less odorous. No sensitive receptors in close proximity.	Risk of creating an explosive atmosphere if covered	Requirement Number 5

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
			Adequate measures considered to be in operation.	without foul air extraction, attributed to residual methane post digestion.	
Centrifuge Feed Tank	R	Tank open to atmosphere with no containment or treatment of emissions.	Tank contains digested sludge only which is inherently less odorous. No sensitive receptors in close proximity. Adequate measures considered to be in operation.	Risk of creating an explosive atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	Requirement Number 5
Centrifuge 5 and 6	S1	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	Requirement Number 1
Centrifuge 7 and 8	S2	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	No

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Raw/Digested Sludge Trailers (x7)	S5/S6	Cake skips open to atmosphere with no containment or treatment of emissions. Covered before they leave site.	Odour management techniques in use rather than specific BAT containment measures. Adequate measures considered to be in operation.	Raw: Risk of creating a corrosive atmosphere if covered without extraction Digested :Risk of creating an explosive atmosphere if covered without foul air extraction, attributed to residual methane post digestion.	No
Flottweg Centrifuges	S7	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	Requirement Number 1
Road Centrifuges	S8	Centrifuges, although of a proprietary enclosed design, do not facilitate creating a negative pressure environment.	Source is enclosed. Area subject to regular inspection and management, source not considered to contribute to off-site odour nuisance potential. No high sensitive receptors in close proximity. Adequate measures considered to be in operation.	None	No

Source	Asset ID	BAT Compliance Review	Alternative Techniques	Compliance Restrictions	Odour Improvement Plan Action Required to make BAT 14 compliant (See Chapter 12, Action number contained in table to be listed.)
Raw Break Tank	T	Tank is covered without foul air extraction. Tank will not hold a negative pressure.	Enclosed process, but without extraction and abatement of process air.	None	Requirement Number 1

The following sources do not adopt or only partially adopt the specific conclusions outline in BAT 14d.

Strain press feed sump, Liquor Sump, Strained Sludge Sump (B1-B3)
Sludge Screening Skips (C and E)
Import Sludge Tank (D)
APD GBT 1,2,3 Feed Tank (F)
APD GBT 1,2,3 (G1)
APD Feed (H)
Avonmouth Consolidation Tanks (x2) (I)
Bellmer Feed Tank (J)
Bellmer GBT (x2) (K)
Bellmer Thickened Sludge Tank (L)
SAS Balance Tank (M1)
SAS GBT (vent on side of building) (M2)
Thickened SAS Tank (N)
Secondary Storage Tanks (x2) (Q)
Centrate Feed Tank (R)
Centrifuges (S1 and S7)
Raw Break Tank (T)

Please see Odour Improvement Plan (Chapter 12).

The screening skips, digestate centrifuges and sludge skips are small area sources and would not typically be considered to be a significant source of site odours. The sludge cake trailers are also exported from site in a timely manner to minimise the storage time of odorous materials on site.

6.0 Monitoring and Control of Odours

All monitoring should clearly relate to the assessment of odour control and complete records must be kept in an auditable format. The only way to determine whether the processes on site are under control, and to keep them under control, is to do appropriate monitoring.

As far as possible, Avonmouth BC is operated to minimise odour generation and release. As long as the treatment process satisfies the normal design criteria, odour should be minimal. To minimise odour nuisance, it is important to ensure that Avonmouth BC is operating at its optimum.

6.1 Sniff Testing

The approach Wessex Water adopts is fundamentally based on the approach as outlined in H4 Odour Management Guidance. Wessex Water procedure for site boundary sniff test assessments is contained within procedure TRTWP558.

Sniff testing is recognised by Wessex Water as a useful technique to build up a picture of the impact the odour has on the surrounding environment over time. Sniff testing shall be used to support profiling site odour impact, investigate odour complaints and to introduce temporary odour mitigation measures. Sniff testing shall be undertaken on site, on a daily basis, by site operational staff. It is accepted that operational staff may not be ideal for sniff testing of site odours as they have adapted to odours from the site. However, this will provide a baseline for routine observations. The daily operator sniff tests shall assess the site boundary and focus on the detection of any odours that could potentially be leaving site. If boundary sniff test is being completed for a permit area regular/routine assessment and an odour intensity of ≥4 is detected, that is believed to be coming from within the permit area, this must be reported to the Area Scientist/Site Manager. Offsite downwind sniff testing may be required to be carried out if there are high sensitive receptors downwind of the permit area.

The recommendation for downwind sniff testing at high sensitive receptors is required where the following requirements are met:

- Where recent odour complaints for the site have been received.
- Where detected odour at downwind boundary sampling points is intensity ≥4 and believed to be coming from the permit area and where high sensitive receptors are within 250m downwind of the permit boundary.
- Where detected odour at downwind boundary sampling points is intensity 5 and believed to be coming from the permit area and where high sensitive receptors are within 500m downwind of the permit boundary.
- Where detected odour at downwind boundary sampling points is intensity 6 and believed to be coming from the permit area and where high sensitive receptors are within 1km downwind of the permit boundary.

A monthly sniff tests shall be carried out by non-site based staff (Regional Scientist/Graduate Scientist/Area Scientist/Operational Managers and Supervisors) who are not adapted to site odours.

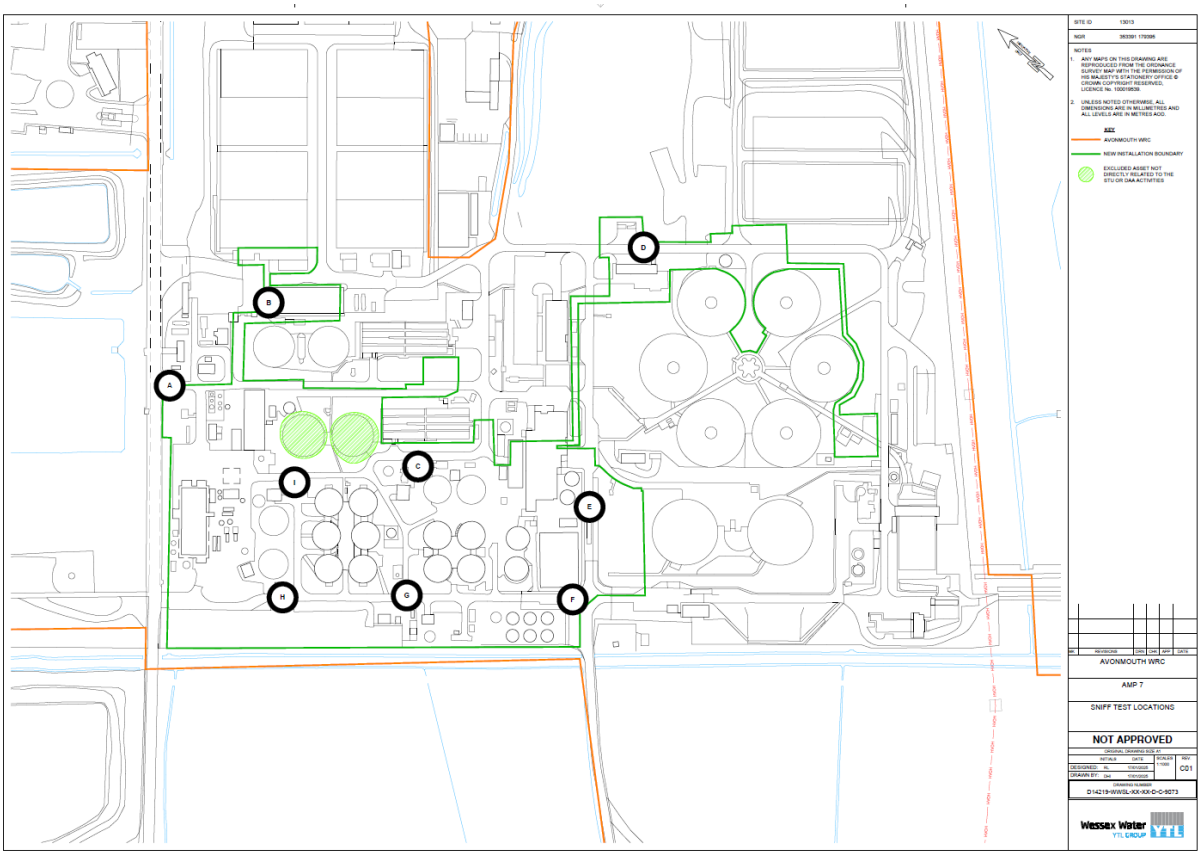
In the event of odour complaints being received, site operators shall undertake a sniff test including off-site sniff testing local to the complaint location(s) if possible and the nearest key receptor(s) to the complainant. In the occurrence of a significant odour event or repeated complaints the following will happen.

An internal member of staff, who has received specific odour sniff test training from a third-party specialist but is not specially based to the site, will carry out an “Enhanced” sniff test survey. This is including off-site sniff testing local to the complaint location(s) and within the identified sensitive receptors locations. If a level of complaints received continue and a reason for the complaints cannot be determined this survey will be repeated. A third-party specialist can be engaged for an additional odour investigation including on and off-site sniff testing where required.

A six monthly “Enhanced” sniff testing survey should be carried out by an internal member of staff, who has received specific odour sniff test training from a third-party and who is not specifically based to this site. Or the testing can be completed by a third-party specialist. This is for comparison with Wessex Water daily and monthly observations. This sniff test shall include both on and off-site locations based on surrounding sensitive receptors and complaint locations.

The location of daily on-site sniff testing locations has been included in Figure 6.1.1. Figure 6.1.1 also includes sniff test locations for the Renewable Energy Area OMP.

Figure 6.1.1 Daily Sniff Testing Locations



6.2 Source Odour Monitoring

Odour Emissions can be monitored using:

- EN standards (e.g. dynamic olfactometry according to EN 13725 in order to determine the odour concentration or EN 16841-1 or -2 in order to determine the odour exposure);
- When applying alternative methods for which no EN standards are available (e.g. estimation of odour impact), ISO, national or other international standards that ensure the provision of data of an equivalent scientific duality.

The applicability of BAT10, that is, to periodically monitor odour emissions, is restricted to cases where odour nuisance at sensitive receptors is expected and/or has been substantiated. Due to the very low levels of odour complaints received associated with sludge treatment and handling activities, no routine diffuse odour monitoring is undertaken.

An olfactometry sampling survey may be completed if there is an increase in the number of valid odour complaints being received for the Avonmouth BC site and this would be triggered by the customer complaint procedure if no reason for the increase in odour complaints can be referred from other monitoring assessments.

The PORA will assess the requirement for future olfactometry sampling to be carried out on an annual basis. Olfactometry sampling must be carried out to the procedure set out in Wessex Water procedure TRTWG669 and only if it is safe to do so.

6.3 Channelled Emissions

BAT 8 is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards.

Table 6.3.1 BAT 8 Channelled Emission Parameters.

Substance / Parameter	Standards	Minimum Monitoring Frequency	Monitoring in association with
Ammonia	No EN standard available	Once every six months	BAT 34
Hydrogen Sulphide	No EN standard available	Once every six months	BAT 34
Odour Concentration	EN 13725	Once every six months	BAT 34
TVOC	EN 12619	Once every six months*	BAT 53

(*The monitoring only applies when the substance concerned is identified as relevant in the waste gas stream based on the inventory mentioned in BAT 3).

Table 6.3.2 BAT 34 BAT-AELS for channelled emissions to air.

Parameter	Units	BAT-AEL (Average over the sampling period)
Ammonia (1)	mg/Nm^3	0.3 - 20
Odour Concentration	ou_E/m^3	200 – 1,000

(1) Either the BAT-AEL for NH3 or the BAT-AEL for the odour concentration applies

Table 6.3.3 BAT 53 BAT-AELS for channelled emissions of HCl and TVOC to air from the treatment of water-base liquid gas.

Parameter	Units	BAT-AEL(1) (Average over the sampling period)
Hydrogen chloride (HCl)	mg/Nm^3	1-5
TVOC	mg/Nm^3	3-20(2)

(1) These BAT-AELs only apply when the substance concerned is identified as relevant in the waste gas stream, based on the inventory mention in BAT 3.

(2) The upper end of the range is 45mg/Nm^3 when the emission load is below 0.5kg/h at the emission point.)

Avonmouth BC operates without any channelled emissions except the extraction of the SAS GBT to the side of the building. Where safe and access allows this will be monitored to comply with the above at the minimum frequencies where applicable.

6.4 Housekeeping

A lack of good housekeeping can result in elevated levels of residual odour, and at times, more serious emissions. Measures constituting to Best Practicable Means for housekeeping that are adopted at Avonmouth BC are listed below.

6.4.1 General

- Ensure that doors to buildings that may contain odours are kept closed except for access. Maintain signage on doors for operational, visiting and contract personnel.
- Ensure that inspection covers or hatches fitted to contain odours are closed immediately after use.
- Where possible covers should be sealed.
- Where sealing strips are fitted to covers check for integrity.
- Retention of sludge should be minimised as much as possible.
- Spillages must be avoided. Ensure the immediate clear up of any spillage.
- Where plant failures may lead to increase in odour emissions repairs should be done as soon as possible.

- New and temporary plant must be assessed for odour and there is a requirement for this Odour Management Plan to be updated. The Odour Management Co-ordinator must be contacted if new or temporary plant is proposed. A Pre Odour Risk Assessment and Process Risk Assessment must be completed before temporary plant is used on site. This Process Risk Assessment must consider possible odour complaint risk that could be caused by the new or temporary plant in question. Plant must be assessed that it will be BAT compliant before it is installed. Environment Agency: Appropriate measures for the biological treatment of waste must be consulted at the design stage.

- Report any raised odour levels to the Site Manager immediately who will liaise with the Area Scientist and Odour Management Co-ordinator.

6.4.2 Sludge Storage and Treatment

- Sludge storage, particularly of primary or mixed primary and biological sludges: allows odour generation, which will be emitted when the sludges are disturbed by a discharge into the tanks, mixing or during subsequent treatment. Therefore, sludge should be processed as soon as is possible. Any mixing should be at low speed and operated continuously. Where possible sludges should be discharged at low level in the tank and, wherever possible, below normal liquid level.

- Equipment for mechanical thickening and dewatering should be operated continuously where practicably possible. This is to ensure that sludges are rapidly handled and provide a continuous stream of return liquor, rather than intermittently with consequent high odour emissions. If not continuous operation, the plant should be cleaned after use. This will remove sludges retained on equipment that may continue to produce malodours.

- Returned liquors can be highly odorous. Aim to minimise turbulence when discharging or discharge under liquor level where possible.

- Aim at balancing the flow of sludge liquors to even the load over the day where process loading allows.

- Aim to minimise turbulence when sludge pumping. Where possible discharges to sumps should be at low level to minimise turbulence and hence odour emissions.

- Ensure that skips containing dewatered sludge cake are not overfilled and removed from site as soon as is practicable.

- Vehicles for skip removal must be kept as clean as is practicable.

6.5 Pre-Acceptance, Acceptance and Rejection of Waste Procedure

Wessex Water has the following procedure in place:

TRTWP549: Wessex Water Pre Acceptance, Acceptance and Rejection Procedure.

This document should be read alongside the Avonmouth BC Waste Management Plan (OPSP343)

6.6 Changing Dispersion Conditions

The site is operated in accordance with this Odour Management Plan to minimise the risk of odour complaints being received. It is recognised there are dispersion conditions where the potential risk of odour complaints being received increases. The three major factors which determine when poor dispersion conditions have been reached would be:

- Wind direction.
- Wind speed.
- Temperature.

The PORA indicates that there are no high sensitive receptors classified at a risk of odour exposure and likely magnitude above negligible risk and negligible effect for the Avonmouth BC site. When reviewing odour complaints received for the Avonmouth WRC, Avonmouth BC and Avonmouth RES in 2022 the majority of the odour complaints are being received for receptors to the SE-SW of the site. To reduce this risk of odour complaints being received from high sensitive receptor in these areas the following must be completed:

1. The weather forecast for the week ahead will be checked on a Monday morning by site staff and recorded for the week ahead. The predicted weather for the day must be check at the start of each day and recorded.
2. Where the following poor dispersion condition parameters are met on checking the predicted weather forecast all Site Staff, Site Manager, Area Scientist/Development Scientist and the Odour Management Co-ordinator must be notified that it is predicted there is the potential for poor dispersion conditions and the risk of an odour complaint being received is higher than normal.

- **Wind direction: NW-NE**
- **Wind speed: Beaufort wind scale 0 (Wind speed 0ms^{-1}) Wind descriptive = Calm to Beaufort wind scale 3 (Wind speed 4-5ms^{-1}) Wind descriptive = Gentle Breeze**
- **Temperature: Day time temperatures to go above 28^{o}C**

3. Site should be checked that housekeeping set out in section 6.5 of this Odour Management Plan is in place. This check is carried out by the Site Operator. Check should be recorded.
4. Key process monitoring set out in section 7.1 of this Odour Management Plan should be checked by the Area Scientist/Development Scientist.
5. Weekly Operator sniff test assessment may need to be increased and coincide with day(s) of poor dispersion conditions. Site Manager, Area Scientist/Development Scientist to discuss with Odour Management Co-ordinator. The number of sniff test

assessments required will be dependent on the predicted duration of poor dispersion condition being present.

6. The fullness of the sludge screening skips must be checked by the Duty Operator. If close to full where possible the skip should be arranged by the Site Manager to be removed from site before the onset of poor dispersion conditions.
7. The Site Operator should check on the number of full digested sludge cake skips awaiting removal. The number of full skips should be reported to the Site Manager who will where possible arrange early removal of full skips so the level of full skips onsite is at the very minimum possible at the predicted time of poor dispersion conditions.
8. Where there are pre-planned maintenance activities outside the normal BC operation detailed in this Odour Management Plan these should be where possible not completed at the identified time of the predicted poor dispersion conditions. There will be events where it is not possible to change the date and time of planned maintenance or emergency maintenance.
9. Where it is not possible to change planned maintenance or emergency maintenance then community engagement described in chapter 9.1 may need to be carried out.

If an odour complaint(s) are received this chapter of the odour management plan should be reviewed to whether poor dispersion conditions trigger points require changing including whether further mitigation actions during poor dispersion need considering.

7.0 Inspection / Monitoring / Maintenance Schedules and Records.

7.1 Key Process Monitoring

The site is operated under PLC control with data logging and interrogation of key parameters to maintain safe, efficient, and low emissions operation. Table 7.1.1 includes the key process monitoring provisions for processes associated with emissions to air.

Table 7.1.1 Key monitoring provisions for process associated with emission to air.

*Pumping station (PS) assets will have wet well high level and pump failure alarms. The monitoring approach is online and frequency is continuous. The action is for the operator to investigate and the timescale will be dependent on the response level set on the alarm.

Emission Point / Description	Parameter	Monitoring Approach	Monitoring Frequency	Trigger level	Action	Timescale
Strain Press Feed sump (Internal PS) (B1)	Sump high level	Online	Continuous	High level	Sludge will weir over to strained sludge sump. Operator will adjust desludging routine for the PSTs. Imports to be restricted	Immediate
Liquor sump. (Internal PS) (B2)	Flow meters on the outlet and high sump level	Online	Continuous	High level	Operator will check pumps are operational and check flow meter	Immediate
Strained Sludge Sump (Internal PS) (B3)	Sump high level	Online	Continuous	High level	Consolidation tank pumps will transfer sludge to consolidation tanks 1&2	Immediate
Strain Press Screening Skips (C and E)	High level	Manual (Visual Check)	Daily	High level	Swap for new skip	Same working day
Import Sludge Tank (D)	High level	Online	Continuous	High level	Visual and audible alarm sounds. Valve on discharge pipework automatically closes.	Immediate
APD GBTs (1-2-3) Feed Tank (F)	High level	Online	Continuous	High level	Will inhibit transfer of sludge from strained sludge PS sump and be transferred to consolidation tanks 1&2	Immediate
APD GBTs 1-2-3 (G1)	% Dry solids	Manual (onsite testing)	Daily	GBT output >4%-<6%	Operator intervention if outside parameters	Same working day
APD Feed Tank (H)	High tank level	Online	Continuous	High level	High level will inhibit feed from APD GBTs 1-3, SAS tank and Bellmer thickened sludge tank.	Immediate
Consolidation Tanks (x2) (I)	Sludge level	Manual (visual check)	Daily	Sludge passing over weir	Initiate centrifuging of raw cake	Immediate
Bellmer Feed Tank (J)	High tank level	Online	Continuous	High level	High level will inhibit sludge transfer pumps from consolidation tank number 1	Immediate
Bellmer GBTs 1-2 (K)	% Dry solids	Manual (onsite testing)	Daily	GBT output >4%-<6%	Operator intervention if outside parameters.	Same working day
Bellmer thickened sludge tank (L)	High tank level	Online	Continuous	High level	High level will inhibit Bellmer GBTs 1-2	Immediate

SAS Balance Tank (M1)						
SAS GBTs 1-2-3 (M2)	% Dry solids	Manual (onsite testing	Daily	GBT output >4%-<6%	Operator intervention if outside parameters.	Same working day.
Thickened SAS Transfer Tank (N)	High tank level	Online	Continuous	High level	SAS GBT 1-2-3 inhibited	Immediate
Digester APD O1-O6 and MAD P1-P6	% dry solids	Manual sample (on site spot check)	Daily and Weekly lab sample	4-6%	Modulate thickening performance of gravity belt thickener.	Same working day.
	Digester feed volume/sludge feed	Online	Continuous	Alarms and maximum volume set points	Operator intervention using PLC (control panel) (programmable e logic controller)	Immediate
	Actual Tank Volume	Online	Continuous	High level	High tank level will result in automatic inhibit on digester feed.	Immediate
	Foaming	Visual check	Daily	Visual check is recorded on log sheet.	Modulate the digester feedstock in terms of volume and or % DS thickness. Dose antifoam.	Same working day
	Volatile Fatty Acids (VFAs)	Manual (Lab sample) Online data trends.	Twice weekly	>300mg/l in MAD>9000mg/l in APD reactor 6	Modulate the digester feedstock in terms of volume in line with HACCP CCP.	Same working day
	Alkalinity	Manual (Lab sample) Online data trends	Twice weekly	<3000mg/l-6000mg/l	Modulate digester feedstock in terms of volume in line with HACCP CCP.	Same working day
	ALK/VFA ratio	Manual (Lab samples) Online data trends and calculation.	Twice Weekly	>0.5	Monitor VFA and pH Test Alkalinity Modulate feedstock with HACCP CCP* volumes accordingly.	Same working day.
	APD Sludge Feed Temperature	Online	Continuous	HMI minimum temperature set	Sludge transfer inhibited until vessels reaches temperature set point.	Immediate
	MAD Process Temperature	Online	Daily reading checks. Set points and high/low alarms.	<30°C-42°C	Manually modulate feeding.	Same working day
	Organic Loading Rate (OLR)	Manual (Lab samples)	Twice weekly Online data trends and calculation.	1.5-3.5kg.VS/m3/d combined.	Modulate feedstock with HACCPCCP.	Same working day
	pH	Daily on-site spot check. Manual (Lab sample). Weekly check and onsite readings.	Daily. Online data trends and calculation.	>6,9-9<	Check VFA/Alkalinity ratio. Modulate feed to digester in line with HACCP CCP.	Same working day
	Hydraulic Retention Time	Online recording (flowmeter)	Continuous	Refer to HACCP CCP	After digester feedstock volumes if outside HACCP CCP	Immediate
	Biogas methane (%)	Online	Continuous	<60%	Check OLR-VFA, pH Modulate feed.	Immediate
	Oxygen Level	Online	Continuous	<2%	Modulate digester feed volume	Immediate
	Digestate Ammonia	Manual (Lab Samples)	Twice Weekly check of trends	>1500mg/l	Modulate the feedstock-Reduce OLR, check pH, Alkalinity and VFA	Immediate
Secondary Sludge Storage Tanks (SSST) (Q)	High level	Online	Continuous	High level	Inhibits secondary feed pumps	Immediate
Centrate Feed Sludge Tank (R	High level	Online	Continuous	High level	Inhibits SSST feed pumps	Immediate
Centifuges (S1, S2,S7 and S8)	Dry Solids	Manual	Periodic	<20%	Operator Investigation	Immediate

7.2.1 Maintenance

Avonmouth BC has a comprehensive maintenance and repair programme set up. This covers both routine and reactive work. Operational Asset maintenance is governed by the (OPSS001) Operational Asset maintenance strategy. A Work Management System is available for operations to schedule work, raise ad-hoc and emergency work, and also provides a record of work completed and outcomes.

8.0 Emergency and Incident Response

This section addresses the issue of appropriate response to odour incidents caused by process failure or equipment breakdown. These emergency procedures include the:

- Foreseeable situations that may compromise the ability to prevent and minimise odorous releases from the process.
- Actions to be taken to minimise the impact.
- Person responsible for initiating the action.

Table 8.1.1 summarises emergency/incident control measures in place. The Wessex Water odour emergency contact details for Avonmouth BC are available in Appendix 1.

Where abnormally high odour levels are observed from either general observations, routine sniff testing or odour complaint being received the following measure should be undertaken:

- Investigating the odour incident and its cause(s).
- Bringing the process back under control; and
- Minimising exposure or annoyance effects.

All failures of a site process should be reported to Site Manager and Area Scientist/Development Scientist. If the failure of the site process has the potential to cause an odour impact the Odour Management Co-ordinator and the Regional Manager must be informed.

In the event of a failure of a site process or an odour control system, that may give rise to odour, it is the Site Managers responsibility to inform the local EA Officer for the area/ Environmental Health Practitioner.

If the event is a critical failure of plant/process that will mean the plant/process is out of operation for an extended period of time a PORA is required to be ran to assess the potential odour impact. It may be that the PORA indicates that the critical failure and change of process is low impact due to the potential odour emission rate and hedonic tone score. Therefore, further odour impact mitigation may not be required. The local EA Officer for the area/ Environmental Health Practitioner are to be informed of the outcome of the PORA and whether further odour impact mitigation is to be put in place and likely timeframes involved. This may include the following:

- Updating potential sensitive receptors.

- Informing Wessex Water CSU department that odour complaint may be received so correct information can be relayed.
- Setting up odour monitoring.
- If critical failure is a spillage report how quickly repair can be made and clean up ASAP.
- Temporary covering of plant (H&S risk must be assessed before any covering is completed).
- Temporary odour control plant installed.
- Further odour modelling and odour risk assessment required.
- Raise risk on Company Risk Management System.
- Odour Management Plan may require updating.

At each stage it must be documented by the Site Manager for the site the actions put in place to minimise the odour impact.

Table 8.1.1 Avonmouth BC Incident/Emergency Control Measures:

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
Liquid sludge spillage	Liquid sludge	Medium – low. Spillage likely to go directly to drain which returns to the WRC for treatment.	Pipework and tanks undergo regular inspections. Planned maintenance on equipment	Stop source of spill and immediately wash down area.	Immediate	Site Operator
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
GBTs	Sludge tanks due to increased retention time	Medium- Potential septicity of sludge increases as held in sludge tanks for a longer period of time.	Sludge imports and indigenous sludge to be inhibited and sludge can be exported if thickener down for long period	EMI to repair	Same working day	Team leader/ Site Manager
Sludge cake spillage	Sludge Cake	Medium to High depending on volume of spill	Regular inspection and planned maintenance	Stop source of spill and immediately wash down area.	Immediate	Tanker Driver
				Arrange repair.	Job to be raised and promoted on same working day or next	Site Operator
				Record spillage and actions taken.	Same day as incident	Site Operator
				If there is likely to be any offsite impact inform site manager and Odour Management Co-ordinator immediately.	Same day as incident	Site Operator
Failure of digestion process (treatment)	Partially treated sludge odours	Medium	Performance monitoring of key parameters Laboratory sampling	Initial investigation by Area Scientist.	Immediate	Area Scientist/ Development Scientist Site Operator

Failure / Incident	Potential Odour Source	Potential Odour Impact	Mitigation Measures	Action to be Taken	Timescale for Rectification	Responsible Person
	Increased odours from post-digestion sources		(see key process monitoring 7.1.1)	Changes made to bring digester back into operational parameters.		
Centrifuges	Sludge tanks as increase retention as digester unable to be fed.	Low	Sludge to be exported if thickener down for long period	EMI to repair	Same working day	Team leader/ Site Manager
Staff unavailability	Risk of increase to site odours due to limited operational resources	Low	Staff replacement	Operator replacement from another site Reduce site activities to only critical jobs Remote monitoring from Control Room / off-site /	Same day / For next working day	Site Manager
Asset Fire	Risk of increase to site odours due to limited access and inability to operate assets	Medium	Regular inspection and planned maintenance	Remote monitoring from Control Room / off-site / another site	Immediate	Site Manager
Power Failure	Risk of increase to site odours due to inability to operate assets	Medium	Standby generator on site	Mains power failure alarm and switch over to generator. Duty operator to check and make sure plant has reset.	Immediately	Site Operator
Very high rainfall	Flooding	Low	Assets unlikely to flood.	Plan put in place to remove floodwater from assets.	Immediately	Site Operator

9.0 Customer Communications

(Customer complaint procedure is the same for the BC and Renewable Energy Site (RES) Odour Management Plans. Both areas must be investigated if a complaint is received).

Complaints are the primary indicator of nuisance and other community dissatisfaction. It is important that complaints are properly and systematically recorded and acted upon.

Complaints of odour are dealt with and recorded by the Customer Support Unit (CSU). The complaint details are placed onto the Ops Contact Reporting System and a unique rapid reference number is created. Customer odour complaints are allocated by CSU/scheduling team to the most relevant Wessex Water department based on initial information provided by the customer when they first contact Wessex Water. There are a number of mechanisms of how a customer can contact Wessex Water. These include telephone, email, letter, social media or via a third party (EA, EHO, Councillor, MP). There are occasions when initially a sewerage crew, sewage pumping station crew, WRC operator is dispatched to investigate the odour complaint as it is believed the source of the odour is from other Wessex Water assets and not the BC/RES in the first instance on information provided by the customer. If on investigation by these other departments, it is identified the source of the odour may be the BC site it will be reallocated to the BC and RES for investigation.

The initial odour complaint action is to be completed within 24hrs of the complaint being allocated by CSU/scheduling team to the BC and RES.

Note: There may be occasions when the initial action cannot be completed in full within 24hrs. For example, the customer has informed in the initial complaint information the odour only occurs on a certain day and time. Investigation must be therefore completed when the odour is most likely to be occurring. Sniff test assessments should be scheduled in for the most appropriate time that the odour is likely to be present.

It is the BC/RES Site Manager responsibility to make sure there is liaison with the local stakeholders (including the complainant) and CSU on progress. Any complaints made directly to site staff must be reported to CSU so they can be placed on the Ops Contact Reporting system. It is important that communication between all interested parties at all times is maintained.

The initial odour complaint action following a complaint will be as follows:

- The BC/RES Operator will inform operator of the Avonmouth WRC so requirements of that sites OMP can be followed.
- The BC/RES Operator will check wind direction.
- The BC/RES Operator will perform a general check of the site.
- The BC/RES Operator will check that there are no on-going process issues or activities that would give rise to odour emissions.
- The BC/RES Operator will check that levels of ‘Good Housekeeping’ are being maintained (see chapter 6.5)

- The BC/RES Site Operator, Area Scientist will check the Key Process Monitoring are within limits (see chapter 7.1)

- The BC/RES Site Operator will complete a Sniff Test Assessment (see section 6.1 and appendix 2)

- The BC/RES Site Operator will perform a sniff test (if access possible) at the location the odour complaint has been reported for. If the wind direction has changed a sniff test should also be completed downwind of the BC site. In some cases the customer does not provide details of the actual location of the odour. This is quite often the case in email, social media and 3rd party contacts. If this is the case CSU should request whether more information can be gained from the customer so a sniff test assessment can be carried out.

- As part of the overall investigation the following should be reported to the Site Manager, Renewable Energy Manager, Area Scientist and Odour Management Co-ordinator where the BC/RES Site Operator has investigated and found the following.

    - The odour is being generated from the WRC or in a remote part of the sewage network. This may require a job to be raised for a WRC operator, sewerage crew, pumping station crew to carry out odour investigations on other Wessex Water assets outside the BC/RES site boundary.

    - There were other known sources of odour in the vicinity at the time.

        - Private issue on customer property.
        - Environmental, especially coastal areas and rotting seaweed, tide times may need to be checked.
        - Muckspreading.
        - Other industry.
        - Other 3rd party e.g. Landfill site.

    - There are good grounds for believing a complaint is frivolous or vexatious.

        - This is rare but has happened where odour complaints have been received for particular sites where the customer does not reside or is in the area when the complaint was made. If this is the case then the odour complaint should still be investigated as normal and boundary sniff testing carried out.

- Even if the odour is believed to be coming from another source Sniff Test Assessment as detailed in section 6.1 must be completed

- The customer complaint form in appendix 3 must be completed.

- The results of this initial action and the customer complaint form will be reported to the Site Manager, Renewable Energy Manager, Area Scientist and Odour Management Co-ordinator.

There is the potential for *"no reason to be found*" for the customers reported odour complaint as there is no detectable odour present at the time when the initial odour complaint action was carried out. Further sniff tests may be required to be carried out at a later date and the customer should be informed of timescales for their completion. If the customer is complaining that they are detecting an odour on a regular occurrence the customer should complete an odour diary (appendix 4). The completed odour diary should be sent by the customer to be reviewed by the Site Manager, Renewable Energy Manager and Area Scientist.

Following the completion of the customer complaint form in appendix 3 it must be decided whether the odour management plan is being followed. If the plan is not being followed then the Site Manager/Renewable Energy Manager will need to complete an action plan to make sure the plan is followed, which is to be briefed out to site staff. The action plan shall be audited by the Odour Management Co-ordinator on the 6 monthly review meeting that this has been completed. If the odour management plan is being adhered to and investigations demonstrate the BC/RES is the cause of the odour complaint the following will need to be conducted. This will be initiated by the Site Manager, Renewable Energy Manager, Area Scientist and Odour Management Co-ordinator.

Further investigations that could involve the following:

- Site Manager, Renewable Energy Manager, Area Scientist and Odour Management Co-ordinator perform general check of the site.
- "Sniff test" survey
- H_2S Survey.
- Measure the performance of abatement equipment.
- Process diagnosis.
- Asset investigations.
- Olfactometry surveys.

Following investigation further action may be required to abate odour emissions. It may require the following.

- Operational solutions.
- Process solutions.
- Maintenance procedures.
- Investment solutions.

If operational solutions and maintenance procedures are required the Site Manager / Renewable Energy Manager must put together an implementation plan. It is the Site Manager / Renewable Energy Manager responsibility to action and review the implementation plan. If process solutions or investment solutions are required an action must be raised on the corporate risk system. This should be completed by the Area Scientist. If process solutions

or investment solutions are required the Odour Improvement Plan must be updated by the Odour Management Co-ordinator and reviewed by the Site Manager / Renewable Energy Manager for the site.

Communication with the customer will be via the mechanism that they originally made contact with Wessex Water. They will be informed of the outcome of the initial odour complaint investigation, whether further investigation should be carried out and what action has been taken where it has been required. Wessex Water aim to respond within 5 working days of the complaint being made unless the customer has requested they do not wish further contact. Following contacting the customer the rapid reference will be closed out unless there are further odour investigations required. The customer will be updated on the results of these odour investigations before the complaint can be closed out.

In the event of an odour issue affecting multiple customers within the community Wessex Water site management team will decide the level of response that is required. This could include, but not be restricted to, stakeholder liaison (communication through local councillors and local resident representatives), community engagement meetings to discuss the odour issues being experienced and actions that will be undertaken, site open days, local media liaison and writing to local residents via a letter drop. Customers may also be requested to complete odour diaries (see appendix).

10.0 Training

Every Operator is trained on all processes with which they are associated. The training is supported by a number of process manuals. Upon completion of the training, every operator is assessed on each process as well as a 'basic' site assessment.

Staff at all levels having duties related to the management, operation, maintenance or repair of odour-critical plant will be trained, competent and have documented training records. All Wessex Water staff involved with odour-critical plant will have access to the Wessex Water Operating Manual on Odour Control and undertake associated training and competency assessments.

A copy of the Odour Control Operation Manual is kept on the odour page of the Wessex Water intranet for reference. Odour Control Operation Manual: TRTMAN007.

Records for training received by all employees are held electronically.

11.0 Encroachment by External Developers

Where potential new development falls within the Wessex Water consultation zone TRTWG669 is to be followed. The potential developer must request a copy of the procedure from Wessex Water Planning Liaison Team. The procedure provides guidance on how to assess the odour impact from Sewage Treatment Works (STW) or Sewage Pumping Stations (SPS). The following policies and guidance below must also be consulted.

The National Planning Policy Framework (NPPF) (2012)

The NPPF describes the policy context in relation to pollutants, including atmospheric pollution.

'The Government's objective is that planning should help to deliver a healthy natural environment of the benefit of everyone and safe places which promote well being.

To achieve this objective, the planning system should aim to conserve and enhance the natural and local environment by:

[…]preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of land, air, water or noise pollution or land instability.'

Where pollution is defined as:

'Any consideration of the quality of land, air, water, soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam and odour.'

The NPPF specifically requires consideration of pollution on health and the natural environment as part of the planning decision process:

'To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.

The Institute of Air Quality Management (IAQM): Guidance on the assessment of odour for planning

The Institute of Air Quality Management (IAQM) published guidance on the assessment of odour for planning in 2014 (updated 2018). The guidance is for assessing odour impacts for planning purposes.

The guidance states that "*IAQM is of the opinion that the practitioner should observe, from the various scientific studies, case law and practical examples of the investigation of odour annoyance cases that in any specific case, an appropriate criterion could lie somewhere in the range of 1 to 10$ou_E m^{-3}$ as a 98th percentile of hourly mean odour concentrations."*

The guidance states that *"Loss of amenity or disamenity does not equate directly to nuisance and significant loss of amenity will often occur at directly lower levels of emission then would constitute a statutory nuisance"*

CIWEM Policy Position Statement (2011)

"*CIWEM considers that the following framework is the most reliable that can be defined on the basis of the limited research undertaken in the UK at the time of writing:*

• C98, 1-hour >10 ou_E/m^3 - complaints are highly likely and odour exposure at these levels represents an actionable nuisance;

• C98, 1-hour >5 ou_E/m^3, - complaints may occur and depending on the sensitivity of the locality and nature of the odour this level may constitute a nuisance;

• C98, 1-hour <3 ou_E/m^3, - complaints are unlikely to occur and exposure below this level are unlikely to constitute significant pollution or significant detriment to amenity unless the locality is highly sensitive or the odour highly unpleasant in nature."

EA Horizon Guidance Document H4 (2012)

Benchmark levels

"The benchmarks are based on the 98th percentile of hourly average concentrations of odour modelled over a year at the site/installation boundary. The benchmarks are:

- *1.5 odour units for **most offensive** odours:*
- *3 odour units for **moderately offensive** odours;*
- *6 odour units for **less offensive** odours.*

(caution should be used as these benchmarks were not from a sewage treatment works and the benchmarks were designed to be applied to those industrial processes regulated by an Environmental Permit. It is generally considered that sewage treatment works odours fall into the middle category (3 ou_E/m^3) unless there is septic wastewater or sludge on the site, in which case the most stringent criterion may apply).

Examples of previous decisions in statutory nuisance cases and planning appeals are listed below (caution should be exercised as decisions will have been based solely on the evidence presented at the time, which may have been incomplete or of a different standard to current best practice).

- Newbiggin appeal (1993) reference APP/F2930/A/92/206240; adoption of a level of 5ou/m^3 ($C_{98,1hr}$) (caution required as units are given as ou/m^3 and not ou_E/m^3) is both reasonable and cautious.

- Leighton Linslade appeal (2010) reference APP/P0240/A/09/2110667. At a threshold of 5, evidence of no harm is not convincing and there could be a risk of regular and unacceptable odour annoyance to such an extent that it would detract from the future resident's living conditions.

- Mogden case (statutory nuisance) [2011] EWHC 3253 (TCC). Nuisance certainly established at $5ou_E/m^3$

- Cockermouth appeals (2012) references APP/G0908/E/11/2152403 and A/11/2151737. $3ou_E/m^3$ for medium offensiveness.
- Stanton appeal (2012) reference APP/E3525/A/11/2162837. More appropriate threshold 3-$5ou_E/m^3$.

- Gillingham (Dorset) (2016) appeal APP/N1215/W/15/3005513. I conclude that the appropriate parameter to apply in this case is the $3ou_E/m^3$ contour line.

12.0 Odour Improvement Plan

This section is to be completed by the Odour Management Co-ordinator if improvements are required to meet BAT, or customer odour complaints are received and further process and investment solutions are required to prevent further complaints. Each entry must be reviewed by the Site Manager for the site.

Requirement Number	Requirement	Reviewed by:
1	Connection of Strainpress feed sump (internal PS) (B1) , Liquor sumps (internal PS) (B2), Strained sludge sump (internal PS) (B3), Import Reception Tank (D), APD GBT Feed Tank (F), APD GBTs (G1), APD Feed Tank (H), Bellmer GBTs (K), Thickened Bellmer tank (L),Centrifuges (S1and S7) and Raw Break Tank (T) to odour control unit(s) meeting BAT and Appropriate Measures requirements.	Site Manager
2	Cover/replace Avonmouth Consolidation Tanks (x2) (I), Bellmer feed tank (J) and extract to an odour control unit(s) meeting BAT and Appropriate Measures requirements.	Site Manager

3	Cover/replace SAS Balancing tank (M1) and extract to an odour control unit meeting BAT and Appropriate Measures requirements.	Site Manager
4	Connection of SAS GBTs vent in side of building (M2) and Thickened SAS transfer tank (N) to odour control unit(s) meeting BAT and Appropriate Measures requirements.	Site Manager
5	Cover/replace secondary sludge storage (SSST) (x2) (Q) and Centrifuge feed tank (R). An assessment of residual biogas potential to determine whether the secondary digesters are extracted to an OCU or biogas removal installation. This will also inform what type of covering is required.	Site Manager
6	Identification of whether HCL and TVOCs are in the waste stream in high enough quantities to conclude whether monitoring described in chapter 6.4 is required to be carried out.	Site Manager

References

Wessex Water Documents

- DS464 - Odour Management
- DS 540 - Sewage Pumping Stations and Pumping Mains
- TRTWP102 – Generic Odour Management Plan
- TRTMAN007 - Odour Control
- TRTWG669 - Odour impact and odour risk assessment procedure for existing WRCs/STC/SPSs, proposed new expansion/development of a site and potential encroachment around/near a site.
- WECEP004 - Preliminary Odour Risk Assessment
- NTKWP222 – Pumping Station Generic Odour Management Plan

Applicable regulation

- Environmental Protection Act 1990
- Public Health Acts 1936, 1961, 1969
- The National Planning Policy Framework (NPPF) (2012)

Further Guidance

- Appropriate measures for the biological treatment of waste: Consultation daft July 2020. Environment Agency
- Best Practical Means (BPM), A Guidebook for Odour Control at Wastewater Treatment Works, UKWIR 06/WW/13/8
- BS – EN 12255-9:2002 – Waste Water Treatment Plants – Part 9: Odour Control and Ventilation
- Code of Practice on Odour Nuisance from Sewage Treatment Works (DEFRA, 2006) (withdrawn September 2017)
- Guidance on the assessment of odour for planning (Institute of Air Quality Management, 2014)
- H4 Odour Management Guidance (How to comply with your Environmental Permit), Environment Agency

Appendix 1: Emergency Contacts

Table Appendix 1 Avonmouth BC Contact:

Avonmouth BC odour related contact	**Wessex Water 03456 004600**

Appendix 2: Sniff Testing Record Sheet

Sniff Test Assessment Date: Sampling period 5 minutes

Assessor: Confirmation assessor has met the following requirements on the back of this sheet: Y/N
Weather Conditions:

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Sampling Point Location/Grid Reference Time of Sampling Wind Direction Wind Speed Air Temperature

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Intensity (I)																														

Max (I) = Mean (I) = Hedonic Tone if Odour Intensity >2 = Description of Odour if (I) >2=

Odour Assessor Requirements:

The odour assessor should confirm the following requirements to safeguard the quality of the sensory assessment are met.

- That the odour assessor has not got a blocked nose, cold, covid, virus, sore throat, sinus trouble, headache or generally feeling unwell.
- The odour assessor is not hungry or thirsty.
- The odour assessor must not work within half an hour of the end of their last meal.
- The odour assessor must not smoke, vape or consume strongly flavoured food or drink, including coffee, for at least half an hour before the field odour survey is carried out, or during the survey. The odour assessor should not consume confectionery or soft drinks for at least half an hour before the field odour survey is carried out, or during the survey.
- Scented toiletries, such as perfume/aftershave should not be used on the day of the field survey.
- The vehicle used during the field odour survey should not contain any deodorisers.
- Where the odour assessor has travelled to site then a rest period must be taken before starting the survey.

Method:

- SSoW must be consulted before start of assessment. Odour assessor requirements must be confirmed and recorded on sheet before starting assessment.
- Wind direction, wind speed and air temperature are to be recorded.
- The assessor breathes normally. The assessor should inhale ambient air samples through the nose every 10 seconds.
- The odour intensity (I) (0-6) should be recorded for each 10 second period for a period of 5 minutes at each sampling point.
- Where the sniff testing is off site for potential encroachment. If odour intensity is a continuous 4-6 then the odour assessor should avoid olfactory fatigue/desensitisation by alternating each sample sniff of ambient air with a sniff of odour-free air from an ori-nasal face mask fitted with carbon filters.
- Where the sniff testing is on site or boundary sniff testing for customer complaints or EA permit requirements if odour intensity is a continuous 4-6 then the odour assessor should avoid olfactory fatigue/desensitisation by stopping sampling after a max of 1 minute (or before) if extremely strong and move to cleaner air.
- Sampling must stop immediately, and the assessor must move to cleaner air if the assessor becomes unwell due to the strength of the odour.
- If an (I) of >2 has been recorded the hedonic tone must be recorded along with an odour description.
- Where sniff testing is being completed for potential encroachment Max (I) should be plotted on a map for each sampling point to identify the sites odour plume and the matrix to assess the odour exposure and odour effect at individual receptors must be calculated.
- Where sniff testing is being completed for EA permitting requirements due to an EA Approved Odour Management Plan (OMP) the Max (I) and Hedonic Tone must be recorded for each boundary sampling point on the form contained in Appendix 2 of the OMP.

Appendix 3 Customer Complaint Form:

Wessex Water Rapid reference number (Customer complaint name and address to be kept on rapid system for GDP)	
Receptor location using location of sensitive receptors figures 3.2.1/3.2.2/3.2.3. (E.G. R1)	
Receptor sensitivity (High, Medium, Low)	
Date of odour	
Time of odour	
Wind direction (e.g. from the NE)	
Wind strength (none, light, steady, strong, gusting)	
Weather conditions i.e. dry, rain, fog, snow)	
Temperature (very warm, warm, mild, cold or degrees if known)	
Complainants description of odour: • What does it smell like?	
Intensity (see below)	
Duration (time)	
Constant or intermittent in this period.	
Does the complainant have any other comments about the odour?	
Are there any other complaints relating to the installation (permit area), or to that location? (either previously or relating to the same exposure)	
Any other relevant information	
Were there other known sources of odour in the vicinity at the time?	
Operating conditions at time the odour occurred: See Housekeeping (Chapter 6.5) Key Performance Monitoring (7.1)	
Action take:	
Does a corporate risk system action require raising? Date corporate risk system action raised if required.	
Form completed by:	
Date	

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 4 Odour Diary

Odour Diary					
Name Telephone number	Address				Sheet Number
Date of odour					
Time of odour					
Location of odour if not at above address (inside/outside)					
Weather conditions (dry, rain, fog, snow etc)					
Temperature (very warm, warm, mild, cold or degrees if known:)					
Wind strength (none, light, steady, strong, gusting).					
Wind direction (e.g. from NE)					
Describe the Odour (rotten eggs, musty, earthy, fishy, urine, sweet, vinegar)					
Intensity: How strong was it? See below 0-6					
How long did it last for (time)?					
Was it constant or intermittent in this period?					
Comments					

Intensity

0 No odour
1 Very faint odour
3 Distinct odour
4 Strong odour
5 Very strong odour
6 Extremely strong odour