Avonmouth Bioresources Centre 11800

Waste Management Plan

1. Introduction

This waste management plan (WMP) is designed to meet the requirements of the Environmental Permitting Regulations (EPR) permit process for waste installation activities.

This WMP plan covers waste acceptance, storage, treatment and the recycling process at Avonmouth Bioresources Centre (BC).

Further details on Permit Compliance, site operations can be found on Source but incudes:

Environmental Management Plan EPEMP006

Odour Management Plan TRTWP157

2. Scope of the waste management plan

This WMP covers the installation permitted area which is shown as a green line in Figure 1 below. The blue line is the wider water recycling centre (WRC) boundary of Avonmouth.

Associated documents to this WMP are:

Wessex Water Pre Acceptance, Acceptance and Rejection Procedure = TRTWP549

Residues Management Plan = TRTWP540

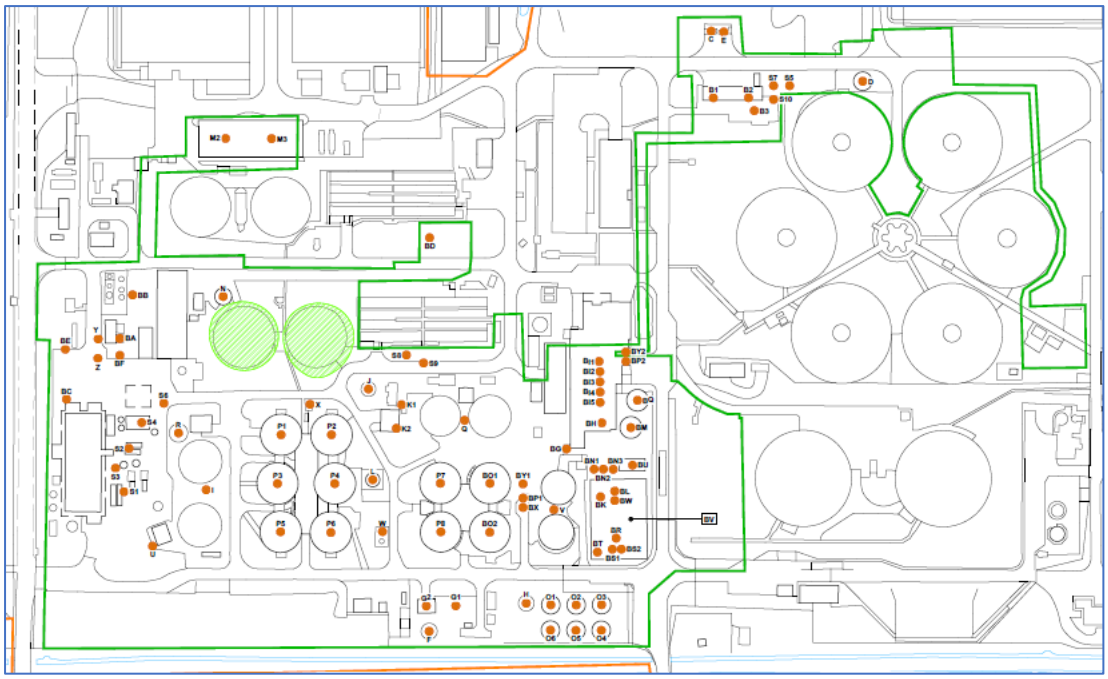

Figure 1: IED permitted area plan at Avonmouth BC

3. Description of operations

Avonmouth BC accepts raw sewage sludge produced by the Urban Waste Water Treatment (UWWT) stream at WRCs across the Northern and Western region of Wessex Water Services. Avonmouth BC also accepts primary and biological sewage sludge (indigenous) produced from the adjoining WRC. The sewage sludge is transported into Avonmouth BC via tanker into

the imported sludge holding tank. Treatment is via acid phase pre-treatment and mesophilic digestion. The digestate is then dewatered to produce a cake which is recycled to agricultural land.

On occasion, the BC will dewater raw sludge and using dedicated centrifuges and export off site for treatment at other sites.

Both sets of liquors produced from the dewatering operations are returned to the inlet of the adjoining WRC.

Please note: Avonmouth BC does not accept hazardous, mirror-entry hazardous, or bespoke wastes.

4. Waste handling

The tanker desk at Wessex Water is responsible for scheduling all tanker loads from outlaying sites to come into Avonmouth BC as sludge imports. Each site will provide an annual tanker requirement for their sites, and then the tankering department will schedule these loads for the year. Tankers are scheduled according to TRTWB003 Sludge Scheduling. The tanker desk then creates a program for tankering into the tankering application TranSend.

Should additional, emergency or ad hoc tankers be required they are scheduled through the tanker desk. Emergency tankers have to follow ROCP114, where the waste is assessed and the tanker desk can book either an internal tanker for non-hazardous waste or use a specialist company and external tanker.

All import movements are then viewable using the QlikView which can also be used to view how many loads are planned to be imported each week. This acts as an audit trail for where loads have been collected from and discharged into Avonmouth BC. This includes information as required by the EA:

- Date and time
- Origin site
- Volume and waste type

Avonmouth BC has a site-specific Traffic Management Plan (BIOP008). Being a large site with sludge treatment processes, the traffic volumes are high. There is a 10mph speed restriction on site, speed camera, traffic calming measures including speed bumps and a one-way system is in place, to reduce traffic accidents and potential pollutions.

TRTWG744 Avonmouth BC Best Tankering Practice is available. Snap off connectors are fitted to all sludge discharge points and along with TBT058 (driving off whilst connected) aim to prevent tanker drive off and loss of tank integrity.

5. Waste treatment

Waste treatment is detailed below with each asset reference letter depicted in Figure 1.

This section is split into two sections:

1. sewage sludge AD process and
2. untreated (raw) sludge dewatering

Please note the initial part of the sludge reception process is the same for process streams and therefore the assets utilised are the same.

1. Sewage Sludge AD process

- 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 before being thickened by injecting polymer from the poly makeup system [M3] into the feed sludge to the SBR SAS GBTs [M2]. 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 6 no 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 two 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.
- 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].

2. <u>Untreated (raw) sludge dewatering</u>

- 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].
- From the strained sludge sump [B3], the untreated (raw) strained sludge can be fed either to the 2no. consolidation tanks [I], the Bellmer Feed tank [J] or may also be fed directly to the Flottweg centrifuges [S7] and associated poly system [S10].
- Untreated (raw) sludge can be taken from the Bellmer Feed Tank [J] and dewatered to untreated (raw) cake using the two road centrifuges [S8] and poly system [S9].
- Untreated (raw) sludge may also be transferred from the Consolidation tanks [I] and processed using centrifuges 5 & 6 [S1] and 7 & 8 [S2] to produced untreated (raw) cake.
- Untreated (raw) dewatered cake is transferred using the raw trailers [S5] which are transported out of the permitted boundary for treatment.

- Untreated (raw) sludge and untreated (raw) sludge cake are kept separate from the treated (digested) cake dewatering, signage, handling and transport. Any untreated (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 untreated (raw) sludge cake.
- There are rare occasions, when a treated (digested) centrifuge needs to be used for untreated (raw) sludge dewatering, there is a complete drain down and clean between the batches to prevent contamination.
- Centrate from 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.

Operational staff are trained using TRTMAN054: Sewage Treatment Basic Knowledge which contains sections on the anaerobic digestion process and maintenance inspections. The EU Skills competency management system (Source link) is in place for all staff Avonmouth BC.

6. Biosolids Certification and Certification

Avonmouth BC retains Biosolids Assurance Scheme (BAS) certification for both the digestion and liming processes. Both processes are controlled by HACCP (Hazard Analysis Critical Control Points) plans (digestion TRTWPL001) and (liming TRTWPL015). The BAS standard requires conventionally treated sludge to achieve an E Coli level of <100,000 in the final product, all sludge at Avonmouth is processed and treated to this “conventional” standard.

The process is controlled by ensuring the CCPs (Critical Control Points), are complied with. For digestion this is the APD digester temperatures and total daily sludge feeds All CCPs are continuously monitored and recorded to ensure compliance with predetermined critical limits. Details of the CCPs are included in the HACCP plans.

The process performance is also monitored by a minimum of quarterly sampling of the raw sludge and the digested cake for microbiological determinands. These laboratory results can be used to calculate the log kill achieved and the E. coli levels in the treated cake.

These samples are taken and processed under controlled conditions to ensure the accuracy of the result. The HACCP plan details the exact location of the sample points, these are labelled on site and detailed in the HACCP plan.

Both the digested and limed cakes are recycled to agricultural land under the SUiAR (Sludge Use in Agriculture Regulations.

7. Waste recycling

How waste residues are handled and managed is covered by the Waste Residues Plan TRTWP540.

AD treated sewage sludge cake or digestate is removed from Avonmouth BC on a daily basis by our contractors. Details are recorded on Wessex Water Sludge Register and reports can be run for the business to identity digestate recycling activities as required by the Sludge (Use in Agriculture) Regulations 1989. Sludge register reports are accessed via Corporate reports and include reports to cover delivery information including date, time, tonnage and location and show spreading movements for field which has spread dates and application rates.

Untreated raw sludge is removed from Avonmouth BC, as the dewatering takes place.

All other wastes, excluding rag skips from the strainpresses, only leave site with waste carrier licence registered contractors. Electronic waste transfer notes or season tickets are completed for these movements and are kept on the EWTN system. Rag skips are transferred to the adjoining composting pad within Avonmouth WRC site area for treatment; via the composting operation operated under permit (EPR/GB3809UZ)

8. Raw materials and usage efficiencies

The raw materials (including materials and other substances which could have and environmental impact) used at Avonmouth BC are listed in Table 1.

Further information of the raw materials properties can be found in its COSHH assessment and associated Safety Data Sheet (SDS) located in the facilities COSHH folder.

When a material is required, the procurement team review suppliers and look for suitable products available for use, considering cost, sustainability and security of supply. The selection process may involve supplier audits and requesting the prospective supplier visit the site to demonstrate product suitability and effectiveness via lab scale demonstrations, where applicable.

Table 1 Raw materials list

Raw Material Name	**Quantities Annual Throughput /year**	**Total held in site**	**Description of use of raw material**
Polymer -Zetag 8160	90,000 kg/a	7000kg (~7 tonnes) (10 x 700kg bags)	Used in poly make up in 3 x locations-SAS GBTs, Belmer GBTS, APD (Raw) GBTs
Zetag 9248FS	290,000 kg/a	10,400 (10 x 1040)	Used for the road dewatering centrifuges
Polymer-Solenis 8187	128,000 kg/a	47 tonnes (10 x 700 kg bags & 40t–Silo)	Used in poly make up for dewatering plant (centrifuges 5, 6, 7 & 8)
Antifoam Burst PF 13	50,000 kg/a	4,000 kg	Used for preventing centrate from centrifuges from foaming and infrequently to prevent digester foaming

Small quantities of oil and lubricants and grease	Approx. 2,000 L/a	Very little stored with in permit boundary	Pumps, motors and compressors

The scope for raw material usage efficiencies is limited, however the use of polymer for both thickening and dewatering of the sludge is monitored using on-site flow meters. On a quarterly basis, a contractor attends site to review the product suitability by carrying out jar tests and use the results of these tests to ensure the dose is optimised for the sludge characteristics.

Daily the plant operators measure the thickness of the sludge being produced by these assets and are able to adjust operational parameters, including polymer dose, to ensure optimal performance. Further, acceptance checks are implemented on tankered imports and mixers are used on sludge tanks where appropriate to ensure sludge consistency. Sludge is moved through the process as fast as possible to minimise any change in its characteristics whilst stored, which could impact polymer usage. Polymer dose rates and thickening and dewatering performance data is recorded as part of the weekly checks by the Technical & Compliance team.

The quantity of antifoam used in the process is dependent on digester stability and operational conditions within the digester. The Digester Monitoring procedure (BIOP037) outlines the monitoring carried out by teams and the frequency with which it takes place. This ensures optimal conditions (including temperature, pH, alkalinity, dry solids and VFAs to name a few) are maintained and that the digester remains stable. Sludge pre-acceptance and acceptance checks also ensure no waste likely to upset the digestion process is introduced. The monitoring means early intervention can be made in the event of operational challenges to maintain stable operation and therefore minimise antifoam use.

As the sludge cake produced is recycled to land, to ensure that the Sludge (Use in Agriculture) regulations (SUiAR) are met, it is not possible to use waste materials instead of a raw material for these applications.

9. Waste minimisation

The residues management plan TRTWP540 Avonmouth Site 13013 Residue plan (TRTWP540) contains waste minimisation measures.

10. Water Usage and efficiencies

Only very small quantities of potable water are used within the treatment process such as topping up the water side of the heat exchanger. The thickening and dewatering processes assets are the largest water consumers and entirely use final effluent from the adjacent WRC.

There are limited opportunities to minimise potable water usage, but we have metering in place to monitor and record volumes in accordance with the permit reporting requirements and guidance: Biological waste treatment: appropriate measures for permitted facilities.

There is a minimal potable water usage for welfare including hand washing and other staff facilities.

Revision history

Issue	Date	Description	Prepared by
1	October 2022	First issue	Carolyn Dewhirst Harriet Edwards
2	January 2024	Inclusion of raw materials	Harriet Edwards
3	November 2025	Revision for waste minimisation, raw material and water usage and efficiencies	James Bezer Shrirunga Bristowe