Yorkshire Water Services Limited

Blackburn Meadows Sludge Treatment Facility (STF)

Application for Environmental Permit Variation

March 2021

Permit Reference: EPR/CP3897LT/V005

Stantec

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Document Structure

Non-technical Summary

Section I: Environmental Permit Application Forms

Part A
Part C2
Part C3
Part F1 (including letter of authorisation)

Section II: Technical Description

Section III: Supporting Information

Section IV: Figures

Figure 1: Site Location Plan
Figure 2: Installation Layout
Figure 3: Principal Emission Points
Figure 4: Drainage Plan

Section V: Appendices

Appendix 1: Relevant Offences
Appendix 2: Technical Competence
Appendix 3: ISO14001 certificate
Appendix 4: Quality and Environmental Policy
Appendix 5: Site Condition Report
Appendix 6: BAT Assessment
Appendix 7: Review of Air Quality Risk Assessment
Appendix 8: Odour Impact Assessment
Appendix 9: Noise Impact Assessment
Appendix 10: Odour Management Plan
Appendix 11: Secondary Containment Risk Assessment

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Sign-off Sheet

Project Name	Environmental Permitting Support
Project No	41527729 0301
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01	31/03/2021	FINAL	E. Stewart	P. Smith	P. Duncan

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Non-technical Summary

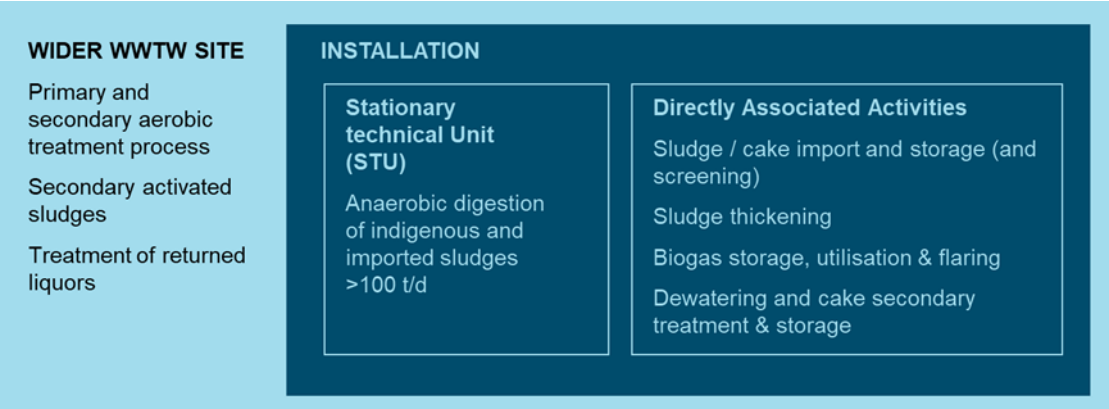
This application is being made due to changes to the Environment Agency (EA) interpretation of the environmental permitting exclusion for Urban Wastewater Activities (under Environmental Permitting (England and Wales) Regulations 2016 (EPR) Schedule 1, Part 2, Chapter 5, Section 5.4). The EA interpretation now requires that anaerobic digestion (AD) plants treating over 100 tonnes/day (t/d) are classified as installations for the purposes of EPR. Furthermore, it has been determined that, in calculating digestor capacity, there should be no distinction between imported or indigenous sludges.

The Yorkshire Water (YW) Blackburn Meadows (BBM) Sludge Treatment Facility (STF), which forms part of the wider BBM wastewater treatment works (WwTW), exceeds the 100t/d throughput limit and it has therefore been agreed that a variation to an existing installation permit (reference number EPR/CP3897LT) is required to add Schedule 5.4 Part A(1)b(i) for AD treatment activities. Note that this existing permit already includes sludge conditioning, biogas storage and treatment (including biogas storage, CHP, boilers and flare) and associated activities. YW is making no changes to the processes within the installation, which is being permitted on the basis of how it is currently operated.

Summary of activities

This permit variation application is to remove the former sludge conditioning processes which used to be carried out at the site, which including blending of sludges with green waste and some Directly Associated Activities (DAAs). In its place, the current sludge treatment process will be added to the permit; this uses AD to safely and effectively treat sewage sludge. Several DAAs related to the AD activity will also be brought into the permit. The revised permit installation will comprise the following:

Figure 1 Installation schematic

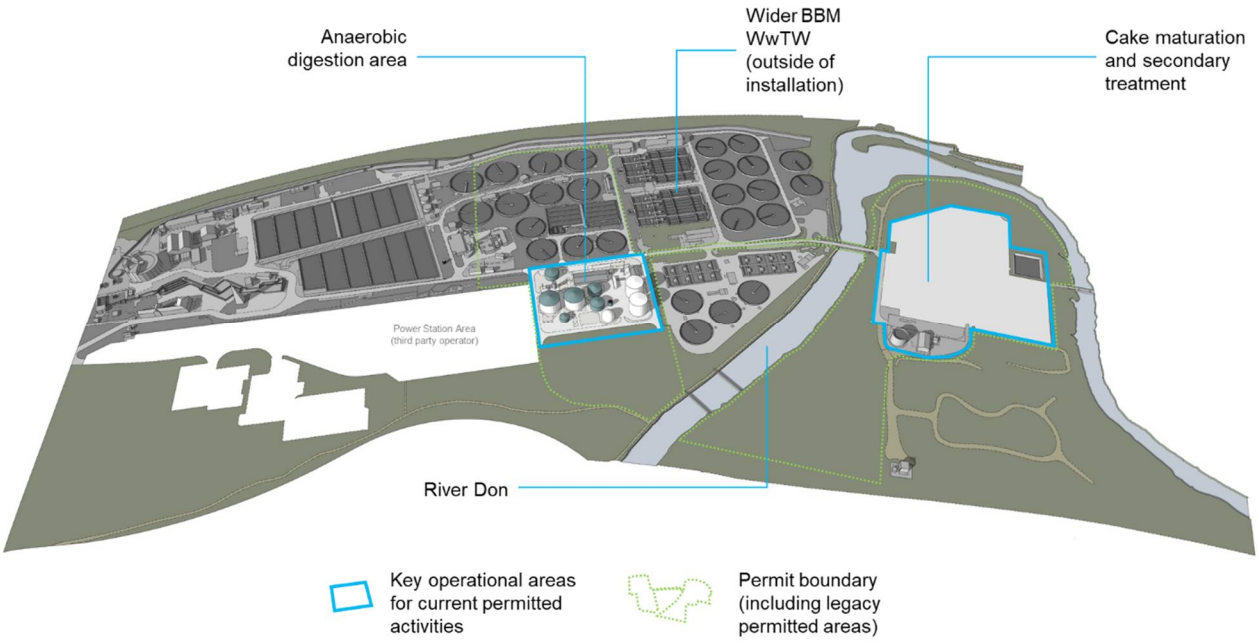


Overview of activities

The BBM STF treats indigenous sewage sludges arising from sewage treatment processes operated within the wider BBM WwTW as well as sewage sludges generated by smaller YW 'satellite' sewage works. The principal activities undertaken within the installation includes:

- Sludge reception and screening,
- Raw sludge thickening,
- Anaerobic digestion,
- Biogas collection and storage (including flaring if operationally necessary),
- Use of biogas (a renewable energy source) to fuel combined heat and power (CHP) and/or boilers, generating electricity and / or heat to support the AD process,
- Digested sludge dewatering,
- Storage and maturation of digested sludge prior to transfer off site for landspreading as an agricultural soil conditioning agent,
- Collection and treatment of potentially odorous gases from the process,
- Raw material storage and use,
- Surface water and process liquor collection and transfer to BBM WwTW for treatment, and
- Waste storage and transfer off site.

Figure NTS-1 Illustration showing main activity areas



Impact assessment

A detailed assessment of emissions from the process and their potential effects on the environment, including local human and ecological sensitive receptors has been carried out. This is reported in this variation application and concludes that there are no significant negative environmental impacts predicted to arise as a result of activities covered within the scope of this permit variation application.

An odour impact assessment has been undertaken. This assessment has concluded that the majority of sensitive receptors are exposed to either a negligible or slight adverse odour effect. One of the fourteen sensitive receptors is assessed as being exposed to a moderately adverse effect. As this is an existing receptor with no history of odour complaints associated with current operations, it is considered that the potential odour exposure at this receptor is unlikely to be significant. However, it is recognised that there is a residual risk arising from odour from any STF process, therefore YW has developed an Odour Management Plan (OMP), which is submitted with this application.

A noise impact assessment has been undertaken. The risk of noise and vibration at nearby sensitive receptors is predicted to be low; more detailed assessment and further mitigation is not required, nor is a specific noise management plan. Noise will continue to be managed through operational controls and good practice.

A fugitive emissions/bioaerosol risk assessment has been undertaken. This has concluded that more detailed assessment and mitigation is not required at BBM STF.

A detailed air quality impact assessment (AQIA) to consider the effects of emissions to air from the CHP and boiler plant has not been undertaken as part of this variation application as these activities are already permitted and no changes are required. A detailed AQIA was undertaken in 2013 to support the application to add the CHP and boilers to the permit. The AQIA has been reviewed and it has been concluded that it remains an appropriate assessment of the potential effects on air quality.

A secondary containment risk assessment has been undertaken to assess whether measures to protect the environment in the event of a failure of containment of primary storage tanks are adequate. Whilst the overall risk assessment indicates that the installation presents an acceptable risk, recommendations are made to consider enhancements to containment in several discrete areas.

Site operational controls

The BBM STF installation is operated in accordance with an Environmental Management System (EMS), which includes controls to minimise point source and fugitive emissions to air, water and land. The YW EMS is certified to ISO14001 and a planned maintenance and inspection programme is in place to optimise the operation of plant.

A leak detection and repair plan is in place to minimise fugitive emissions to air.

An accident management plan has been prepared to assess risks and identify controls associated with accidents and other unplanned events.

Section I: Application Forms

Form A

Form C2

Form C3

Form F1 (including letter of authorisation)

Section II: Technical Description

This section of the application provides a Technical Description of the proposed MCP to be operated at the site.

The Information provided in this section should be viewed in parallel with:

- Section I: Application Forms
- Section III: Supporting Information

1.1 Introduction and overview

This application is being made due to changes to the Environment Agency (EA) interpretation of the environmental permitting exclusion for Urban Wastewater Activities (under Environmental Permitting (England and Wales) Regulations 2016 (EPR) Schedule 1, Part 2, Chapter 5, Section 5.4). The EA interpretation now requires that anaerobic digestion (AD) plants treating over 100 tonnes/day (t/d) are classified as installations for the purposes of EPR. Furthermore, it has been determined that, in calculating digester capacity, there shall be no distinction between imported or indigenous sludges. Therefore, the Yorkshire Water (YW) Blackburn Meadows (BBM) Sludge Treatment Facility (STF) exceeds the 100t/d throughput limit and it has been agreed that a variation to an existing permit is required to add Schedule 5.4 Part A(1)(b)(i) for AD treatment activities.

1.2 Permitting History

YW holds a permit for the sludge conditioning facility at BBM. The permit (reference number EPR/CP3897LT) was originally issued as a waste operation permit on 13th March 2009. A permit variation application was subsequently made (variation issued on 25th October 2013) to include the addition of biogas holder, a combined heat and power plant (CHP), boilers and associated flare stack to the sludge conditioning permit. A subsequent application was then made to transition the sludge conditioning only from a waste operation permit to an installation under the Industrial Emissions Directive (IED). This permit variation was issued on 24th February 2016.

In addition to the permit for sludge conditioning and CHP, YW also holds an environmental permit for a sewage sludge incinerator permit (installation permit reference VP3739PM). This permitted activity remains entirely separate and unconnected to the sludge treatment activities that are the subject of this variation application. BBM Wastewater Treatment Works (WwTW) also currently holds a registered T21 exemption (reference WEX233118).

1.3 Description of Site Activities

A summary description of all activities carried out with the BBM STF is provided below, although it should be noted that biogas storage and treatment activities (including biogas storage, CHP, boilers and flare, listed as waste operations R1, R13 and D10) are already permitted by EPR/CP3897LT.

Figure A Installation schematic

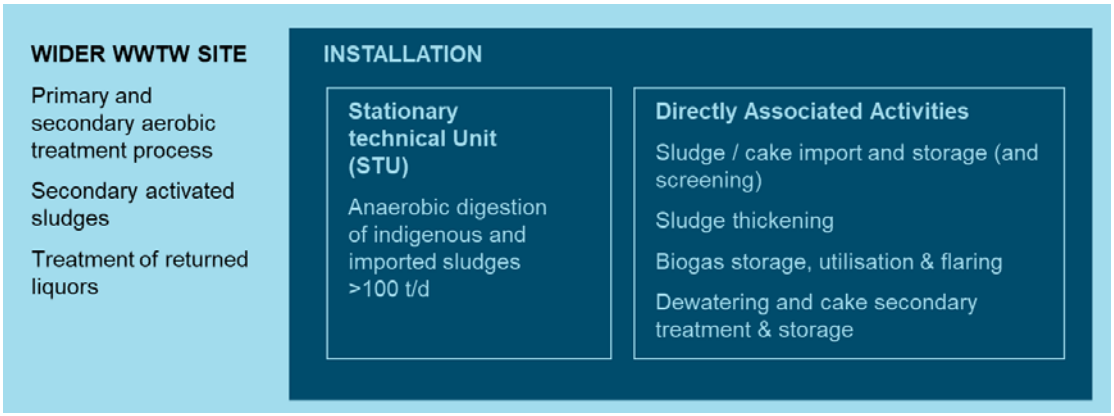


Figure B Installation overview

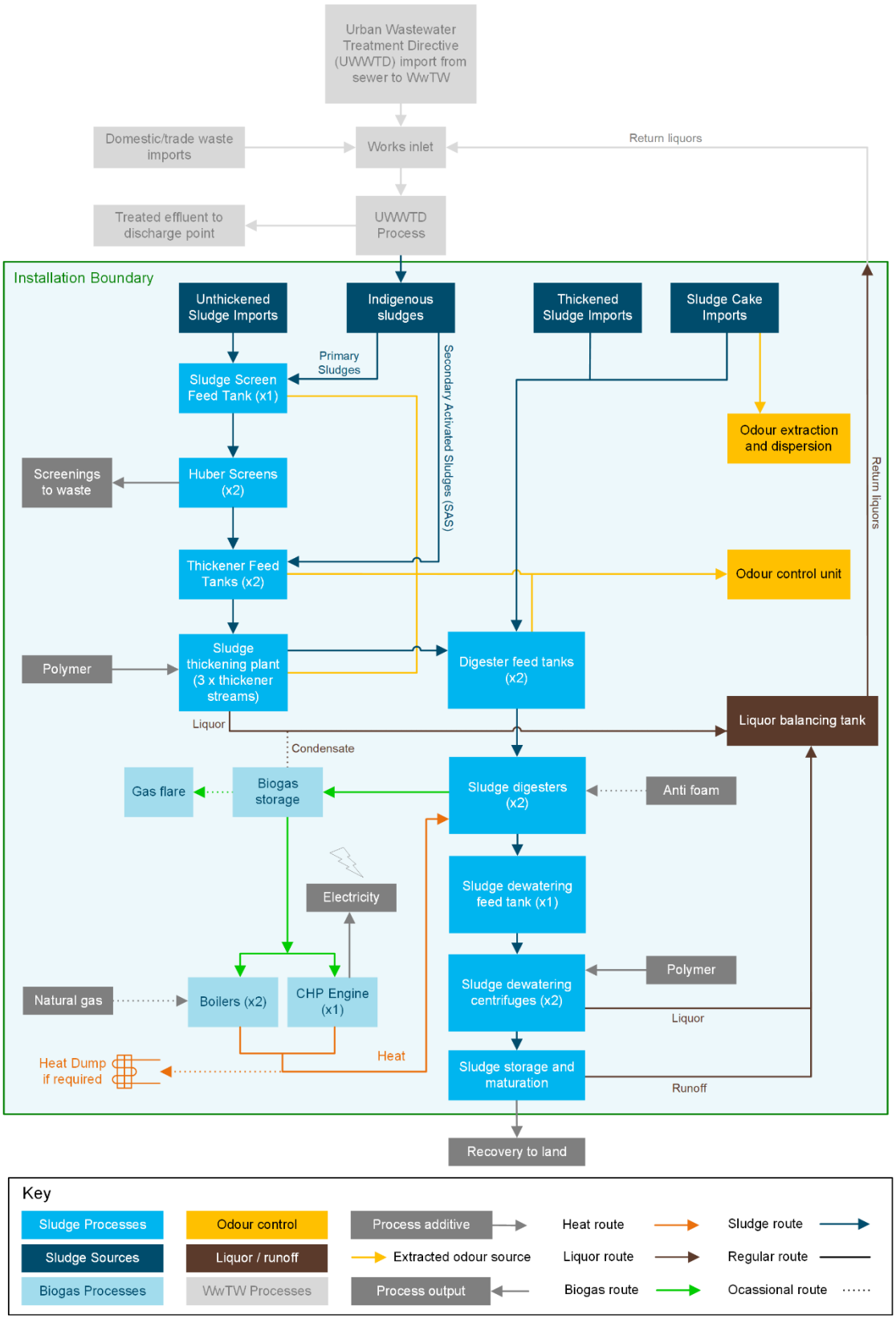
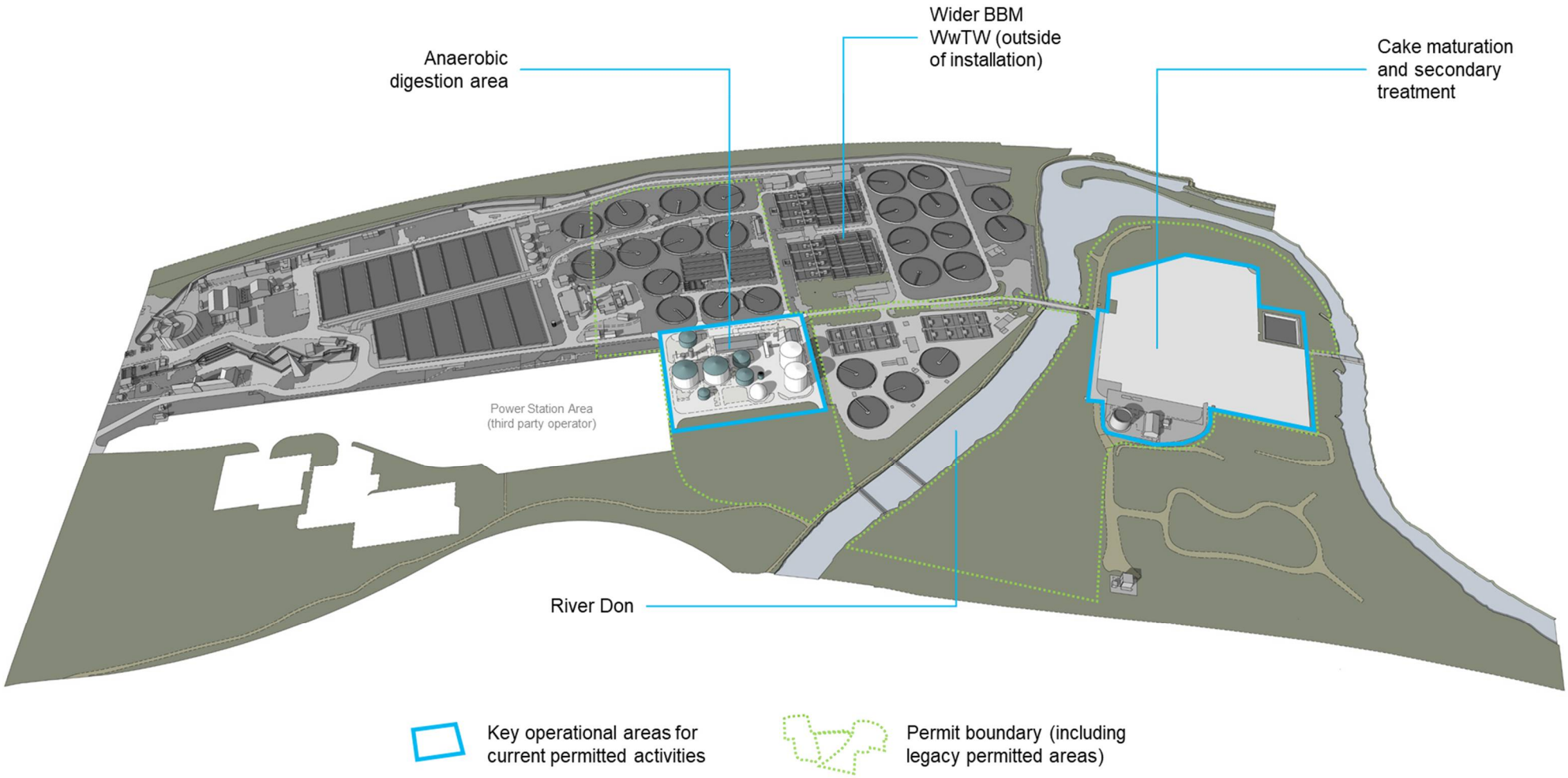


Figure C Installation illustration



1.4 Sludge reception, treatment and handling

Sewage sludges and sludge cake treated within the STF originates from several sources:

- Indigenous sewage sludges arising from sewage treatment processes operated within the wider BBM WwTW are piped directly to the STF.
- Sewage sludges generated by smaller YW 'satellite' sewage works (with lower capacity or capability for treating sludges on-site) are imported to BBM STF for additional treatment. These sludges may be received in the form of thickened sludge, unthickened sludge or undigested sludge cake.

Sludge and sludge cake are delivered to the site by tanker / covered tipper lorry, the maximum load typically being 28 tonnes with unloading routinely taking up to 30 minutes. Only appropriately authorised vehicles can discharge at the site. This is controlled using 'WaSP' loggers, valves on the discharge pipework will only open when a driver presents appropriate authentication to the system. The WaSP loggers record the source of the sludge, the time and date of delivery, the total volume discharged and average percentage dry solids of the load.

Figure D Sludge unloading via WaSP loggers

Imported unthickened sludge is delivered to site by tanker. The tanker unloads at the dedicated sludge import area and sludge is pumped (using vehicle mounted pumps) into the sludge screen feed tank (540 m^3 steel tank). Headspace air from this tank is routed to the Odour Control Unit (OCU). The sludge is screened using two Huber Rotamat enclosed rotating screens. Screenings drop into a skip and are disposed of off-site (see Part III: Form C3, Question 6e for more details of waste streams).

Imported thickened sludges, indigenous sludges and cake are not screened within the permitted installation, these imports are pumped from the transport vehicles using fixed skid mounted pumps.

Figure E Enclosed rotating sludge screens

Sludge cake is tipped from an enclosed wagon to the dedicated sludge cake reception unit which is fully enclosed when tipping operations are not taking place. Sludge is moved from the tipping area via enclosed belt conveyor and is rewetted with final treated effluent (to target ~6% dry solids) and pumped to the digester feed tanks. Transfer lines are trace heated to reduce the risk of freezing and pipe rupture. The sludge cake reception unit has odour extraction and dispersion via a 15m high stack.

Figure F Dedicated sludge cake reception area

After screening, sludge is pumped via a sub-surface concrete sump, to the thickener feed tanks (2 no. 5,816 m^3 concrete tanks with GRP roofs) where sludge is blended and mixed (using air injection compressors); the tanks operate in parallel fill / draw mode.

Sludge from these tanks is transferred to the thickener building via a dedicated pipeline serving each of three thickening streams. Headspace air from these tanks is routed to the OCU. Within the thickener building, liquid polymer is first diluted with potable water, then mixed with final treated effluent as a carrier and introduced to the sludge via in-line injection. After injection of polymer, the sludge passes through a shear valve to break up large pieces of sludge before transfer into a flocculation tank. The flocculation tank gives time for the sludge and polymer to mix prior to entry into the drum thickeners. Each of the three thickener drum units comprises a single hopper serving two individual drums, operating on a duty/standby basis. The polymer encourages separation of water and sludge as the thickened sludge is rotated in the drum to remove excess liquid. These Bio-Energy Digestion (BED) liquors are transferred via the liquor pumping station to the liquor balancing tank (1 no. 1,653m^3 GRP coated steel tank) prior to transfer to the primary treatment section of the main BBM WwTW. The drum thickeners have a cleaning-in-place (CIP) system installed, which utilises potable water.

Liquid polymer is delivered to a 23 m^3 fibreglass storage tank located adjacent to the roadway outside the thickener building and then pumped underground to a second 5 m^3 polymer storage tank located within the thickener building where it is held prior to use. Both tanks are surrounded by a large below ground sumps to provide secondary containment in the event of spills/leaks. Drainage of the sump bunds is controlled by a manually actuated valve, which returns bund water to the head of works for treatment. The sump is fitted with level sensor.

The thickened sludge is transferred to the digester feed tanks (2 no. 1,576 m^3 GRP coated steel tanks), where it is mixed with imported thickened sludge and imported sludge cake, both of which are pumped directly to these tanks. Air compressors provide tank mixing. In the event of a process upset, a bypass line is provided to divert sludge to the digester feed tanks without being processed in the thickener tanks. This would be sub-optimal from a digester yield perspective but provides operational flexibility and enhanced process control.

Best Available Techniques (BAT) Summary: Sludge reception, treatment & handling

- Supervised unloading processes with tankers contracted via approved supplier(s).
- Proprietary enclosed rotating sludge screens reduce odour generation risk.
- Trace heating reduces the risk of loss of containment from pipe fracture on freezing.
- The drum thickeners have a CIP system installed to ensure they operate effectively, efficiently and with reduced odour generation potential.
- Sludge thickener bypass provision to avoid plant shutdown and reduced process control in the event of mechanical or other breakdown in the thickening process.
- Final treated effluent is used as a diluted polymer carrier reducing potable water demand.
- In-line dosing of polymer ensures levels are control and raw materials used efficiently.
- Sludge screening tank and thickener feed tank headspace air is directed to the OCU.
- Tank mixing using air injection to avoid settlement, blockage or gas production.
- PLC controlled plant and largely automated. PLC includes level sensors to reduce risk of tank overtopping, resulting in contamination and potential odour generation.
- YW Environmental Management Procedures (EMPs) are in place covering the import process (refer to Section III, Form C2, Q3d Management Systems).

1.5 Odour control

An odour control unit is operational on site. This comprises a two-stage process with biofilter using polypropylene fibrous media followed by carbon adsorption scrubber. Air extracted from the following sources is transferred for treatment in the odour control unit prior to discharge to atmosphere:

- Sludge screen feed tank,
- Thickener feed tanks,
- Drum thickeners,
- Return liquor pumping station,
- Liquors balancing tank, and
- Digestor feed tanks.

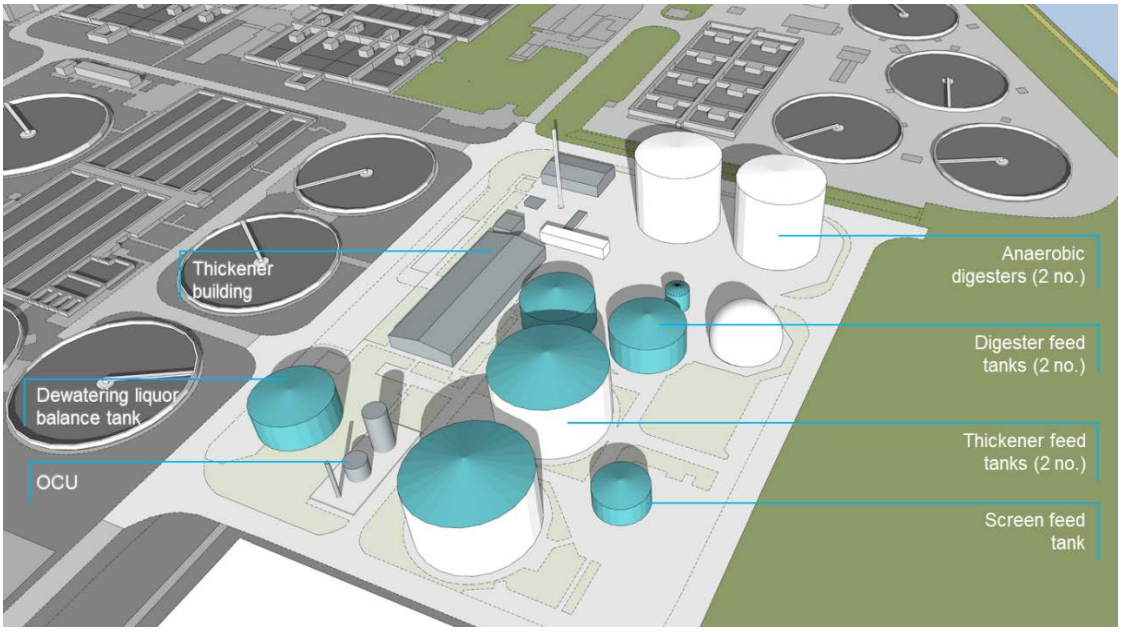
H_2S as measured in the take-off pipework from the digesters is typically less than 10ppm. The H_2S monitoring is linked to SCADA alarms, with various triggers levels (including, High, High High, Low, Low Low). Low H_2S will not cause process problems but is alarmed as very low readings may indicate equipment failure.

Figure G Odour control unit

1.6 Sludge digestion

Thickened sludges are pumped from the digester feed tanks to the anaerobic digesters (2 no. 6,713 m^3 concrete tanks). The anaerobic digesters operate as a continuous process with sludge being added and treated sludge extracted. The digesters have a typical combined feed rate of around 863 m^3 /day; the maximum feed rate is 960m^3/day giving a 12-day retention time as required by Hazard Analysis and Critical Control Points (HACCP) controls. The digesters are mixed by gas mixing systems, which utilise biogas from the headspace of each digester; the gas is compressed and then reintroduced using an array of mixing nozzles on the floor of the digester.

Figure H AD area configuration



A hot water circuit provides heating to ensure optimum conditions for digester microbial activity. Mains water is heated to around 70°C by the CHP and/or boilers. This hot water then heats the digester using tube-in-tube, counter-current heat exchangers. Sludge in the digesters is continually recirculated around the heat exchangers via convection currents. A 3-way modulating valve on the water side moderates the amount of hot water that passes into the heat exchanger, depending on the heat demands of the digesters.

Grit build up within digesters is a normal feature of operation, the digesters are cleaned out (including accumulated grit) every 10 years as part of the planned periodic inspection which also includes an internal and external inspection of tank integrity and replacement of instrumentation and gas mixing equipment as required.

An automatic anti-foam dosing system is in place to control digester foaming. This system uses a radar level probe in the digester headspace and compares this to the pressure level sensor at the bottom of the digester to determine the depth of foam. Upon detection of foam, final treated effluent is sprayed into the digester head space through nozzles in the digester roof. If this is not effective in breaking up the foam, a chemical anti-foam is mixed with final treated effluent and dosed into the headspace of the digester via the same spray nozzles. This system includes operator-adjustable dosing setpoints and failsafe systems; if the foam

level continues to increase mixing systems are inhibited and if this continues the digester feed will be inhibited. Antifoam is stored in an 1m^3 IBC located within a bunded GRP kiosk.

Sludge extracted from the digesters combines via a bell mouth into a single feed to the transfer tank (107 m^3 GRP coated steel tank) prior to onward processing. The transfer tank is equipped with air mixing to introduce oxygen and prevent the anaerobic generation of methane and is connected to the OCU.

Best Available Techniques (BAT) Summary: Sludge digestion (*BAT 38*)

- Sludge pumps are on inverters for energy efficiency, and typically operate around 75% speed.
- Digested sludge transfer pumps are fitted with vent lines to prevent build-up of potentially explosive biogas.
- The plant operates under PLC and is largely automated.
- YW procedures are in place covering the digestion process management.
- Monitoring is undertaken to check that the digestion process is healthy and stable. This includes temperature, solids, volatiles, fatty acids and pH, as well as biogas quality (Refer to Section III, Form C2 Q4a for further information on process monitoring).
- Foam levels are actively monitored, and an anti-foam system is used as required.
- Monitoring instrumentation including high level probes and pressure sensors linked to automatic PLC controlled pumps and other equipment to avoid potential loss of containment.
- An inspection and testing programme for above and below ground vessels, pipes and valves is in place. This incorporates a combination of visual examinations and non-destructive testing (e.g. ultrasonic thickness measurements).

1.7 Biogas storage and use

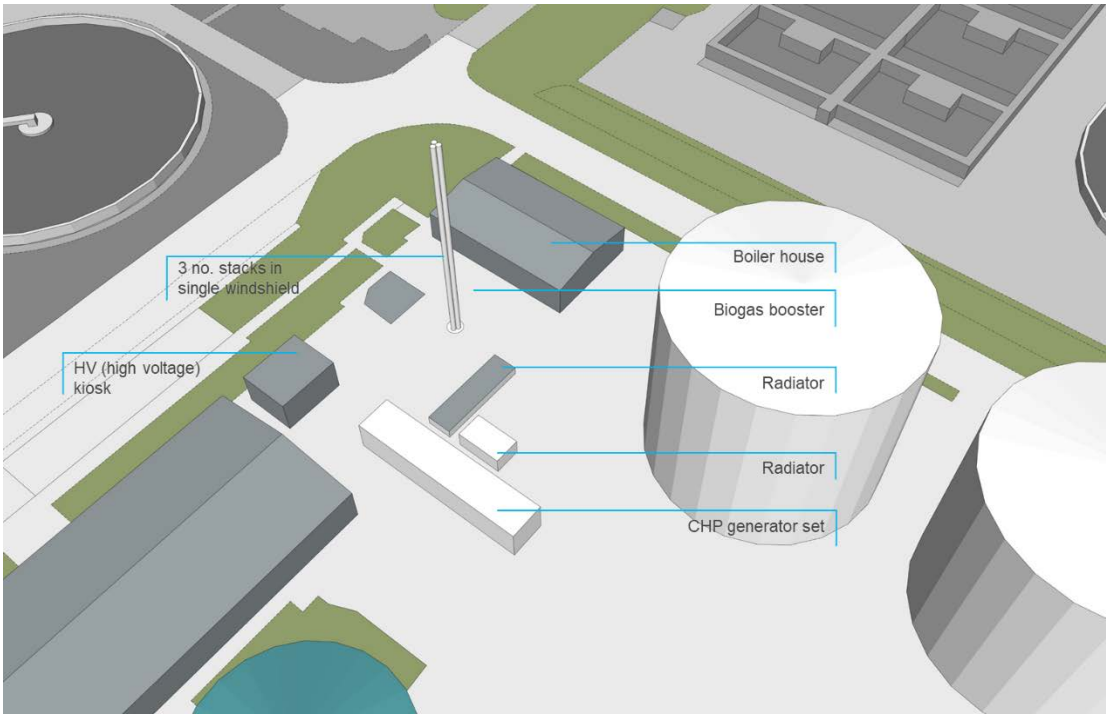
Biogas generated by the digester is piped to the biogas holder (1,580m^3 capacity) and from there to the CHP, boiler plant and/or waste gas burner (flare). The biogas holder provides gas buffering capability in order to allow for fluctuations in gas production.

Figure I Biogas holder (with digesters behind)

Excess liquids within the biogas are removed via condensate traps on the biogas system, at the inlet to the biogas holder, in the pipeline leading to the flare and in the pipeline leading to the CHP/Boilers. These collected liquids are transferred to the head of the works for treatment.

Pressure relief valves are located at the digesters (2 no. at each digester), and on the inlet to the biogas holder. These valves are an essential safety mechanism and will release gas to atmosphere in the event of a build of pressure preventing damage to equipment e.g. the gas holder. The valves are also an 'anti-vacuum' design to prevent tank damage from negative pressures. Additional gas release valves are installed between the digesters and digested sludge tank (3 no.) and on transfer pipes between the digesters and the sludge dewatering centrifuge. The primary purpose of these is to prevent air-locking within pipework and subsequent loss of pumping.

Figure J Biogas utilisation area configuration



Biogas, via a gas booster, is used as the sole fuel source for the site CHP; no natural gas or other alternative fuel is available. The CHP facility comprises a single reciprocating engine generator set. This engine has a thermal input of 2MW and generates electricity which is used to power essential site processes; excess electricity may be exported to the national grid. Heat from the combustion process is used to maintain the required temperature in the anaerobic digesters, with any excess being discharged using air cooled radiators.

CHP engine combustion products are discharged via a 27 m high stack located adjacent to the engine. This exhaust stack is contained, with two boiler exhaust stacks (one for each boiler), within a single windshield.

In periods where the CHP engine is unavailable biogas is directed to the waste gas burner. This flare facility comprises a 1,528m³/hr enclosed thermal combustor with 7.5m high exhaust stack and is located at a safe distance from the digesters and other biogas handling and treatment activities. Flare stack operation is automated based on gas level. If the gas level is high then the flare will operate, however utilisation of the gas is preferred over flaring. The flare provides 0.3 second retention time at 1,000 deg. C.

Gas-fired boilers are used as an alternative heat source for the digesters. There are 2 no. 3,392kW boilers, which operate on a duty/standby basis. Each boiler is powered by biogas (with gas booster) with mains gas providing back-up fuel supply.

The areas around the digesters and gas storage and use are classified as a potentially explosive atmosphere, with strict provisions on the control of potential ignition sources in line with requirements of the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).

All areas of the STF are surrounded by sections of concrete hardstanding, with a mix of grass and gravel beyond.

Best Available Techniques (BAT) Summary: Biogas utilisation and flares (*BAT 15 and 16*)

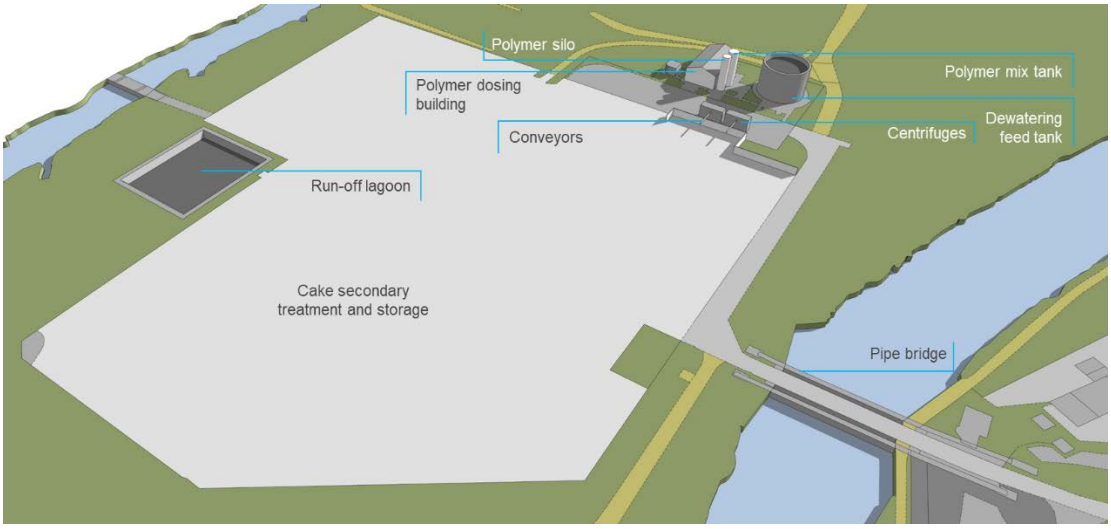
No scrubbers of gas cleaning systems are required due to the high quality of gas generated by the site and low levels of H_2S present.

- Flame arrestors are fitted to the biogas flare system to reduce the risk of fire / explosion.
- Flare burns at 1,000 deg. C with 0.3 second retention time.
- The flare is regularly checked to ensure that it ignites correctly when required and gas flow to the flare is constantly monitored using inline meters.
- Biogas holder provides gas buffering and allowance for fluctuations in gas production.
- Flow meters installed on gas utilisation under PLC control to maximise utilisation efficiency.
- The plant operates under PLC and is largely automated.
- YW procedures are in place covering biogas management.

1.8 Digested sludge treatment, handling and disposal

Digested sludge is pumped from the transfer tank located adjacent to the anaerobic digesters to the digested sludge dewatering facility via a combination of above and below ground pipes, including a pipe bridge across the River Don. The pipe bridge is lagged above ground at the river crossing to provide temperature control. Gas release vents are located on the transfer pipes from digesters to centrifuge (on the sludge pad side of pipe bridge).

Figure K Digested sludge treatment area



Digested sludge transferred to a single dewatering feed tank (concrete tank with a capacity of 1,973m^3); this represents approximately 2-3 days sludge generation at normal throughput rates. The tank has air mixing both to prevent settlement and inhibit generation of methane. Powdered polymer stored within a storage silo is mixed with potable water within a polymer mixing tank. The polymer solution is injected into the sludge stream and taken to one of two centrifuges where the sludge coagulates and supernatant liquor is removed by centrifugal forces. Dewatered liquor drops from the centrifuges into a sump and is pumped back to the liquor treatment tank, allowing return of liquor to the works for treatment to be controlled.

The final digested and dewatered sludge cake is transferred via centreless screw conveyers from the centrifuges up over a push-wall and onto the cake pad. The whole area under the conveyer and adjacent sludge cake pad is an engineered impermeable surface, with water runoff draining to a lagoon, which is lined with a geotextile membrane. From the lagoon, liquids are pumped to the head of the works ensuring that all run-off and process liquors are collected and treated prior to discharge.

Figure L Cake pad area

Once on the cake pad, sludge cake is moved by mechanical loaders into storage rows. There is no lime addition at BBM; instead, cake is stored in piles according to age and is left to mature for a minimum of four weeks in accordance with HACCP requirements. This means that approximately 3,000m^3 sludge cake will normally be held on site at any one time. The maximum storage capacity of the cake pad is significantly greater (approximately 12,000m^3); greater volumes may be stored on site in emergency/abnormal conditions such as following processing problems at other YW sites or in extreme weather conditions when landspreading operations are temporarily paused. Once maturation is complete, sludge cake is removed from site and landspread in accordance with legislative requirements. Samples of digested, matured cake are taken every 3 months and analysed for metals and pathogens to ensure HACCP standards are being met.

The cake pad also serves certain contingency functions, for both operations at BBM and to wider strategic regional sewage infrastructure operated by YW. The cake pad may, under exceptional circumstances (such as the failure of assets or non-availability of normal disposal routes on a temporary basis) be used for storage of treated digestate produced at satellite sites, before being recycled to agriculture. Similarly, other contingency measures could require, under exceptional circumstances such as failure of assets, the interim storage of thickened or dewatered sludge on the cake pad, where that sludge originates from a satellite site (or from BBM operations), before that material then undergoes AD treatment in the STF at BBM, or if necessary is removed for ongoing treatment at an alternative AD facility. It is recognised that such operations are abnormal and would require initiation of site contingency operating procedures, with the intention of minimising any potential short term adverse environmental effects and returning to normal operations as soon as practicable.

Best Available Techniques (BAT Summary)

- Lagging on above ground pipework forming the river pipe bridge provides temperature management to ensure that flow is maintained reducing the risk of viscosity increases or expansion associated with cold temperatures, reducing the risk of pipe fracture and loss of containment.
- Digested sludge transfer pumps are fitted with vent lines to prevent build up potentially explosive biogas.
- Engineered cake pad with leachate and washwater collected for treatment at the WwTW.
- An inspection and testing programme for pipes and valves is in place. This includes biennial surveys using in-pipe crack detection technology.

Section III: Supporting Information

This part of the application provides detailed responses to questions in Section I: Application Forms, where further space is required to provide the necessary information.

Responses are provided only where further information is required, and the questions numbers are as stated in the application forms.

The information provided in this section should be viewed in parallel with:

- Section I: Application Forms
- Section II: Technical Description

Form C2 Supporting Information

2 About your proposed changes

Proposed changes to current activities within this installation are provided in C2: Table 1 below. A full summary of activities it is proposed will be included within this installation are provided in response to Form C3, Table 1a later in this section.

Table C2: 1 - Changes to existing activities

Name	Installation schedule 1 references	Description of the installation activity	Description of waste operation	Description of the mining waste operations	Description of water discharge activity	Description of groundwater activity
BBM STF	Section 5.4 A(1) (b)(i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment	**Removal** of sludge conditioning / phytoconditioning from the permit	None – already regulated as an installation level permit	N/A	N/A	N/A
		Addition of anaerobic digestion of sewage sludge including directly associated activities (DAAs)	None – already regulated as an installation level permit	N/A	N/A	N/A
		Removal of DAA associated with phytoconditioning process: Physical treatment for the purpose of recycling	None – already regulated as an installation level permit	N/A	N/A	N/A
		Addition of DAAs associated with anaerobic digestion: Secondary treatment (including physical handling and dewatering) of treated digestate.	None – already regulated as an installation level permit	N/A	N/A	N/A
		Addition of DAA associated with anaerobic digestion: Interim storage of thickened or dewatered sludge before AD at another site	None – already regulated as an installation level permit	N/A	N/A	N/A
	None – currently regulated as a waste level permit	None – currently regulated as a waste level permit	**Transition** of the following waste activities to installation level permit (as DAAs): • Storage and treatment of biogas • Use of biogas as a fuel in existing combustion plant • Incineration of biogas	N/A	N/A	N/A

3 Your ability as an operator

3b Technical ability

YW have relevant technical competence to operate the activities at the site, including those included in this permit variation. Technical management will be provided by David Shaw, Yorkshire Water; his primary and continuing competency assessment certificates can be found in Appendix 2.

The environmental permit numbers and site address for all other waste activities that David Shaw provides technical competence for are provided in Table C2: 3b below.

Table C2: 3b Sites under the technical competence of David Shaw

Permit number	Site address	Postcode
KP3036LW	Lemonroyd STF Fleet Lane Oulton Leeds	LS26 8AB
VP3730GB	Mitchell Laithes (Dewsbury) STF Dewsbury	WF12 9BB
KP3536LL	Neiley STF Newmill Road Brockholes	HD9 7AL
KP3836LT	South Elmsall STF Chapel Lane South Elmsall	WF9 2SW
FB3809MM	Knostrop STF Knowsthorpe Lane Leeds	LS9 0PJ
EPR/VP3130GZ	Esholt Waste Water Treatment Works CHP Plant Ainsbury House Idle Bradford West Yorkshire	BD10 0TW
EP/VP3639PS	Huddersfield Energy & Recycling Facility Upper Brighouse WwWTW Cooper Bridge Road Mirfield West Yorkshire	WF14 0BS
EPR/WP3030GC	Hull Sludge Treatment Facility Hull Waste Water Treatment Works Hull Road Kingston upon Hull	HU12 8EY
UP3634LF	Halifax Copley Sludge Treatment Facility Halifax Copley WwTW Wakefield Road Salterhebble Halifax West Yorkshire	HX3 0TL

3d Management systems

YW has an established EMS, which is certified to the ISO14001 standard. A copy of the YW ISO14001 certificate is provided as Appendix 3. The EMS forms part of a wider corporate Integrated Management System (IMS) which also incorporates quality management, health and safety management, asset management, organisational resilience and business continuity requirements. The management system follows an asset life cycle approach, from design through to decommissioning.

Corporate level management system processes are in place, which are supplemented by site-specific documented procedures and processes. YW's IMS is structured as shown in Table C2: 3d-1 below.

Table C2: 3d-1 Overall IMS structure

Level 1 - IMS Manual	
	YW's IMS manual is a set of documents including records which describe the scope, policy, objectives and overall management responsibility within YW and specifically addresses the requirements of ISO9001, ISO14001, ISO55001 and ISO45001.
Level 2 - Generic Manuals	
	The level 2 generic manuals detail policies and procedures, concerning the operation and maintenance of systems giving the purpose, scope, responsibilities and operational requirements.
Level 3 - Site Specific Manuals	
	The level 3 site specific manuals detail site specific information and procedures, concerning operations, giving the purpose, scope and responsibilities. Document control procedures are in place to ensure IMS and associated documents and records are identified, controlled, maintained and retained appropriately. Key records maintained in accordance with IMS procedures include training records, internal audit reports, waste transfer and consignment notes, complaint records, risk assessments, legislative records, permits, consents and associated documentation, accident and incident records and monitoring and measurement data.

A summary of the EMS is provided on the following pages, focusing in more detail on how this is applied to the management of sludge treatment operations.

Scope and Policy

The YW EMS has been certified to ISO14001 since 2004. The certified EMS scope covers:

"The management and operation of clean and waste water assets and associated services".

YW's top level commitment to environmental and quality performance can be found in the Quality & Environmental Policy; a copy of the policy is provided as Appendix 4.

Quality and Environmental Policy

Chief Executive of Yorkshire Water Services Ltd approves and is **accountable** for implementation

Responsibility of **all employees** to comply

Covers **all YW activities**, including the BBM site, and applies to all individuals who are employed by, or carry out work on behalf of YW including contractors, temporary staff and agency workers

Key Roles and Responsibilities

YW has a central team responsible for the implementation of the overall IMS; the YW Bioresources team are responsible for maintaining ongoing compliance and managing the BBM STF.

YW personnel have role statements which provide details of the responsibilities and accountability of individual roles.

Planning Actions

YW has established appropriate forums and mechanisms for the identification and management of risk, including senior leadership teams and governance groups. Actions are cascaded throughout the organisation as appropriate.

In relation to environmental issues, climate change risk assessments are carried out as well as consideration of extreme weather and climate resilience work. Environmental aspects and impacts have been identified and are recorded using the company's software platform for recording risks (currently the '4Risk' system).

YW is committed to comply with all relevant legislation, regulations and any other requirements to which the organisation subscribes. Legislation is analysed so that its relevance to the activities, aspects, products and services of YW are understood, communicated and applied. Registers of relevant legislation and other requirements are maintained and managed via the Evaluation of Compliance (EoC) process held on SharePoint.

Management requirements that arise from risk assessments and evaluation of compliance processes are taken into account in planning operational control and emergency preparedness procedures.

General Operational Controls (Environmental)

Operational facilities, including the BBM STF, are managed in accordance with procedures laid down within the EMS. This includes procedures to identify and control environmental issues arising from YW's activities, including specific environmental permit requirements.

Procedures specify environmental best practice requirements, including for example storage of chemicals and oils within a bund (with 110% capacity) which must be maintained in good condition, located inside a building wherever possible, on hardstanding and away from watercourses and site drains. Waste must be segregated appropriately, and waste containers must be located on impermeable hardstanding.

YW has developed a biodiversity policy, underpinned by specific processes and procedures, to deliver programmes of work that aim towards a biodiversity net gain. This policy is applicable to contractors delivering work on behalf of YW.

Maintenance (Planned)

A planned maintenance system is in operation at BBM covering all electrical and mechanical equipment and calibration of instrumentation and control system. A list of all plant items is stored on the Asset Inventory System (AI2) and the frequency, scope and records of planned maintenance and calibration are stored on SAP. Job cards for planned maintenance are produced through the SAP system giving the necessary work instruction. Planned maintenance requirements are initially based on recommendations provided in Operations and Maintenance (O&M manuals).

Total Care Plans (TCPs) are produced for all sites and are reviewed at set intervals. TCP reviews set future planned maintenance frequency, the work to be carried out during the planned maintenance and identifies critical and life expired plant items. This is based on the review of the plant item's history and on condition monitoring results.

An inspection and testing programme for above and below ground vessels, pipes and valves is in place. This programme of work to detect any deterioration or weakness of assets

typically incorporates a combination of visual examinations and non-destructive testing (e.g. ultrasonic thickness measurements). The frequency of inspection is in accordance with risk-based requirements, which also varies according to the condition of the asset. A clear process to address any identified defects, with assigned responsibilities, is in place.

In addition to planned maintenance activities described above, a programme of daily, weekly and monthly visual inspections and checks are undertaken. This includes, for instance, visual inspections of general site condition and housekeeping including spills and biogas leaks, checks for abnormal heat, noise and vibration, checking the operation of pumps and monitoring instrumentation, checking calibrations are in date etc. Any abnormal observations are recorded in the site logbook.

Odour checks are carried out in accordance with the Odour Management Plan (see Appendix 10).

The designated Technically Competent Manager (TCM) also undertakes monthly inspections of the site to identify any potential issues and arrange resolution as necessary. These inspections are recorded and the information is retained by YW.

Maintenance of the CHP, boilers, OCU, and de-watering plant are undertaken by specialist contractors. All activities are closely managed from site to ensure that all YW H&S and environmental policies are met. Regular maintenance of plant such as CHP engine is undertaken in accordance with requirements specified by the equipment manufacturer including routine planned inspections and more in-depth servicing. The frequency of servicing is based on a combination of running hours and condition monitoring data. CHP contractors are on site weekly whilst boiler maintenance normally requires attendance on a quarterly basis. Maintenance contracts include provision for reactive/emergency activities and management of spares.

Processes on site operate continuously, 24-hours per day, 7-days per week, apart from maintenance periods. The plant is designed to operate unattended with process parameters being monitored continuously. Operating logs are stored electronically.

Maintenance (Reactive)

Plant breakdowns are responded to on the basis of a risk assessment matrix (RAM) and prioritised according to consequence of failure and likely time to failure occurring. Amongst other attributes, the RAM takes into account impact to environment, health and safety, cost and flooding.

Site operational staff are responsible for requesting breakdown maintenance and repairs. Any reactive work that achieves a high priority on the RAM is called through to the Engineering Service Desk for progression. These jobs are treated as schedule busters and are progressed accordingly.

Records of all maintenance (planned and reactive) and calibration are retained on the SAP work management system.

Waste Characterisation (Pre-acceptance & Acceptance)

All sludges arriving at BBM STF are either indigenous primary and secondary sludges from the BBM WwTW or imported sludge and sludge cake from satellite YW sites. As a result, the composition of the sludge is very stable, consistent, and is well understood. The volume and source of imports to the site is recorded by WaSP loggers. These also ensure that only appropriately authorised drivers can discharge at the BBM STF. All sites supplying sludge to BBM have been reviewed to ensure that the typical sludge they produce is suitable and safe for anaerobic digestion. Sludge production problems are rare, but operators and tanker drivers are trained to identify contaminated sludges at source and stop them being transferred to the digestion site. Spot checks are carried out on imported sludges to ensure they are within acceptable parameters and safe for the digestion process.

All cake (digested sludge) exported from BBM has to meet stringent HACCP requirements, including regular sampling to assess safety.

Emergency Preparedness and Response

YW has developed processes to identify, respond to and control emergency situations that may cause adverse environmental consequences. Spill kits are readily accessible at locations where there is a risk of spillage (e.g. delivery, storage and areas of use). Spill control toolbox talks are provided to staff. This includes information about how to prevent and control pollution incidents from accidental spills of oils, fuels, sludge and chemicals.

Contingency plans help minimise potential environmental impacts; this includes emergencies arising from breakdowns, enforced shutdowns, abnormal circumstances such as flooding as well as major fire and spill/loss of containment events. Refer also to the Accident management plan (see Section III; C3, Q6-6) and the Secondary Containment Risk Assessment (Appendix 11).

The YW Business Continuity Plan is in place to define and prioritise critical business functions, details the immediate response requirements for a critical incident and details strategies and actions to be taken to ensure business continuity.

All Bioresources sites, including BBM, have the capability of remote monitoring and remote operation of key functions. A security guard is present on site 12 hours per day Monday to Friday and CCTV security cameras are located across the site with monitoring provided 24/7 by the YW Service Delivery Centre. All buildings are alarmed and high-risk equipment is provided with secondary fencing for added security.

Monitoring

Process monitoring is undertaken for all key processes on site. This includes monitoring of operational parameters of plant and equipment to ensure it is operating effectively and efficiently. Further details are provided in Section II Technical Description.

Air emissions monitoring, including emissions from the CHP stack, is undertaken in accordance with permit requirements. Further details are provided in Section III, Form C3, Question 2 below. Odour monitoring is described in Appendix 10: Odour Management Plan.

Environmental performance monitoring includes monitoring electricity and gas use, biogas generation, electricity generation, water use and waste arisings. Further details are provided below in response to Form C3, Questions 6a, b, c, d and e.

Training, Awareness and Competence

YW maintains processes to ensure that all those working for or on behalf of YW are suitably trained to fulfil their roles efficiently. Assessment of competence and identification of individual training needs is carried out through mutual discussion between the individual and their manager as part of the company performance management process, a fundamental part of which is the competency framework and progression plans which are available for every role in the organisation.

All YW employees receive IMS awareness training, delivered online at induction and periodically thereafter. This includes awareness of the environmental policy and understanding key environmental hazards and risks and the need to comply with IMS requirements.

Staff who work at the BBM STF receive specific training in the plant's operation and the potential environmental impact of the process as well as health and safety. AD plant operators have a detailed understanding of the operational procedures for the site for both normal and abnormal operation. As part of the training, operators will receive specific instructions relating to those aspects of plant operation that have the potential for a negative impact on the environment. Toolbox talks are used to provide information and training to site staff, including information about environmental requirements/activities and legislative and compliance requirements. Training records for programmes and courses managed centrally are held on the company Learning Management System. Records for specific training managed locally at the BBM site is held by individual managers and/or on the Leaning Management System.

Communication

Communication plans are in place to communicate business performance based on the company's 'Big Goals', company objectives and performance commitments, aligned to the quality, safety, environmental and asset management requirements.

The company intranet, called the Hive, provides regular news updates for YW personnel and holds a wide range of information that employees can access. Other key communication channels include regular corporate newsletters, business unit-specific newsletters, and update sessions and events held by senior business leaders. 'Safeguard' communications are used to issue notifications such as Safety Alerts, Toolbox Talks and Lessons Learned from incident investigations to personnel across the business.

At a BBM site level environmental information is communicated primarily via toolbox talks and noticeboards.

Contractors

YW has specific procedures in place for the management of contractors regarding health, safety and environmental requirements. This includes procedures to ensure contractors have the required skills and environmental competencies to carry out works at this site. Initially, contractors are assessed by the procurement department for inclusion on the approved supplier list, which includes health and safety and environmental criteria for example, waste documentation such as waste carrier's licence/training certificates. Even when the contractors are on the approved supplier list, they are still further assessed for each specific contracted activity. The contractor is required to submit a risk assessment method statement (RAMS) prior to any commencement of work, identifying how work is to be undertaken and the associated risks. The RAMS must be approved by the Site Manager or an assessor who is competent at reviewing a RAMS, who will also identify any site hazards and issue an Authorisation to Work/Enter the site, following a site induction. When on-site, the contractor must carry this Authorisation to Work at all times.

Environmental Improvement

Yorkshire Water's IMS objectives are documented with the 'Big Goals' and 'Performance Commitments' which are available and communicated via the company intranet. Planning to achieve IMS objectives is monitored and reported internally (via Performance Zone) and externally (via the Annual Report).

The BBM STF has daily and weekly performance targets including sludge throughput, gas quality, electricity generation and electricity consumption targets. Performance against these targets is reviewed at daily meetings and corrective actions taken as required.

The EMS is subject to a Senior Management Review twice a year to consider environmental performance, objectives and targets and continual improvement.

The Innovations Team at YW undertakes regular monitoring and review of new and innovative technologies and equipment to ensure the business continually improves its operations and activities. This includes consideration of cleaner technologies and improved environmental performance. Sectoral and cross-section benchmarking also takes place as required.

Incidents, non-compliance and complaints

Processes have been developed by YW to identify, respond to and control situations that may cause actual or potential non-conformities. Non-conformities may be identified through internal audits/inspections or may be detected through other means. Incidents are managed in accordance with the Incident Management policy and procedures and Emergency Planning manual. In the event of a significant incident a root cause analysis is conducted. Actions are identified, reported, recorded and communicated to prevent reoccurrence.

Complaints are typically received by YW central Customer Services team, where all complaints are logged on the ICE system. Complaints relevant to BBM STF are passed on to the Site Manager for further investigation. The Site Manager is responsible for ensuring that any complaint is investigated and, if found to be justified, that work is undertaken to resolve the issue, including liaising with the relevant regulatory bodies where appropriate. The Customer Service Team ensure an appropriate response to the complainant in a timely manner including, if and as appropriate, detailing the reason behind the issue and the actions taken to resolve the matter.

All complaints information is recorded on the ICE system in order that this can be monitored, reviewed and analysed.

Auditing

YW operates an internal audit programme delivered by trained internal auditors or suitably qualified external consultants or contractors. This includes the following:

- IMS auditing/inspections undertaken by the IMS Team.
- Regular combined quality, health and safety and environmental inspections performed at all operational sites, including BBM STF.
- Assurance and improvement programme to ensure the health, safety, environmental and technical compliance of contractors delivering capital schemes.

- Audits of contractors delivering repair and maintenance activities.

YW is also subject to regular audits by external auditors to ensure continuing adherence to ISO14001 requirements.

Management Review

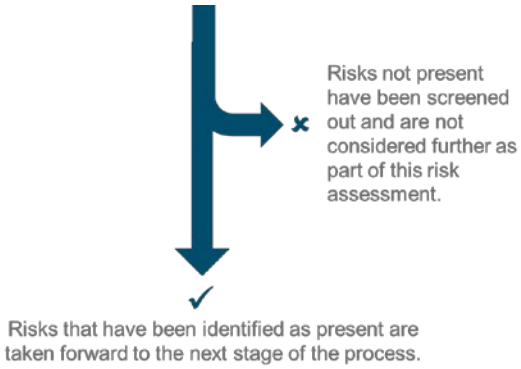
A formal Management Review of YW's IMS is undertaken and recorded at least once a year. The purpose of these meetings is to ensure the IMS' continuing suitability, adequacy and effectiveness as well as to assess opportunities for improvement and the need for changes to the management system, including the policy and objectives.

6 Environmental risk assessment

A review of environmental risks associated with activities covered by the scope of this variation application has been carried out. This review follows EA guidance on risk assessments for environmental permits[1] and adopts the approach outlined below:

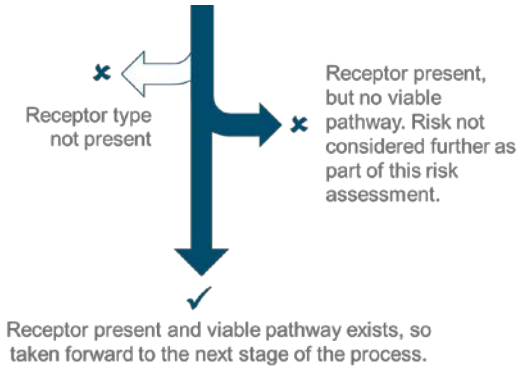
1. Identify and consider risks, and the sources of the risks, and assess whether these require further assessment or can be screened out. Only risks arising from processes that are within scope of this permit variation application have been considered.

⇨**Table C2: 6-1**



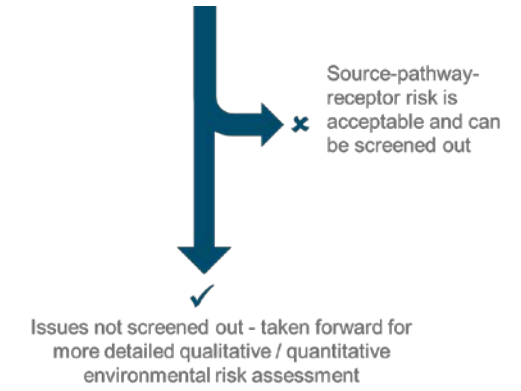
2. Identify and review the receptors (people, animals, property and anything else that could be affected by the hazard) at risk. Within each receptor category, the closest receptor(s) has been identified along with possible pathways to link the receptor to the credible site risks from Stage 1.

⇨**Table C2: 6-2**



3. Assess risks relevant to the specific activity and check they are acceptable and can be screened out –provides a summary of the risk-pathway-receptor assessment.

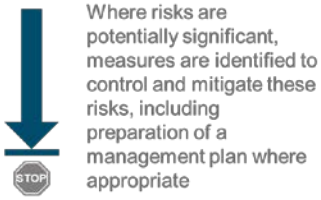
⇨**Table C2: 6-3**



4. Qualitative and quantitative risk assessments for risks which cannot be screened out.

⇨**Q 6-1 to 6-6**

⇨**Appendices 7, 8 and 9**



[1] https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit (accessed February 2021)

Table C2: 6-1: Identification of Environmental Risks

Identified risk area		Sources on site	Discussion	Identified risk
	Odour	Odour control unit, sludge import facility stack, fugitive releases from tanks, digested sludge cake storage area	Following sludge import, raw sludge is fully contained throughout the process to minimise odour generation potential. Displaced air from tanks and processing facilities are captured and transferred to an odour control unit prior to discharge to the environment via emission point A5. Emissions from the sludge cake import facility are discharged via emission point A6. Odour emissions (fugitive) from digested sludge and cake handling and sludge maturation facilities are low.	✓ Further review
	Point source emissions to air. Emissions deposited from air to land	Odour control unit	Processing of sewage sludges can result in emissions of various compounds with potential human health or ecological impacts. These include Volatile Organic Compounds (VOCs), hydrogen sulphide (H_2S), ammonia, and other organics including mercaptans. Adopting a precautionary approach, these emissions have been further reviewed. These compounds can also be highly odorous; this aspect is considered separately.	✓ Further review
	Noise	Motors, pumps, blowers, conveyors, vehicle movements, site personnel CHP, Boiler, waste gas burner	Procedures are in place to ensure effective planned maintenance and minimisation of noise and vibration from noise sources associated with sludge treatment and handling facilities. Whilst the CHP, boiler and waste gas burner are already included within the scope of the existing installation, these sources have also been considered for completeness.	✓ Further review
	Fugitive emissions	Tanks, pipework and containers used for storage, treatment and digestion of sludge	Anaerobic digestion tanks are fully sealed and biogas is captured and transferred to CHP, boiler and/or flares (see point source emissions to air). Raw sludge is fully contained throughout the process in order to minimise potential for fugitive emissions. Displaced air from tanks and processing facilities are captured and transferred to an odour control unit prior to discharge to the environment (see point source emissions to air). Planned maintenance and leak detection and repair programme in place in respect of fugitive emissions.	✓ Further review

Identified risk area		Sources on site	Discussion	Identified risk
	Bioaerosols	Storage and handling of sludge	Raw and digested sludge have a high water content (approx. 60% after thickening). Sludge is contained at all process stages until final digested sludge maturation at the sludge cake treatment pad. Sludge disturbance is minimal, other than initial delivery to the pad and subsequent removal from the pad. Potential for generation of dust and bioaerosols is very low. Displaced air from raw sludge tanks and processing facilities are captured and treated via an odour control unit (biofilter and carbon adsorption) prior to discharge to the environment (see point source emissions to air).	✓ Further review
	Accidental Releases	All areas / all activities	Emergency/unplanned events have the potential to result in abnormal emissions of odour, noise of emissions to air, land or water. This includes spillages of potentially contaminative liquids e.g. sludge, chemicals, oils and releases of biogas.	✓ Further review
	Point source emissions to air. Emissions deposited from air to land	CHP, boiler, waste gas burner (flare)	All combustion plant emission points are already included within the scope of the existing installation. A table of point source emissions to air is included in Table C3:2-1. No changes to these emissions are proposed and therefore no further assessment is required. As a precautionary approach, a review of the 2013 AQIA has been undertaken and it has been concluded that this remains an appropriate assessment of the potential effects on air quality. Refer to Appendix 7 for this review.	✗ Not considered further
	Point source emissions to surface, groundwater and land	None	No point source emissions to surface water, groundwater or land within the scope of the permit. All process liquids and surface water runoff is returned to BBM WwTW for treatment prior to discharge to the River Don. Risks associated with accidents and other planned incidents are considered separately.	✗ Not considered further
	Point source emissions to sewer	Surface water run-off and liquor from raw sludge thickening and digested sludge dewatering facilities	All process liquids and surface water runoff is returned to BBM WwTW (outside of the scope of this permit application) for treatment prior to discharge to the River Don.	✗ Not considered further

Identified risk area		Sources on site	Discussion	Identified risk
	Visible plumes	CHP, Boiler, waste gas burner	The nature of the combustion sources is such that plume moisture levels will be low and thus in normal operations, and for the majority of weather conditions, plume visibility is expected to be very low. CHP, Boiler and waste gas burner are already included within the scope of the existing installation and no changes are proposed. No further assessment is required.	✘ Not considered further
	Adapting to climate change	All areas / all activities	Required only for new bespoke permit applications.	✘ Not considered further
	Litter	Storage and handling of sludge in open air	The nature of waste treated on site does not result in litter.	✘ Not considered further
	Vermin and Pests	Storage and handling of sludge in open air	The activities within the installation do not give rise to significant pest or vermin issues.	✘ Not considered further
	Dust	Storage and handling of sludge in open air	The facility handles wet wastes which do not result in dusts.	✘ Not considered further
	Global warming potential	CHP, Boiler, waste gas burner	All combustion plant emission points are already included within the scope of the existing installation, primary fuel is renewable. Further energy information is provided in a detailed response to Q6 of Form C3.	✘ Not considered further

Table C2: 6-2: Identification of Sensitive Receptors and pathways

Receptor type	Receptor description and distance	Pathway	Possible pathway from source					
			Air (OCU)	Sewer	Fugitive Odour	Noise	Fugitive / bioaerosol	Accidental releases
Human								
Residential housing - North	Residential housing located approximately 400-500m to the north of the installation. These areas of housing are significantly elevated above the site. A railway line and other industrial activities are also located between the site and this residential area.	Airborne	✓	✘	✓	✓	✓	✓
Residential housing – East	Nearest residential housing (single dwelling) located approximately 750 east of the sludge processing activities and approximately 300m from the nearest extent of the sludge cake maturation pad.	Airborne	✓	✘	✓	✓	✓	✓
Residential housing – South	Residential housing located approximately 400m to the south of the installation. A railway line, river and other industrial activities are also located between the site and this residential area.	Airborne	✓	✘	✓	✓	✓	✓
Residential housing – West	Residential housing located approximately 1km to the west of the installation. The M1 motorway, railway line and Meadowhall shopping centre are located between the site and this residential area.	Airborne	✘	✘	✘	✘	✘	✘
Public amenity areas including public footpath/cycleway and Blackburn Meadows LNR	Directly adjacent to, and crossing through, the installation boundary.	Airborne	✓	✘	✓	✓	✓	✓
Public amenity – Meadowhall shopping centre	Meadowhall Shopping Centre is located to the West of the site, separated by M1 motorway and other roads and industrial activities.	Airborne	✘	✘	✓	✘	✘	✘

Receptor type	Receptor description and distance	Pathway	Possible pathway from source					
			Air (OCU)	Sewer	Fugitive Odour	Noise	Fugitive / bioaerosol	Accidental releases
Schools	There are 14 schools within approximately 2km of the site, and 2 sites within 1km. The nearest of these is 780m to the south-southwest. Railway line, motorway and other roads, river, shopping centre and/or other industrial activities are located between the site and all schools.	Airborne	✘	✘	✓	✘	✘	✘
Hospitals	There are no hospitals within 2 km of the site. There are 2 hospitals within 5 km of the site.	Airborne	✘	✘	✘	✘	✘	✘
Industrial sites	Industrial units located to the north and south of the site, separated from the installation by railway lines and/or river.	Airborne	✓	✘	✓	✓	✓	✓
Ecological								
Habitat / amenity site – Blackburn Meadows Nature Reserve (NB this is not included within the Natural England list of designated local nature reserves)	Blackburn Meadows nature reserve located to the east of the site, beyond the River Don.	Airborne Surface water Groundwater	✓	✓	✓	✓	✓	✓
Designated habitat site –other Local Nature Reserves	Woolley Wood LNR located 1.15km to the west.	Airborne	✘	✘	✘	✘	✘	✘
	Centenary Riverside LNRs located 1.38km to the east adjacent to the River Don.	Airborne Surface water	✘	✓	✘	✘	✘	✓
Protected species	Possible presence of protected species on or off site including at Blackburn Meadows nature reserve.	Airborne Surface water Groundwater	✘	✓	✘	✓	✘	✓
Environment – Other								
Global atmosphere	Regional and global atmosphere.	Airborne	✘	✘	✘	✘	✓	✓

Receptor type	Receptor description and distance	Pathway	Possible pathway from source					
			Air (OCU)	Sewer	Fugitive Odour	Noise	Fugitive / bioaerosol	Accidental releases
Local atmosphere - AQMA	Site located within (but on the outer edge of) Sheffield Citywide AQMA. AQMA declared for particulate matter PM_{10} and nitrogen dioxide NO_2.	Airborne	✘	✘	✘	✘	✘	✘
Ground / groundwater	Underlying groundwater classed as a Secondary A aquifer; groundwater vulnerability classed as medium-high.	Unmade ground / infiltration / percolation	✘	✘	✘	✘	✘	✓
Surface water	River Don directly adjacent to installation boundary. Likely hydraulic continuity between underlying groundwater and river.	Overland runoff / infiltration / percolation	✘	✓	✘	✘	✘	✓

Table C2:6-3: Assess risks: screening assessment

Table C2.6-3 below sets out the screening assessment for environmental risks.

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Point source emissions to air from OCU – ammonia / H_2S / other organics	⇨	Airborne	⇨	Residential housing – north, east, south Public amenity areas including public footpath/cycleway Industrial sites Habitat / amenity site – Blackburn Meadows NR	Off gases and vapours collected from tank headspace and displacement air can contain substances potentially harmful to human health (e.g. H_2S) and also substances which can contribute to nutrification of habitat sites (ammonia) potential. The effective operation of the OCU also serves as the primary control for these emission, therefore further assessment is considered appropriate.	**A summary review of the abatement plant has been provided in response to Q 6-2 below.**
Odour (fugitive)	⇨	Airborne	⇨	Residential housing – north, east, south Public amenity areas including public footpath/cycleway Public amenity – Meadowhall shopping centre Schools Industrial sites Habitat / amenity site – Blackburn Meadows NR	Fugitive odour sources on site include sludge intake and screening, digested sludge dewatering, liquor handling, waste storage and secondary treatment of digested sludge cake. The majority of odour sources are covered, with air extracted and transferred for treatment in the OCU prior to discharge to atmosphere (see entry below for separate screening assessment of point source emissions from OCU).	**Yes – odour impact assessment is summarised in response to Q 6-3 below. Full assessment is included as Appendix 8.**
Noise	⇨	Airborne	⇨	Residential housing – north, east, south Public amenity areas including public footpath/cycleway Industrial sites Habitat / amenity site – Blackburn Meadows NR	There are fixed and mobile noise sources within the installation. Whilst these are not considered to represent a significant contribution to off-site noise levels arising from the wider BBM WwTW, and recognising the urban location of the site with significant transport related noise emissions in the locality, there remains some potential to affect the identified off-site receptors.	**Yes – qualitative risk assessment is summarised in response to Q 6-4 below. Full assessment is included as Appendix 9**

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Fugitive emissions (methane)	⇨	Airborne	⇨	Global atmosphere	It is recognised that this a potentially significant issue in the sector, a leak detection and repair plan is in place covering the installation.	**A leak detection and repair plan is proposed – see Form C3 Q3b**
Bioaerosols	⇨	Airborne	⇨	Public amenity areas including public footpath/cycleway. Industrial sites	Housing is outside of screening range [6] (250m) for a static receptor location. Relevant sensitive exposure locations are those where there is potential for exposure over an extended period. Whilst EA guidance does not consider AD as a significant source [3] it is recognised that there are some potential low-level sources within the installation (the biofilter and cake pad). As a precautionary principle a risk assessment has been undertaken.	**Yes – qualitative risk assessment is provided in response to Q 6-5 below.**
Accidental Releases	⇨	Airborne Overland runoff / infiltration / percolation	⇨	Residential housing – north, east, south Public amenity areas including public footpath/cycleway Industrial sites Habitat / amenity site – Blackburn Meadows NR Designated habitat site –other Local Nature Reserves Protected species Global atmosphere Ground / groundwater Surface water - River Don	Pollution prevention infrastructure, operational control and management techniques (including as part of the EMS) are in place to prevent accidents and other unplanned events with environmental consequences, or, in the event that these do occur to minimise or mitigate the environmental impacts.	**Yes – accident management plan is provided in response to Q 6-6 below**

Source	⇨	Pathway	⇨	Receptor	Discussion	Further assessment required?
Point source emissions to air from OCU – odour	⇨	Airborne	⇨	Residential housing – north, east, south Public amenity areas including public footpath/cycleway Industrial sites Habitat / amenity site – Blackburn Meadows NR	OCU provides adequate mitigation of potentially odorous sources within the process. Substantial distance from nearest sensitive receptor and lack of complaint history. Process monitoring proposed for OCU to ensure ongoing correct operations of the plant. This conclusion was confirmed via the Odour Impact Assessment (Appendix 8).	**No, risk low and proposed BAT controls adequate**
Point source emissions to sewer	⇨	Direct discharge to River Don	⇨	Habitat / amenity site – Blackburn Meadows NR Designated habitat site –other Local Nature Reserves Protected species Surface water - River Don	All process liquids and surface water runoff are returned for treatment at BBM WwTW prior to discharge to the River Don in accordance with discharge permit conditions. Site liquid discharges arise primarily from rainwater runoff and thickening / dewatering liquor and are a very small fraction of total influent loading at the WwTW. The potential risk of normal site discharge causing disruption of sewage treatment processes, sufficient to impact on the receiving watercourse (River Don), is negligible. Potential discharges to sewer as a result of accidents and other unplanned events are considered separately.	**No, risk low and proposed BAT controls adequate**

Q 6-1 Habitats risk assessment requirements

There are no European designated habitat sites (including SPAs, SACs, Ramsar sites) within 10km of the site. Bradgate Brickworks SSSI is located approximately 2km of the site. This is cited as a site of geological interest. Therefore, permitted activities at BBM will not impact on the designation. Blackburn Meadows Nature Reserve is located to the east of the site, beyond the River Don (note that this is not included within the Natural England list of designated local nature reserves). Woolley Wood LNR is located just under 1.15km to the west and Centenary Riverside LNRs located 1.38km to the east.

A habitats risk assessment is not required although habitat sites have been considered as sensitive receptors in applicable impact assessments.

Q 6-2 Summary review of abatement plant

YW operates an OCU at the BBM STF, this represents a key abatement asset within the permitted installation. The use of effective controls in respect of odour at the installation is evidenced by the site's operational history.

The odour impact assessment included as Appendix 8 considers potential odour impacts, odour monitoring results, records of odour complaints (none relating to the processes described in this variation) and odour related incidents (none relating to the processes described in this variation). This assessment concludes that no further assessment is required in respect of point source emissions from the OCU.

Notwithstanding this conclusion, this asset remains the key on site emission abatement system for potentially odorous and polluting off-gasses from the sludge handing and treatment activities. Adopting a precautionary principle, YW commits to undertake a review of OCU plant effectiveness (refer to Proposed Improvement Programme) and also to undertaking ongoing periodic emissions measurements from the OCU stack (emission point A5) (Refer to Section III: Supporting Information, C3 4a).

Q 6-3 Summary of the Odour Impact Assessment

A qualitative odour impact assessment (OIA) has been undertaken for BBM STF and is reported in full in Appendix 8. This assessment indicates that thirteen of the fourteen considered sensitive receptors are exposed to either a 'negligible' or 'slight adverse' odour effect. Only one of the fourteen is potentially exposed to a 'moderately adverse' effect from odour; it being of high sensitivity (residential) and in the prevailing wind direction (to the North-East) of the cake storage pad which is considered the main source risk of odour impact. In support of the OIA, odour measurements were taken from cake on the pad at varying maturities; this indicated low measured odour levels. The receptor in question is an existing property with no history of odour complaints associated with current operations; it is located over 300m from the emission source, providing sufficient dilution of the low measured odour levels. In practice, the potential odour exposure at this receptor is unlikely to be significant and would be unlikely to cause complaints. This would therefore suggest that OIA is conservative in its consideration of any potential odour effects. However, it is recognised that there is a residual risk arising from odour from any STF process, therefore YW has developed an Odour Management Plan (OMP) which is provided in Appendix 10.

Q 6-4 Summary of the Noise Impact Assessment

Potential sources of noise resulting from the activities proposed in this variation application, have been identified and assessed in Table C2: 6-5. Further detail is provided in Appendix 9. For scoring mechanism refer to Q 6-7.

Table C2: 6-5: Review of potential noise impacts and associated risk

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Noise: CHP	Residential / Ecological	Airborne	The equipment is containerised in a high performance acoustically treated enclosure and designed for external applications. Plant is located a significant distance from receptors. Plant is located such that surrounding structures shield potential receptors from the noise source. Good maintenance of plant to ensure that excessive noise levels are not generated, under Operations & Maintenance contract. Regular checks of noise mitigation measures fitted to items of plant. Where repair or replacement is required, the plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	Unlikely - The risk management actions will prevent significant impact at nearest receptors	Mild – Minor nuisance impacts	Low
Noise: CHP Exhaust	Residential / Ecological	Airborne	High performance exhaust silencer with elevated stack vent point. Plant is located a significant distance from receptors. Regular checks of noise mitigation measures fitted to items of plant. Where repair or replacement is required, the plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	Unlikely - The risk management actions will prevent significant impact at nearest receptors	Mild – Minor nuisance impacts	Low
Noise: Fans on air cooled radiators	Residential / Ecological	Airborne	Fans of a low noise specification and subject to regular checks and maintenance. Plant is located such that surrounding structures shield potential receptors from the noise source. Plant is located a significant distance from receptors. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear (e.g. fan motor bearing failure), under Operations & Maintenance contract.	Unlikely - The risk management actions will prevent significant impact at nearest receptors	Mild – Minor nuisance impacts	Low

Hazard	Receptor	Pathway	Risk Management Techniques	Probability of Exposure	Consequence	Overall Risk
Noise: Waste Gas Burner	Residential / Ecological	Airborne	Waste gas burner operates only when CHP is unavailable or there is excess biogas. Plant is located a significant distance from receptors. Good maintenance of plant to ensure that excessive noise levels are not generated from equipment breakdown or wear and tear (e.g. fan motor bearing failure), under Operations & Maintenance contract.	Unlikely - The risk management actions will prevent significant impact at nearest receptors	Mild – Minor nuisance impacts	Low
Noise: Vehicular movements around site	Residential / Ecological	Airborne	Vehicles will be screened from receptors for the majority of their operations with the exception of movements on the eastern site boundary closest to BBM. Due to the layout of this area, vehicle movements would be transient and typically associated with passing movements only. Background sound levels in this area are already likely to be relatively high (due to road traffic on the M1) and are unlikely to be significantly affected by vehicle movements on the site.	Unlikely - The risk management actions will prevent significant impact at nearest receptors	Mild – Minor nuisance impacts	Low

Q 6-5 Bioaerosol Risk Assessment

Bioaerosols are defined as micro-organisms suspended in the air and can include bacteria, fungi and viruses, or parts of living organisms, such as spores and plant pollen. Bioaerosols are usually smaller than 10µm in diameter and can cause human health impacts such as allergic responses and inflammation. Bioaerosols are naturally present in the air, but they are also associated with organic waste treatment processes including composting, mechanical biological treatment, and potentially some aspects of anaerobic digestion (AD) which are widely used in the UK.

There is minimal regulatory guidance available for assessing bioaerosol emissions from AD facilities. Regulatory Position Statement 031[2], states that bioaerosol concerns would normally be associated with composting activities, and in particular:

'Operations…likely to result in the uncontrolled release of high levels of bioaerosols' are defined as including '*the shredding of waste and the turning of waste in the sanitisation, stabilisation and maturation stages of composting where these operations are not contained or are not subject to exhaust ventilation and scrubbing/filtering'*.

These activities do not take place at BBM STF. Furthermore, Environment Agency guidance (2012)[3] states that:

"We do not consider that bioaerosols from anaerobic digestion are a serious concern.

However, the most recent guidance[4] requires that biological waste treatment facilities provide a site-specific bioaerosol risk assessment if there are sensitive receptors within 250m of activities, regardless of the specific processes carried out at a site. It is noted that the consensus from various studies is that bioaerosols from composting activities decline rapidly within the first 100 metres from a site and generally decline to background levels within 250m[5]. Technical Guidance Note M9[6] states that receptors located more than 250m away should be discounted as they are not likely to be affected.

There is no residential housing, schools or hospitals within 250m of the BBM STF installation. Most industrial and commercial receptors are located more than 250m from the installation although a small number of industrial facilities to the south are slightly less than 250m from the installation boundary. Risks associated with these types of receptors are likely to be less significant due to the relatively shorter duration of exposure (i.e. on the basis of approximately 8 hour/day, 5 days / week working pattern, or less in the case of visitors to these sites). The prevailing wind direction is towards the west[7], further reducing potential to impact on these locations.

Therefore, a precautionary approach has been taken within this application and consideration has been given to the potential for impact from bioaerosols as a result of activities at BBM STF. This review follows a source-pathway-receptor model to evaluate risk, giving consideration to the characteristics of the waste material, plant design and the operational controls in place to mitigate the risks from bioaerosols. This is summarised in Table C2: 6-6 overleaf.

[2] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.
[3] Environment Agency. 2012. Guidance for developments requiring planning permission and environmental permits.
[4] Environment Agency, consultation draft July 2020, Appropriate measures for the biological treatment of waste.
[5] Environment Agency. 2011. Composting and potential health effects from bioaerosols: our interim guidance for permit applicants. Regulatory Position Statement 031.
[6] Environment Agency Technical Guidance Note M9 'Environmental Monitoring of Bioaerosols at Regulated Facilities', July 2018,
[7] Based on meteorological data from the Attercliffe weather station in Sheffield, located approximately 3km from the site. This meteorological data set was used in the 2013 air quality impact assessment.

Table C2: 6-6: Review of potential bioaerosol sources and associated risk

Source	Source controls	Pathway	Receptors	Overall risk
Raw sludge reception	Sludge is enclosed throughout; sludge is pumped from tankers or via pipelines to receiving enclosed storage tanks. Displaced air is extracted and treated within an OCU (see separate entry below). Unloading activities occur infrequently.	None	There is no residential housing, schools or hospitals within 250m of bioaerosol sources. A small number of industrial / commercial facilities to the south are slightly less than 250m from the installation boundary.	No risk present – sludge is fully enclosed
Sludge cake reception facility	Unloading activities occur infrequently and are of short duration. Cake is delivered by covered wagon. Reception unit equipped with roller shutter doors which are closed when tipping is not taking place. Material disturbance is short lived during tipping operations only. Sludge cake is wet, does not produce dust and is not readily susceptible to airborne dispersion.	Airborne dispersion		Low
Sludge reception - screenings skip	Screenings are not subject to regular disturbance and are stored in relatively small quantities (2 x skips). Screening are wet, do not produce dust and are not readily susceptible to airborne dispersion.			Low
Sludge handling – screening, thickening, dewatering, digestion	Sludge is fully enclosed within tanks or pipework at all times. Displaced air is extracted and treated within an OCU (see separate entry below).	None		No risk present – sludge is fully enclosed
Odour control unit (OCU) stack	Air from sludge tanks is treated via a two-stage OCU comprising biofilter and activated carbon filtration prior to discharge to atmosphere. OCU subject to monitoring programme and planned maintenance to ensure effective operation.	Airborne dispersion		Low
Digested sludge tank (uncovered)	Sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion.			Low
Digested cake maturation pad (uncovered)	Digested sludge cake is delivered to cake pad, moved into storage location and is then left undisturbed until removal from site. Sludge cake is wet (approximately 25% solids content), does not produce dust and is not readily susceptible to airborne dispersion			Low
Vehicle tracking of materials around on the cake pad, which could dry out and disperse	Regular washdown and wetting through the use of on-site bowser in order to reduce dust and keep pad area clean.	Airborne dispersion	There is no residential housing, schools or hospitals	Very low

Source	Source controls	Pathway	Receptors	Overall risk
Emergency scenario – bio-gas venting	As the sludge digestion process is a wet process, biogas is unlikely to contain significant concentrations of bioaerosols. Venting events infrequent and short-lived.		within 250m of bioaerosol sources. A small number of industrial / commercial facilities to the south are slightly less than 250m from the installation boundary.	Very low
Emergency scenario – Sludge spillage	Sludge is wet, does not produce dust and is not readily susceptible to airborne dispersion. Events occur infrequently and in almost all cases will involve small quantities of sludge. Major/catastrophic loss is highly unlikely to occur. Emergency response procedures are in place to ensure such incidents are responded to promptly and spilt material is cleaned up			Very low

Bioaerosol Risk Assessment - conclusions

The bioaerosol risk assessment undertaken concludes that the BBM STF installation is not considered to be a significant source of bioaerosols and the likelihood of bioaerosols causing negative impacts at nearby receptors is low or very low. This is due to:

- All potential bioaerosol sources at BBM STF are wet, do not produce dust and are not readily susceptible to airborne dispersion.
- Most bioaerosol sources are fully enclosed with any displaced air treated via a two-stage OCU.
- Uncontained/uncovered bioaerosol sources are not subject to regular turning or other disturbance which would be more likely to result in bioaerosol dispersion.
- There is no residential housing, schools or hospitals within 250m of bioaerosol sources.
- The closest industrial / commercial receptors are located slightly less than 250m to the south of the installation boundary. Risks associated with these types of receptors are likely to be less significant due to the relatively shorter duration of exposure. The prevailing wind direction is towards the west, further reducing potential to impact on these locations.

Further quantitative risk assessment is not deemed necessary as adequate control measures are already in place to minimise the release of bioaerosols as a result of permitted activities. This conclusion is consistent with Environment Agency guidance which states that this topic is not typically a material consideration for AD activities such as that carried out at BBM.

Q 6-6 Accident Management Plan

The potential for accidental releases resulting from the activities proposed in this variation application are identified and assessed in Table C2: 6-7 below. This includes a summary of measures in place to manage/reduce accident risks. Refer to Q 6-7 for the scoring mechanism.

Table C2: 6-7: Potential accidental releases and associated risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Site Wide - general						
Flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / Infiltration	**Preventative controls** • Flood risk review undertaken. The sludge treatment facility and cake maturation areas lie within Flood Zone 2 (land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding). • Land on which the sludge treatment facility is located has been raised above the surrounding flood plain to mitigate against flood risks and was not affected during previous serious flooding in the area (2007 and 2015). • Materials are stored in appropriately sealed containers (preferably bulk or semi-bulk), or proprietary secondary containment cabinets, such that the risk of contents being mobilised or containers being washed away in a flood event is low. • Vulnerable Asset Protection Plan specifically details flooding actions including how river levels should be monitored and what actions are required. **In the event of an incident/accident** • Initiate site emergency plan. • Remove any remaining mobile fuel/chemical sources away from flood risk, if appropriate and safe to do so.	Unlikely	Medium	Moderate/low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Flooding due to drain blockages and/or excessive rainfall causing localised on-site surface water flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / Infiltration	**Preventative controls** • Land on which the sludge treatment facility is located has been raised above the surrounding flood plain to mitigate against flood risks, therefore localised surface water flooding highly unlikely. • Materials are stored in appropriately sealed containers (preferably bulk or semi-bulk), or proprietary secondary containment cabinets, such that the risk of contents being mobilised or containers being washed away in a flood event is low. • Vulnerable Asset Protection Plan specifically details flooding actions. • Planned maintenance / inspection of site drainage systems. **In the event of an incident/accident** • Initiate site emergency plan. • Remove any remaining mobile fuel/ chemical sources away from flood risk, if appropriate and safe to do so.	Unlikely	Mild	Low risk
Fire	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Regular maintenance of equipment; LDAR programme in place. • Fire alarms are fitted in CHP and boiler rooms. • DSEAR assessment has been completed for site and only appropriate ATEX rated equipment may be used in high risk areas. • Access controls in place for digester compound and portable gas monitor use required when inside compound. • Site does not treat combustible wastes. Sludge is wet. • Gas slam shut valves on natural gas and biogas feeds to the CHP / boilers. • Gas and fire detection in the boiler house and CHP enclosure, and other key AD plant areas including the thickener building. **In the event of an incident/accident** • Initiate site emergency procedure. • Hydrants connected to a final treated effluent supply can be used by the fire service. The final settlement tanks adjacent to the AD compound are also available as a high-volume source of water for firefighting. • Excess biogas created by the site will be burnt through the flare.	Highly unlikely	Severe	Moderate/Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure to contain firewater following fire / explosion event leading to localised on site surface water flooding leading to damage to site processes and/or mobilisation of polluting materials	Ground / groundwater / surface waters	Floodwaters / Infiltration	**Preventative controls** • Site drainage collects and returns surface water to WwTW for treatment. • Site drainage systems, hardstanding, collection sumps and storm water tanks and lagoon will minimise flow of firewater to receptors. **In the event of an incident/accident** • Initiate site emergency procedure.	Highly unlikely	Medium	Low risk
Excessively low temperatures leading to blockages or damage to pipework, valves or equipment and unplanned release of gas with fire / explosions risks and/or release of potentially polluting liquids	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • 'Winterisation' procedures. • Bunding provided to environmentally critical plant and equipment. • Current YW technical standards include trace heating and lagging for vulnerable pipework. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and/or emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required).	Unlikely	Mild	Low risk
Generalised or localised power failure leading to failure of pumps / control systems and escape of sludge and/or biogas	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • Site has a dual power supply to minimise risk of power failure. • Process for recovering from power failure planned and documented. • In the event of power failure, sludge transfers will stop but this will not affect security of containment e.g., tanks will not overflow. **In the event of an incident/accident** • Halt sludge imports to site. • Confirm backup power supply is online. • Confirm that all systems are operating normally.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Vandalism / site security failure leading to unplanned release of gas with fire / explosions risks and/or release of potentially polluting liquids (chemicals, oils, sludges)	Nearby human receptors Local air quality and global climate impacts Ground / groundwater / surface waters	Air Overland runoff / infiltration / drainage systems	**Preventative controls** • High level of security on site with 24 hr security monitoring, CCTV security cameras, secure entry gate systems and locked cabs and control units. • Perimeter fencing around site, key digestion equipment sits within a separate fenced digester compound area. • Storage containers bunded. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required). • Review security measures on site.	Highly unlikely	Mild	Negligible risk
Failure of chemical or oil containment due to deterioration of storage containers, pipework or valves leading to spillage	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Chemical and oil storage tanks are provided with bunding or are double skinned. • Joints external to containment minimised and fully welded. • Tank and pipework inspections undertaken as part of routine maintenance. • Operational procedures for refilling oil and chemical storage tanks. Spill kits available on site. • CHP enclosure is bunded. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required). • Review systems to prevent recurrence.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of chemical or oil containment during delivery	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Delivery procedures inc. supervision by site staff, check on space available in receiving tank. • Storage containers bunded. • Chemical/oil storage only in area surrounded by hardstanding with all drainage directed to WwTW. **In the event of an incident/accident** • Follow spill response plan.	Unlikely	Mild	Low risk
Vehicle impact leading to loss of pressurised gas and explosion / fire risk or loss of liquid containment (chemicals, oils, sludges)	Nearby human receptors Contribution to local air pollution and global warming Ground / groundwater / surface waters	Air	**Preventative controls** • Site speed limits in place to reduce chance and consequence of collision. • Tanker discharge point and access to this area are controlled by manned security point at main site entrance. • Key areas including sludge tanker unloading point and cake reception area have barriers to prevent collision with equipment. • Key digestion assets including gas holder and digestion tanks are set back from road and surrounded by a fence. • Site drainage will capture spills related to pipe failure. **In the event of an incident/accident** • Isolate systems as appropriate and initiate fire, spill and/or emergency response procedures, cleaning up spill and disposal of wastes appropriately. • Carry out repairs (as required).	Highly unlikely	Medium	Low risk
Excessive noise from plant or equipment e.g., due to equipment deterioration or failure	Nearby human receptors	Air	**Preventative controls** • Procurement controls mean plant are selected to comply with relevant noise limits. • Regular maintenance completed to ensure equipment operates within normal noise parameters. • Sensitive receptors not located within close proximity to the site. Refer to Table C2: 6-2 for summary of Sensitive Receptors. **In the event of an incident/accident** • Investigate cause and implement preventive measures, which may include system maintenance interventions.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Site wide - sludge pipework, tanks, valves						
Spillage of sludge during sludge import and transfer / handling activities	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Staff training on system operation. • Supervision of manually initiated transfer activities. • Hardstanding in key/high risk areas. • Site drainage returns surface runoff to WwTW. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately.	Likely	Minor / negligible	Low risk
Failure (cracks, splitting) of underground pipework (e.g. fuel, chemicals, sludge, site drains)	Ground / groundwater / surface waters	Infiltration	**Preventative controls** • Existing underground pipework will be surveyed using in-pipe crack detection technology every 2 years, where buried mechanical joints are present, and every 5 years in other cases. • Where new pipework at the site has to be underground, this will be installed with secondary containment and leak detection. **In the event of an incident/accident** • Damaged pipe will be isolated. • Spill management procedure will be followed including clean-up/remediation as required. • Repairs to damaged pipework will be arranged.	Unlikely	Medium	Moderate/Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Minor failure of sludge storage tanks / digester tanks e.g., tank overtopping, pipework leaks	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • High level probes to prevent overfilling of tanks, overflow pipework is in place as a failsafe. • Site is monitored on a daily basis. • Infrastructure maintenance and inspections. • Protective measures as for sludge spillage. • Site drainage returns surface runoff to WwTW. • Refer to Appendix 11 for details of secondary containment risk assessment. **In the event of an incident/accident** • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately. • Arrange repairs.	Unlikely	Minor / negligible	Negligible risk
Major failure of digester or other sludge storage tank or associated pipework leading to large scale sludge loss/spillage	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Design and construction of assets is governed by relevant YW technical standards to ensure it is fit for purpose. • Infrastructure maintenance and inspections including non-destructive testing. • Existing and planned bunding/secondary containment (refer to Appendix 11 Secondary Containment Risk Assessment. **In the event of an incident/accident** • Cancel all sludge deliveries to site. • Isolate systems as appropriate and initiate spill response procedure, cleaning up spill and disposal of wastes appropriately.	Highly unlikely	Severe	Moderate/Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Biogas pipework, valves, vents						
Failure of biogas pipework, valves and biogas holder (corrosion, cracks, material defects etc) leading to minor release of biogas and slight fire / explosion risk	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Design and construction of pipework is governed by relevant YW technical standards to ensure it is fit for purpose. • Most biogas pipework operates at low pressures Pipework/gas holders protected from excessive pressure by pressure relief valves. • Pipework is above ground where possible to facilitate inspection and maintenance. • Maintenance schedule defined as part of LDAR strategy at site. • Requirements around use of ATEX rated equipment control risk of leak leading to fire/explosion. **In the event of an incident/accident** • Consider need to isolate pipework. • Consider need to initiate emergency response procedures. • Arrange repair to affected asset.	Unlikely	Minor / negligible	Low risk
Failure of biogas pipework, valves and biogas holder (corrosion, cracks, material defects etc) leading to major release of biogas and fire/ explosion risk	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Design and construction of pipework is governed by relevant YW technical standards to ensure it is fit for purpose. • Most biogas pipework operates at low pressures. Pipework/gas holders protected from excessive pressure by pressure relief valves. • Pipework is above ground where possible to facilitate inspection and maintenance. • Maintenance schedule defined as part of LDAR strategy at site. • Standard operational H&S requires staff to wear personal gas monitors at all times, these will detect large scale leakage from pipes. • Requirements around use of ATEX rated equipment control risk of leak leading to fire/explosion. • Gas detection fitted in key process buildings and enclosures. **In the event of an incident/accident** • Immediately follow safety control mechanisms in place to isolate pipework / equipment. • Consider need to initiate emergency response procedures.	Highly Unlikely	Medium	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Breakdown or other damage to on site gas consumers e.g. CHP/boilers leading to disposal of biogas without energy recovery	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Site is designed to minimise risk of uncontrolled release to air. • Operational and maintenance controls in place to promote reliability of equipment and minimise requirement to send biogas to flare. **In the event of an incident/accident** • Any remaining capacity on on-site gas storage will fill. • Once gas storage is full flare will operate, ensuring proper combustion of biogas. • If flare fails, gas will vent through PRVs to prevent damage to site gas system.	High likelihood	Negligible	Moderate/low risk
Failure of flare leading to release of unburnt biogas to atmosphere	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Flare only used as backup in event of problems elsewhere on site. • Flare selected to give minimum 0.3sec. retention at 1000 deg. C ensuring full combustion of biogas. • Operational and maintenance controls in place to reduce requirement to send biogas to flare. • Flare has control system that ensures ignition e.g. flame detection. • Maintenance programme in place to ensure that flare is in good operational condition. **In the event of an incident/accident** • Raise urgent maintenance request for repairs to flare. • If flare fails, valve will automatically shut down flow of gas to flare. • Once all site gas containment is full, pressure will release through PRVs to prevent damage to equipment.	Unlikely	Mild	Low risk
Incorrect setting or damage to emergency pressure relief valves leads to premature release of gas or valve fails to reseat after release leading to uncontrolled release of biogas to atmosphere	Local air quality and global climate impacts	Air	**Preventative controls** • Inspection and maintenance of PRVs carried out on a routine basis to ensure they are set and operate correctly. • Checks on PRVs part of normal operational routine. • Over-pressure alarms in control system will alert site staff to incidents that could trigger PRV release. **In the event of an incident/accident** • Follow management procedures to ensure that the valves are re-seated/pressure setting adjusted rapidly and without putting staff at risk.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Digester foaming blocks gas lines, leading to release of biogas and/or foam through PRVs	Local air quality and global climate impacts	Air	**Preventative controls** • Feed rate to digesters is controlled to prevent organic overloading. • Digester mixing is regularly assessed as part of operational checks to ensure that it is functioning effectively. • Feedstock assessment ensures that nature and quality of feedstock is understood. • Anti-foam system is fitted to digesters to control foaming. **In the event of an incident/accident** • Follow site procedures for dealing with foaming. • Investigate cause and implement preventive measures. • Ensure that PRVs are not blocked with foam and operating correctly to protect tanks. • Ensure PRVs reseat once pressure in headspace returns to normal levels.	Unlikely	Mild	Low risk
Spillage / loss of containment of liquids including condensate	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Checks on condensate traps and valves are part of regular operational routine. • Condensate runs to site drainage for treatment. • Digester operation is controlled to minimise risk of foaming, which could lead to blockages on condensate system. **In the event of an incident/accident** • Clear up any spills. • Ensure all valves are operating correctly.	Unlikely	Minor / negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Sludge treatment processes						
Import of sludge which does not meet waste acceptance criteria leading to disruption to sludge treatment processes	Ground	Spread to land as part of disposal	**Preventative controls** • YW control all sites supplying sludge. Only sewage sludge is imported to BBM, this has a consistent composition and comes from carefully controlled treatment processes. • Prior to initial acceptance of sludge from a new YW site, a screening assessment will be completed to confirm it is safe and stable. • JRP- WaSP system records the dry solids, volume and origin of every import brought to site. • Satellite site operators and tanker drivers are trained to identify problem sludges and prevent immediate transfer to STF pending further assessment. **In the event of an incident/accident** • Digester health will be investigated to understand cause of problem and best route to resolution. • Digestate being removed from digesters will be subject to enhanced monitoring to ensure that there is no environmental risk. Note this is also a HACCP requirement. • Where relevant, the Environment Agency will be alerted that a problem has occurred. • The root cause of the problem will be investigated and procedures updated so that the incident cannot recur.	Unlikely	Minor / negligible	Negligible risk
Failure/blockage of sludge screening facility leading to spillage and excess odour emissions	Ground Air	Overland runoff / infiltration / drainage systems Odour to air	**Preventative controls** • Design and construction controls ensure equipment is correctly specified for task. • Planned maintenance to ensure reliable operation of equipment. • Imports are from YW sites which gives control over content. • Hardstanding around import facility prevents migration to ground/groundwater. • Site drainage will collect spills and return to WwTW for treatment. **In the event of an incident/accident** • Stop imports. • Clean up spill. • Unblock screens.	Likely	Minor / negligible	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Sludge contamination leading to inhibition of microbial activity / process disruption and insufficient digestion	Ground	Spread to land as part of disposal	**Preventative controls** • Management controls to identify potentially problematic sludges at source. • Almost all sludge imports are from a small number of YW satellite sites where sludge characteristics are very stable. • Contamination levels would need to be very severe to significantly impact digestion processes due to the very large digester volume. **In the event of an incident/accident** • Assess digester content to decide best route to normal digester health. • Sample cake prior to export from site to confirm it is safe to spread to land. • Review acceptance procedures.	Highly Unlikely	Medium	Low risk
Failure of tank heating (in colder conditions) leading to inhibition of microbial activity / process disruption and insufficient digestion	Ground / groundwater / surface waters	Spread to land as part of disposal	**Preventative controls** • Multiple heat sources (CHP/boilers). • Preventative maintenance programme. • Boilers can operate on biogas or natural gas i.e., if biogas is not available, a backup fuel source can be used. • Large thermal mass of digesters means lack of heating is not a critical issue in the short term. • Digesters do not accept high risk materials e.g. Animal By-Products (ABP). **In the event of an incident/accident** • Consider restricting digester feed so cold material is not introduced to digester. • If temperature has dropped below HACCP minimum follow procedure in HACCP plan.	Highly Unlikely	Medium	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Excessive feeding of digester leads to reduced retention time and failure to meet pathogen kill requirements	Ground / groundwater / surface waters	Spread to land as part of disposal	**Preventative controls** • Staff training. • Digesters have a maximum feed interlock ensuring that a set daily feed volume cannot be exceeded. This limit has been calculated to ensure digester stability and safety. • HACCP monitoring. **In the event of an incident/accident** • Turn off digester feed. • Stop additional sludge imports until normal operational situation returns.	Highly Unlikely	Medium	Low risk
Failure of dewatering process leading to discharge to cake pad of cake with high water content	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Liquid runoff from sludge cake pad collected and directed to WwTW for treatment. System has large storage and handling capacity. **In the event of an incident/accident** • Switch off centrifuge and identify cause of problem. • Reprocess take as necessary to achieve target moisture content.	Unlikely	Minor/negligible	Negligible risk
Temporary cessation of land spreading e.g. due to extreme weather conditions, leading to build up of digested sludge cake	Local air quality and global climate impacts	Air	**Preventative controls** • BBM has very large area for sludge cake storage (approx. 12,000m^3 storage capacity, normal storage volumes are approx. 3,000m^3). • Standard storage at site for a maximum 13 weeks; there is extensive storage available at the site due to the size of the cake pad area, providing adequate contingency for all reasonably foreseeable circumstances. • Additional storage is available at nearby Yorkshire Water sites. **In the event of an incident/accident** • Monitor available storage on cake pad and reduce/stop sludge imports as required. • Divert sludge imports to alternative YW sites for storage.	Likely	Minor/negligible	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Very warm weather leading to increase in odour generation from cake storage	Local air quality	Air	**Preventative controls** • Warm weather has not been seen to increase odour, so it is likely this would only happen during an extreme weather event. • Odour Management Plan in place which includes contingency measures. **In the event of an incident/accident** • Initial response would be to review operating times and avoid cake generation during problematic weather events, considering both temperature and wind. • Maximise opportunities for recovery of fully treated sludge to land to reduce volumes stored on site.	Unlikely	Mild	Low risk
Odour Control System						
Failure of components within extraction and treatment system leading to release of untreated, odorous emissions to air	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Regular operational checks and process monitoring at OCU. • Automated alarms highlighting equipment failure. • Inspection and maintenance schedule to ensure reliability of extraction and treatment system. • Typical H_2S levels on site are low. OCU stack would provide a degree of passive dispersion even if induced draft fans were not operational. **In the event of an incident/accident** • Follow operational procedures to minimise generation of emissions until system is repaired.	Unlikely	Mild	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Failure of media within odour treatment system leading to release of partially treated or untreated, odorous emissions to air	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Regular operational checks and process monitoring at OCU ensure equipment is operating effectively and need for media change is identified promptly. • Inspection and maintenance schedule to ensure reliability of extraction and treatment system. • Clearly defined procedure for obtaining and replacing failed media. • Typical H_2S levels on site are low. OCU stack would provide a degree of passive dispersion even if induced draft fans were not operational. **In the event of an incident/accident** • Follow operational procedures to minimise generation of emissions until system is repaired.	Unlikely	Mild	Low risk
Contamination of ground/groundwater following accidental spillage of exhausted odour control media	Ground / groundwater / surface waters	Overland runoff / infiltration / drainage systems	**Preventative controls** • Operational controls in place for removal and disposal of exhausted media. • Area surrounding odour control unit, including areas where maintenance activities are undertaken are covered by hardstanding and surface water drainage is connected to the head of the works. • Only appropriately licenced operators used to remove waste from site. **In the event of an incident/accident** • Contain media to prevent pollution. • Arrange clean up and safe disposal of media as soon as is practicable.	Unlikely	Minor/negligible	Negligible risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
CHPs, Boilers and other gas consumers						
Excessive emissions to air from boilers and CHP e.g. due to equipment failure, poor performance or malfunction leading to incomplete or inefficient combustion	Nearby human receptors Local air quality and global climate impacts	Air	**Preventative controls** • Planned preventative maintenance in place for equipment to ensure assets continue to meet original specification on emissions. • Site operational knowledge supported through contracts with specialist providers. • Regular emissions monitoring timetable in operation to confirm required performance level is maintained. **In the event of an incident/accident** • Investigate cause and implement preventive measures, which may include system maintenance interventions.	Unlikely	Mild	Low risk
Pipe Bridge						
Rupture due to impact	Surface waters	Air	**Preventative controls** • Protective steel frame around pipework. • Site observations indicate that the pipe bridge normally has a height of around 4m above the river level. In times of flood (including significant flooding in recent years) the river has risen to around 1m below the bridge. It is thought that this is the highest bridge in this area. **In the event of an incident/accident** • Cease pumping operations. • Inform Environment Agency. • Local spill control to reduce potential for material to spread to river. • Follow actions as directed by Environment Agency (if safe to do so with river in spate). An incident taking place during very high flow conditions would provide high degree of dilution. • Implement post event investigation and remedial maintenance work prior to reinstating flows.	Highly Unlikely	Medium	Low risk

What harm can be caused and who can be harmed			Managing the risk	Assessing the risk (after preventative controls)		
Hazard	**Receptor**	**Pathway**	**Risk management**	**Probability of exposure**	**Environmental Consequence**	**What is the overall risk?**
What has the potential to cause harm?	**What is at risk? What do I wish to protect?**	**How can the hazard get to the receptor?**	**What measures will you take to reduce the risk? If it occurs – who is responsible for what?**	**How likely is this contact?**	**What is the harm that can be caused?**	**What is the risk that still remains?**
Rupture due to freezing	Surface waters	Air	**Preventative controls** • Insulation fitted to pipes. • Trace heating fitted to all pipes at risk of freezing including sludge, wash water and potable water. **In the event of an incident/accident** • Cease pumping operations. • Inform Environment Agency. • Local spill control to reduce potential for material to spread to river. • Follow actions as directed by Environment Agency. • Implement post event investigation and remedial maintenance work prior to reinstating flows.	Unlikely	Medium	Moderate/low risk
Rupture due to pressure	Surface waters	Air	**Preventative controls** • Air / gas release valves fitted to pipework. • Pumps that have potential to generate high pressures e.g. progressive cavity pumps will be fitted with high pressure cut out sensors. • Maintenance and inspection regime to confirm integrity of pipework. **In the event of an incident/accident** • Cease pumping operations. • Inform Environment Agency. • Local spill control to reduce potential for material to spread to river. • Follow actions as directed by Environment Agency. • Implement post event investigation and remedial maintenance work prior to reinstating flows.	Highly unlikely	Medium	Low risk

Q 6-7 Risk assessment methodology

The risk assessment methodology employed for the noise impact assessment (Q 6-4) and accident management plan (Q 6-6) is summarised in Tables C2 6-8 to 6-11 below.

The overall risk rating for each of the identified risk scenarios is determined on the basis of the probability of the scenario occurring (the probability/likelihood score) and the environmental consequence(s) if the scenario were to occur (the consequence score). The probability and consequence categories used in this methodology are provided in Tables C2: 6-8 and 6-9 below.

Table C2: 6-8: Classification of Consequences

Classification	Definition
Severe	• Acute risks to human health • Short-term risk of pollution of sensitive water resource (e.g. major spillage into controlled waters) • Impact on controlled waters e.g. large-scale pollution or very high levels of contamination • Catastrophic damage to buildings or property (e.g. explosion causing building collapse) • Ecological system effects – irreversible adverse changes to a protected location. Immediate risks
Medium	• Chronic risks to human health • Pollution of sensitive water resources (e.g. leaching of contaminants into controlled waters) • Ecological system effects – substantial adverse changes to a protected location • Significant damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage)
Mild	• Non-permanent health effects to human health • Pollution of non-sensitive water resources (e.g. pollution of non-classified groundwater) • Damage to buildings, structures and services (e.g. damage rendering a building unsafe to occupy, such as foundation damage) • Substantial damage to non-sensitive environments (unprotected ecosystems e.g. crops)
Minor/Negligible	• Non-permanent health effects to human health (easily prevented by appropriate use of PPE) • Minor pollution to non-sensitive water resources • Minor damage to non-sensitive environments (unprotected ecosystems e.g. crops) • Easily repairable effects of damage to buildings, structures, services or the environment (e.g. discoloration of concrete, loss of plants in a landscaping scene)

Table C2: 6-9: Classification of probability / Likelihood

Classification	Definition
High Likelihood	An event is very likely to occur in the short term, and is almost inevitable over the long term OR there is evidence at the receptor of harm or pollution
Likely	It is probable that an event will occur. It is not inevitable, but possible in the short term and likely over the long term
Unlikely	Circumstances are possible under which an event could occur. It is by no means certain that even over a longer period such an event would take place, and less likely in the short term
Highly Unlikely	Probability is so low that it is close to zero; It is improbable that an event would occur even in the very long term

Table C2: 6-10 below provides the matrix used to identify the overall risk category using these consequence and probability categories.

Table C2: 6-10: Risk Matrix and Terminology Used for Risk Assessments

		Consequence			
		Severe	**Medium**	**Mild**	**Minor/Negligible**
Probability (Likelihood)	**High Likelihood**	Very high risk	High risk	Moderate risk	Moderate/Low risk
	Likely	High risk	Moderate risk	Moderate/Low risk	Low risk
	Unlikely	Moderate risk	Moderate/Low risk	Low risk	Negligible risk
	Highly Unlikely	Moderate/Low risk	Low risk	Negligible risk	Negligible risk

The overall risk categories are described in Table C2: 6-11 below.

Table C2: 6-11: Description of Risk Categories

Term	Description
Very high risk	Severe harm to a receptor may already be occurring OR a high likelihood that severe harm will arise to a receptor, unless immediate remedial action works / mitigation measures are undertaken.
High risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short term, but likely to be required over the long term.
Moderate risk	Possible that harm could arise to a receptor but low likelihood that such harm would be severe. Harm is likely to be medium. Some remedial works may be required in the long term.
Moderate / low risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as medium. It can be driven by cases where there is an acute risk which carries a severe consequence, but where the exposure is unlikely.
Low risk	Possible that harm could arise to a receptor. Such harm would at worse normally be mild.
Negligible risk	Low likelihood that harm could arise to a receptor. Such harm unlikely to be any worse than mild.

Form C3 Supporting Information

1 What activities are you applying to vary?

Activities to be included within this installation are provided in Table C3: 1a-1 below. A summary of the activities to be removed from, and added to, the permit is provided above in C2: Table 1 above in response to Form C2, Question 2.

Table C3: 1a-1 – Types of activities

Installation name	Schedule 1 references	Description of the Activity	Activity Capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
BBM STF	Section 5.4 A(1) (b)(i)	**Anaerobic digestion** of indigenous and imported UWWT-derived sludges: Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment	>100 tonnes per day	R 3: recycling/ reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)	N/A	Total digester treatment capacity combined 1,055m^3 day, 60.3 tonnes dry solids (TDS) per day.

Directly Associated Activities (including description)	
Secondary treatment of digestate (including physical handling and dewatering) before being recycled to agriculture, including digestate produced on site or, as a contingency measure, from satellite sites.	R3: Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) D15: Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where the waste is produced)
As a contingency measure**, storage** of digestate, produced at satellite sites, before being recycled to agriculture	R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)
As a contingency measure, the **interim storage** of thickened or dewatered sludge where sludge is produced at a satellite site, before AD treatment on site at BBM or at an alternative AD facility.	R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced)

Installation name	Schedule 1 references	Description of the Activity	Activity Capacity	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity
Storage and treatment of biogas			R13: Storage of wastes pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) R5 Recycling / reclamation of other inorganic compounds D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)			
Use of biogas as a fuel			R1: Use principally as a fuel to generate energy			
Incineration of biogas			D10: Incineration on land			
Treatment of sludges prior to digestion, including screening, mixing and thickening operations			No applicable waste codes			
Raw material (non-waste) **storage**			No applicable waste codes			
Surface water collection, including **temporary storage**			No applicable waste codes			
Collection and treatment of odorous gases			No applicable waste codes			
Total storage capacity (tonnes)			Sludge storage capacity within STF vessels provided in Table 1a-2 overleaf.			
Annual throughput (tonnes each year) [8]			**Liquid imports:** 50,000 tonnes[9] **Cake imports:** 10,000 tonnes (at 6% dry solids) **Indigenous:** 1,500,000 tonnes			

[8] Data derived from 2019 / 2020 figures, with contingency provision.
[9] m^3, reported as tonnes

Table 1a-2 – Storage capacities

Vessel	Nominal capacity (m^3)
Sludge screen feed tank (1)	540
Thickener feed tank (2)	5,816 each
Digester feed tank (2)	1,576 each
Digester (2)	6,713 each
Sludge dewatering feed tank (1)	1,973
Cake pad	
A maximum storage capacity has been estimated on the basis of available space on the cake pad, taking account of typical sizes and heights of material stockpiles. This is necessarily an estimate. On this basis a figure of 12,000 tonnes has been derived. Under normal circumstances the amount of cake stored will be significantly below this quantity (in the region of 3,000 tonnes).	

Table 1b – Types of waste accepted and restrictions

Waste Code	Description of the waste
19	Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use
19 02	Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge)
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge conditioned with wood waste (known as wood waste TCSS)
19 06	Wastes from anaerobic treatment of waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
19 08	Wastes from waste water treatment plants not otherwise specified
19 08 05	Sludges from treatment of urban waste water

2 Point source emissions to air, water and land

A full inventory of emission points is provided in Table C3: 2-1 below and illustrated in Section IV Figure 3. Proposals for monitoring emissions to air are provided in Table C3: 4a-1.

Table C3:2-1: Emissions Inventory to air

New / Existing	Emission Point Ref	Source	Location	Emissions parameter	Quantity / unit[10]		Techniques to minimise emissions
Existing plant – emission point unchanged, currently within permit CP3897LT	A1	CHP stack	Energy compound	Oxides of nitrogen (NOx)	<250 [11]	$mgNm^3$	Lean Low NOx combustion controls
				Carbon monoxide (CO)	<1,400 [11]	$mgNm^3$	Engine servicing and maintenance
				Sulphur dioxide (SO_2)	<350 [11]	$mgNm^3$	Low H_2S content in biogas
				Non-methane VOCs (as Carbon)	<10 [12]	$mgNm^3$	Engine servicing and maintenance
				Total VOCs (as Carbon)	<1,500 [12]	$mgNm^3$	Engine servicing and maintenance
	A2	Boiler No. 1 stack (biogas)	Energy compound	NOx	Not quantified [13]		Low NOx burners
				CO	Not quantified [13]		Boiler servicing and maintenance
				SO_2	Not quantified [13]		Low H_2S content in biogas
		Boiler No. 1 stack (natural gas)	Energy compound	NOx	Not quantified [13]		Low NOx burners
				CO	Not quantified [13]		Engine servicing and maintenance
				SO_2	Negligible		Natural gas fuel
Existing plant – emission point unchanged, currently within permit CP3897LT	A3	Boiler No. 2 stack (biogas)	Energy compound	NOx	Not quantified [13]		Low NOx burners
				CO	Not quantified [13]		Boiler servicing and maintenance
				SO_2	Not quantified [13]		Low H_2S content in biogas
		Boiler No. 2 stack (natural gas)	Energy compound	NOx	Not quantified [13]		Low NOx burners
				CO	Not quantified [13]		Engine servicing and maintenance
				SO_2	Negligible		Natural gas fuel
	A4	Gas flare	Flare compound	NOx	Not quantified [13]		None - abnormal use only
				CO	Not quantified [13]		None - abnormal use only
				SO_2	Not quantified [13]		None - abnormal use only
				T VOCs (as C)	Not quantified [13]		Flame temperature and residence
Existing plant newly added to CP3897LT	A5	Odour control unit	Digester area	H_2S	Not quantified [13]		Biofilter / carbon filter
				NH_3	Not quantified [13]		Biofilter / carbon filter
				Mercaptans	Not quantified [13]		Biofilter / carbon filter
				Dimethyl sulphide	Not quantified [13]		Biofilter / carbon filter

[10] Reference conditions as per current permit CP3897LT/V004: 273 degrees Kelvin, 1013 mb, dry gas, 5% O_2 for emission point A1.
[11] Emission Limit Values (ELVs) in Permit CP3897LT/V004
[12] Based on results from previous rounds of compliance monitoring (at existing permit reference conditions: 273 degrees Kelvin, 1013 mb, dry gas, 5% O_2 for emission point A1). No permit limit proposed (see Proposed Improvement Programme).
[13] No ELV for these determinands proposed in permit. No appropriate reference limit value identified.

Emissions to sewer

All process liquor and surface water runoff is collected and discharged via underground drainage systems to BBM WwTW for full treatment prior to discharge to the River Don. Emission point S1 is shown in Figure 3; a copy of the site drainage plan is provided as Figure 4.

Process liquor emissions comprise liquor from raw sludge thickening and digested sludge dewatering processes, condensate e.g. from biogas handling, cleaning washwater and surface water runoff. The largest area of surface water runoff is from the digested sludge cake pad. Surface water runoff from this area is directed to a storage lagoon which provides storage capacity in the event of periods of very high rainfall. This is returned via a pumping station to BBM WwTW for treatment along with liquors from the digester area.

The BBM WwTW is a very large treatment works treating sewerage discharges from around 552,000 inhabitants of the cities of Sheffield and Rotherham as well as a wide variety of industrial processes operating in the area. Process liquors generated at BBM STF contributes only a very small proportion of overall loading to the treatment works (both in terms of hydraulic and organic/chemical loading). Processes and controls in place in respect of wastewater handling and treatment are adequate to prevent significant negative impacts on the receiving environment as a result of site activities.

Table C3: 2-2 – Emissions to sewer

Emission Point Ref.	Source	Parameter	Expected Emissions	
			Quantity	Unit
S1	Thickening liquor – raw sludge Surface water runoff Dewatering liquor – digested sludge	Suspended solids	Not quantified, no monitoring undertaken or proposed. Volume and load represent a very small % of works influent and are returned for full treatment.	
		Biological Oxygen Demand (BOD)		
		Ammonia		
		Volume (digested sludge dewatering)	1,100 [14]	m^3/day
		Volume (raw sludge thickening)	1,900 [14]	m^3/day
		Surface water run-off	Variable ~ dependent on rainfall	

[14] Approximate volume, varies on throughput

3 Operating techniques

3a1 Does your permit (in Table 1.2 Operating Techniques or similar table in the permit) have references to any of your own documents or parts of documents submitted as part of a previous application for this site?

Table 1.2 of the current permit (CP3897LT/V004) includes reference to documents which are superseded by documents contained within this permit variation application. This is summarised in Table C3: 3a1 below.

Table C3: 3a1 – Superseded Documents

Existing document reference (taken from Table 1.2 Operating Techniques)	Reason no longer valid	New document reference
Response to request for further clarification for question 5d types and amounts of waste, 5c site plan and 6e management systems	Superseded by information provided in this variation application	• Section III: Supporting Information, Form C3, Question 6e Waste • Section IV: Figure 2 Site Location Plan • Section III: Supporting Information, Form C2, Question 3d Management systems
Response to request for bioaerosol monitoring	Superseded by information provided in this variation application	• Sludge conditioning / phytoconditioning activities no longer carried out on site. Bioaerosols risk assessment included in response to Q 6-5. Bioaerosol monitoring not required.
Response to request for Odour Management Plan	Superseded by information provided in this variation application	• Section V: Appendix 10 Odour Management Plan
Response to request for site drainage plans	Superseded by information provided in this variation application	• Section IV: Figure 4 Drainage Plan

3b General requirements

Fugitive emissions management plan – Leak Detection and Repair (LDAR) programme

YW has a defined maintenance plan for biogas pipework at BBM STF. This includes regular visual inspections, as well as more detailed investigations such as use of a methane detecting camera to identify leaks. Any leaks identified are assigned a priority for repair, the priority recognises potential as both an environmental and safety hazard. Key section headings in the LDAR management procedure (which forms part of the EMS) include:

- Introduction, scope, responsibilities, assurance
- Site specific LDAR plan
  - STF Tanks (All STF tanks including sludge storage and Anaerobic Digesters)
  - Pressure Relief Valves
  - Biogas pipework from AD to biogas treatment and storage
  - Biogas treatment and storage area

  - Pipework from biogas treatment to flare stack and engine
  - Biogas Engine / Flare Stack
  - Pumps and pipework (non-biogas)
  - Digested Sludge Cake Pad
- Strategies/standards/guidance notes, registers, references

The majority of biogas pipework is within a secure area to reduce the risk of physical damage. A DSEAR review of the site has been completed and installed equipment is appropriate for the zone in which it is installed.

Best Available Techniques: Reducing diffuse (fugitive) emissions to air (*BAT 14*)

The design and operation of BBM STF ensures diffuse (fugitive) emissions to air are minimised. This includes the following measures:

- Raw sludge and sludge cake is fully contained from waste reception through to sludge digestion. Displaced air from tanks is piped to an odour control unit for treatment (biofilter followed by carbon adsorption) prior to release to atmosphere.
- Raw sludge thickening activities are undertaken within a building with air extracted and treated within the OCU.
- H_2S is continually monitored in the gas and levels are very low, typically less than 10ppm (Refer to Table C3: 4a-2).
- Digested sludge and sludge cake is not fully contained (digested sludge tank is not covered, sludge cake maturation pad is not covered). However, emissions of odour and organic compounds from this material is very low. Refer to the odour impact assessment and odour management plan (Appendices 7 and 9, respectively) for more details.
- All pipework design is subject to Water Industry Mechanical and Electrical Specifications (WIMES), which ensures correct material selection, corrosion prevention and valve type.
- Regular inspections of tanks and pipework undertaken in line with the LDAR programme.
- Biogas pipework largely above-ground, allowing easy inspection/leakage detection.
- Sludge and sludge cake is wet at all times and therefore potential for generation of dust is very limited. This is not an issue of concern (see bioaerosol risk assessment, Section 6).
- Traffic speed limits of 10pm are enforced on site.

3c Types and amounts of raw materials

Table C3: 3c-1 – Types and amounts of raw materials

Description of raw material	Use	Maximum storage capacity	Annual throughput[15]	Main hazards	Alternative
Polymer (liquid)	Coagulant used for raw sludge thickening	22,100 litres	1,727 m^3	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Polymer (powder)	Coagulant used for digested sludge thickening	24,500 kgs	90,066 kgs	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Antifoam	Digester antifoaming agent	1 m^3	200 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Water treatment chemicals	Boiler treatment	Not stored within installation boundary	25 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Glycol	Antifreeze	350 litres	1,000 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Lubrication oil	Equipment lubricant	1,200 litres	2,000 litres	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Diesel	Fuel for mechanical loaders	Not stored within installation boundary	6,500 litres [16]	Polluting to watercourses in the event of a spillage/loss	No viable alternative
Polypropylene fibrous media	Biofilter media	None	Media replaced infrequently, as required	None	No viable alternative
Carbon	Carbon adsorption scrubber	None	Carbon replaced infrequently as required	None	No viable alternative

[15] Annual throughput based on 2020 data
[16] Annual throughput data includes use outside of installation boundary (within the wider BBM WwTW)

4 Monitoring

4a Describe the measures you use for monitoring emissions

Table C3: 4a-1 Proposed emissions monitoring requirements

Emission point	Parameter	Monitoring technique	Monitoring frequency
Emissions to air			
A1 CHP	NOx (NO and NO_2 expressed as NO_2)	Extractive emissions testing in line with TGN M1 and BS EN 14792	Annual
	CO	Extractive emissions testing in line with TGN M1 and BS EN 15058	Annual
	Sulphur dioxide (SO_2)	Extractive emissions testing in line with TGN M1 and EN 14791	Annual
	Total VOCs	Extractive emissions testing in line with TGN M1 and EN 12619:2013	Annual
	Methane (speciated)	To be confirmed by identified specialist contractor, anticipated to be extractive emissions testing to EN 25140.	One off characterisation (See also Proposed Improvement Programme)
A2 Boiler No. 1 (biogas)	NOx (NO and NO_2 expressed as NO_2)	No monitoring of this source is required under current permit CP3897LT/V004 and none is proposed.	
	CO		
	SO_2		
A2 Boiler No. 1 (natural gas)	NOx (NO and NO_2 expressed as NO_2)	No monitoring of this source is required under current permit CP3897LT/V004 and none is proposed.	
	CO		
A3 Boiler No. 2 (biogas)	NOx (NO and NO_2 expressed as NO_2)	No monitoring of this source is required under current permit CP3897LT/V004 and none is proposed.	
	CO		
	SO_2		
A3 Boiler No. 2 (natural gas)	NOx	No monitoring of this source is required under current permit CP3897LT/V004 and none is proposed.	
	CO		
A4 Gas flare	NOx (NO and NO_2 expressed as NO_2)	Extractive emissions testing in line with BS EN 14792	Periodic (only in the event that operation exceeds 876 hours per calendar year)
	CO	Extractive emissions testing in line with BS EN 15058	
	Total VOCs	Extractive emissions testing in line with EN 12619:2013	

Emission point	Parameter	Monitoring technique	Monitoring frequency
A5 Odour control unit	Hydrogen sulphide (H_2S)	Extractive emissions testing in line with CEN TS 13649 for sampling NIOSH 6013 for analysis	Annual
	Ammonia	Extractive emissions testing in line with EN ISO 21877	Annual
A6 Cake import facility	Hydrogen sulphide (H_2S)	No emissions monitoring proposed due to intermittent and short-term use (during cake import). Emissions concentrations expected to be very low due to the nature and scale of operations.	
	Ammonia		
	Odour Units		
Emissions to sewer			
S1 Return liquors to head of works	No specific monitoring programme proposed. Process liquors and surface water runoff are subject to full treatment at BBM WwTW and forms a very small % of overall works influent.		

Selected process monitoring parameters are illustrated in Table C3: 4a-2. The site is operated under full PLC SCADA control with data logging and interrogation of key parameters to maintain safe, efficient and low emissions operation.

Table C3: 4a-2 Key process monitoring provisions

Emission point / description	Parameter	Monitoring approach	Monitoring frequency
Sludge intake	Intake volume	SCADA	Continuous during unloading operations
	% dry solids	SCADA	Continuous during unloading operations
CHP (A1)	Operating hours	SCADA	Continuous data logging
	Electricity generated	SCADA	Continuous data logging
	Load required / actual (%)	SCADA	Continuous data logging
	Biogas flow / pressure to CHP	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
Boilers (A2, A3)	Load required / actual (%)	SCADA	Continuous data logging
	Biogas / natural gas flow / pressure to boiler	SCADA	Continuous data logging
	Heat circuit temperatures (deg. C)	SCADA	Continuous data logging
	Heat circuit flow	SCADA	Continuous data logging
Flare compound (A4)	Biogas to flare (m^3)	SCADA	Continuous data logging
	Run hours	SCADA	Continuous data logging
OCU (A5)	Operational status	SCADA	Indication
Biogas storage	Gas level (%)	SCADA	Continuous data logging
	Gas pressure (mb)	SCADA	Continuous data logging
	Methane %	SCADA	Continuous data logging
Digesters	Volume	SCADA	Continuous data logging
	Volatile Fatty Acids (VFAs)	Manual	Periodic
	Alkalinity	Manual	Periodic
	Process temperature	SCADA	Continuous data logging
	% solids (intake)	SCADA	Continuous data logging
	Retention (hours)	SCADA	Continuous data logging
	Heat exchanger temperatures (deg. C)	SCADA	Continuous data logging
	H_2S (ppm)	SCADA	Continuous data logging
Centrifuges	Dry solids (%)	Manual	Periodic

4b Point source emissions to air only – M1 Assessment

The proposed sampling locations and facilities are assessed in Table C3: 4b-1, based on the requirements and recommendations provided in Environment Agency M1[17]. The most recent MCERTS accredited stack emission test[18] carried out at the site reported:

"The sampling location meets all the requirements specified in EA Guidance Note M1 and EN 15259, and therefore there are no improvement recommendations."

Table 4b-1: M1 Assessment - Sampling Requirements

Characteristic	Requirement	Commentary
Sample plane location	As far downstream or upstream from any disturbance, which could produce a change in direction of flow (e.g. bends, fans).	Sampling ports are installed on a straight section of stack, substantially downstream of 90 degree bends where horizontal hot gas ductworks enters the windshield. A constant cross-sectional area is present within the flues.
	In a section of duct with constant shape and cross-sectional area.	
	Recommend five hydraulic diameters* upstream and two hydraulic diameters downstream (or five hydraulic diameters from the top of the stack)	
Sample plane orientation	Installation of sample plane in vertical stacks is preferred to horizontal ducts	The sampling plane is vertical.
Exploratory survey	It is advised that an exploratory velocity traverse is carried out before committing to installation	The ports are installed and reported as compliant. Due to the narrow diameter, homogeneity testing in line with the requirements set out in BS EN 15259 is not required, as per guidance[19].
Flow criteria	Angle of gas flow less than 15° to duct axis.	No particulate sampling is proposed in line with the requirements of the current permit and given nature of gaseous fuels burnt.
	No local negative flow.	
	Minimum velocity (a differential pressure of 5Pa, which equates to 3 ms-1).	
	Ratio of the highest to lowest gas velocity less than 3:1.	
Measurement ports	Planned at detailed design stage because retrofitting can be expensive (for example ducts may have protective linings).	The number, location and type of measurement ports were designed having regard to TGN M1.
	Allows access to sample points.	

[17] Environment Agency Technical Guidance Note (Monitoring) M1 (2010)
[18] Element Materials Technology (2020), Job Reference Number ENE-1023
[19] Method Implementation Document for EN 15259:2007, Environment Agency, v3, May 2019

Characteristic	Requirement	Commentary
	It is recommended that for small stacks (less than 0.7m diameter) a socket of 75mm is acceptable.	A sampling platform is in place which allows compliant sampling from all ports. Sample ports are sized appropriately to the equipment to be used for monitoring. The ports are accessible via the platform for maintenance. No CEMS is installed or proposed – not applicable.
	The port socket must not project into the gas stream.	
	Additional ports may be required to allow access for measurement of other quantities (for example velocity and water vapour)	
	Additional ports for CEMS (if applicable)	
	The operator must maintain the ports in good condition and free them up prior to work being undertaken	
Identification	Clearly identified and labelled measurement section	The ports are clearly identifiable.
Load bearing capacity	Permanent and temporary working platforms must have a load bearing capacity sufficient to fulfil the measurement objective	A permanent working platform is be provided; the structure is designed for appropriate loading for all sampling and maintenance activities.
Position and working space	Sufficient working area to manipulate probe and operate the measuring instruments, without equipment overhanging guardrails	A suitable working platform is provided, which facilitates manipulation of probes and operation of measuring instruments. Permanent safe ladder access is provided. The platform has chains / self-closing gates at the top of the ladder.
	A sufficient depth of the working area is given by the internal diameter or depth of the duct and the wall thickness plus 1.5 m	
	If two opposite measurement ports are installed for one measurement line, a correspondingly smaller working area is required	
	Its recommended that vertical ducts have a working height from the platform to the ports of 1.2 to 1.5m	
	Removable chains or self-closing gates at the platform to prevent workers falling through access hatches or ladders.	
Fall prevention	Upper handrails at a minimum of 950mm (910mm allowed for old handrails). Gaps in rail no bigger than 470mm. Toe boards required	Fixed guard rails are provided on the platform (at 0.5m and 1m). The platform has vertical base boards (approx. 0.25m high).
	Consider installing personal protection systems on vertical ladders	

Characteristic	Requirement	Commentary
Access	Easy and safe access available	Permanent ladder access is provided reported by the MCERTS contractors as 'safe' and 'easy'
	Consider installing work restraint systems on vertical ladders	
Power supply	Single phase 110V electrical power of a suitable current provided by a suitable number of sockets at the platform	Adequate and safe electrical supply provisions are made.
Lifting equipment	Lifting systems for raising and lowering of equipment, where access to the sampling platform is by vertical, or steeply inclined, ladders or stairs	An appropriately designed and installed lifting hoist is provided.
	Lifting systems (for example, hoists) and attachments (for example, eyes) must be inspected and maintained by a competent person	
	Installation of a support structure for securing portable lifting systems (handrails are not usually suitable for supporting lifting systems)	
Monorails	Consider sampling monorails above the sampling ports to enable certain designs of sampling train to be suspended.	Not applicable
Exposure to gas	Avoid areas of sources which emit unexpectedly, for example rupture discs, overpressure valves and steam discharges.	Compliant
Exposure to stack gas	Avoid areas of significant positive pressure.	Monitoring takes place externally which provides natural (passive) ventilation.
Awareness	Consider how stack emission monitoring personnel are informed of operating faults that may endanger them?	All monitoring works would be under a permit to work scheme, which includes a detailed Risk Assessment and Method Statement (RAMS).
Ventilation	Well ventilated.	Monitoring takes place externally which provides natural (passive) ventilation.
Heat and dust	Protection of the working area from heat and dust.	No dust sources within working space. Twin walled flue design (internal flues with windshield), no specific personnel protection required for heat above normal safe site working conditions.

Characteristic	Requirement	Commentary
Weather protection	Protective measures (for example, weather protection and heating to ensure conditions are appropriate for personnel and equipment).	The suitability of weather conditions is assessed as part of the risk assessment and monitored during the course of the sampling exercise. If weather conditions were deemed unsafe by dynamic risk assessment following commencement, work would be halted and rescheduled.
Lighting	Artificial lighting or facilities for temporary lighting.	Need is assessed on a case by case basis, but preference is for monitoring to take place during daylight hours.

6 Resource efficiency and climate change

6a Describe the basic measures for improving how energy efficient your activities are

YW consumption and generation data is collated and stored within a web-based energy database. This enables the business to produce bespoke reports as required by internal stakeholders.

Monthly energy consumption hubs are held to review ongoing energy use and performance. These are supported with discussions regarding how asset operation can be modified, or capital intervention made, to reduce energy use. This is further supported by YW requirements under the Energy Saving Opportunity Scheme (ESOS) compliance programme. YW conducts energy surveys that are discussed with the site operational teams. The findings of the surveys are collated into a final report and presented to senior management.

YW have published performance commitments in relation to the amount of biogas that is derived from the sludge processed. The higher the efficiency of biogas production the greater the potential for electricity generation. There is a daily generation hub that seeks to identify any generation issues and rectify them ASAP.

Overall annual energy and carbon performance is publicly shared via the company annual report as part of the Streamlined Energy and Carbon Reporting (SECR) requirements.

Energy is monitored and managed on a regular basis through the Energy and Recycling Team. Energy consumption and energy generation reports are run and reviewed regularly and are recorded on YW's Performance Zone. YW also participates in a number of mandatory and voluntary carbon reporting schemes. YW sets itself targets for energy consumption and energy generation at both a strategic and operational level. YW has dedicated teams which focus on:

- Maximising renewable energy generation; and
- Implementing strategic and site-specific energy efficiency projects.

Table C3: 6a-1 below describes the measures taken on site to minimise energy use.

Table C3: 6a-1 – Energy efficiency measures

Operating and maintenance	**Documented measures in place**	
Regular testing and maintenance of biogas systems for leaks, seals, and condensate traps	Yes	Maintenance/servicing undertaken by qualified technicians and registered organisations. Records are maintained on site.
Operation of motors and drives	Yes	Regular inspections/lubrication & maintenance undertaken by qualified technicians and specialist contractors. Records are retained.
Compressed air systems	Yes	On-going leak detection and repair programme undertaken by qualified technicians.
Hot water systems	Yes	Digester system monitored constantly and inspected and tested regularly by an operator and recorded.
Lubrication to avoid high friction losses	Yes	Technicians and specialist contractors carry out regular lubrication, including CHP engine oil change, and records are maintained.
Boiler maintenance e.g. optimising excess air	Yes	Carried out as per legislative requirements and YW procedures.
Physical measures	Documented measures in place	
Sufficient insulation of heated vessels and pipework	Yes	Inspection and housekeeping to check condition of insulation; repair or replacement carried out as necessary
Provision of sealing and containment methods to maintain temperature	Yes	Anaerobic digesters are enclosed.
Other appropriate measures	Yes	Daily operational inspections are conducted to check for aspects such as leaking tanks and pipework
Building services	Documented measures in place	
Energy efficient lighting is in place	Yes	There are limited building service requirements on site, energy efficient options are provided where readily available, and when equipment comes up for renewal
Space heating	Yes	
Hot water	Yes	
Temperature control	Yes	
Ventilation	Yes	
Draft proofing	Yes	
BAT conclusions for energy recovery	Documented measures in place	
Heat recovery (please specify where from and add more lines if appropriate)	Yes	Heat recovered from CHP engine to maintain anaerobic digester temperature.
Heat exchangers (explain where fitted and add more lines if appropriate)	Yes	Heat exchangers are used in the CHP engine and in the anaerobic digesters.
Re-use of spent cooling water	N/A	
Minimisation of water use and re-circulating water systems for energy saving	Yes	Water is recirculated within the anaerobic digester heating systems
Good insulation	Yes	All boilers, anaerobic digesters and pipework are insulated
Plant layout to reduce pumping distances	Yes	Where existing layout allows

6b Provide a breakdown of any changes to the energy your activities use up and create

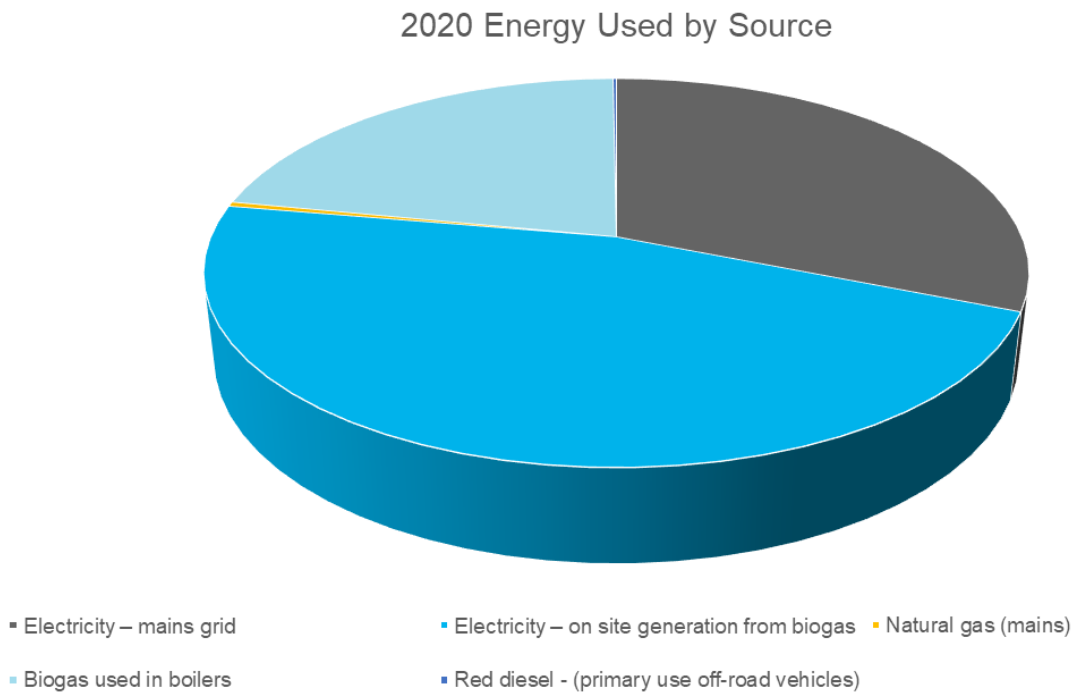
The main site energy sources are electricity from the public supply and biogas generated by the anaerobic digesters which is combusted in the CHP engine to generate electricity and heat on site or in the boilers (for the generation of heat only). Mains gas is used as back-up fuel supply for the boilers only. Table C3: 6b-1 shows the energy balance for the site. Electricity generated on site is used to power site equipment, with the facility to export any excess to the national grid. To maintain control of energy consumption, and improve it where possible, electricity and fuel consumption is reported and reviewed on a regular basis.

Table C3: 6b-1 – Typical annual energy use

Energy Source	Energy Consumption [20]		
	Delivered	Primary	% of total (primary)
Electricity – mains grid [21]	5,830 MWh	13,992 MWh	31.1%
Electricity – on site generation from biogas [22] [23]	7,693 MWh	20,992 MWh	46.6%
Natural gas (mains) [24]	171 MWh	171 MWh	0.4%
Biogas used in boilers	9,804 MWh	9,804 MWh	21.8%
Red diesel [25]	70 MWh	70 MWh	0.2%

[20] 2020 data
[21] Electricity imported includes the use for the whole site not just the permitted activities due to metering arrangements.
[22] Delivered value derived from CHP measured efficiency of 37%, and recorded electricity generated (net of exported value of 4MWh). Does not take account of heat generated.
[23] YW recognises that biogas utilisation for electricity generation is not currently optimised at BBM and has committed to undertake a detailed review of CHP availability issues and plant sizing relative to anticipated gas yields (See Proposed Improvement Programme). At present biogas which could otherwise be utilised at the site is being flared to ensure ongoing safe operations and minimise resulting global warming potential.
[24] Natural gas CV of 40.25 MJ/m3, 100% conversion efficiency
[25] Primary use is off-road vehicles, e.g. cake handling on pad. 6,500 litres consumption, energy derived using DUKES 2019 calorific values of fuels.

Figure C3: 6b-1 – 2020 energy by source



Global warming potential (GWP)

The installation is operated as a renewable energy generation plant, thus there are no direct emissions of carbon dioxide (a greenhouse gas) resulting from the combustion process using biogas. There will be some losses of biogas (methane) from the plant (a substance with a high global warming potential, at least 21 times higher than CO_2), resulting from unquantified fugitive losses from the biogas system (see LDAR programme). These have not been included in the GWP calculation as no data is available. There are some direct CO_2 emissions as a result of combustion of natural gas as a standby fuel in the boilers. There are also indirect emissions of CO_2 resulting from the use of imported electricity. At present, due to metering arrangements, it is not possible to apportion electricity usage to just the permitted activities within the installation, therefore site wide (BBM WwTW) usage is reported in this section. The CO_2 equivalent (CO_2e) emissions for the plant are set out in Table C3: 6b-2, together with overall GWP calculation.

Table C3:6b-2 – Global warming potential

Substance	Energy source	Energy Consumption in 2020– Primary (MWh)	CO_2 emission factor (T/MWh) [26]	Mass CO_2 released (tonnes/yr)	Global warming potential	Overall Global Warming Potential (TCO_2 / yr) [27] [28]
Carbon dioxide	Electricity (mains) imported	13,992	0.166	2,323	1	2,323
	Gas (mains)	171	0.19	32		32
	Biogas	30,796	0	0	0	0
	Red diesel	70	0.25	17	1	17
Total GWP						2,373

6c Have you entered into, or will you enter into, a climate change levy agreement?

No, the activities are not eligible to take part in the CCL Scheme.

The production and use of biogas to produce heat (which is used in the process) and electricity which is either used on site or exported to the national grid, is the single greatest measure which allows the site to minimise its use of fossil fuels and maximise the use of energy, whilst recovering biological wastes. However, notwithstanding this, YW has identified that further specific measures are required to improve energy efficiency, specifically relating to increased utilisation of biogas.

It is recognised that a number of operational challenges (relating to plant availability and reliability) have reduced the amount of biogas that has been used in the installation, leading to excess usage of the flare system to ensure continued safe operation of the plant. Whilst flaring of biogas is preferable to the direct release of methane, and significantly reduces the GWP, the hierarchy of preferential use is in the CHP, then the boilers, with flaring as least preferred solution.

YW commits to undertake a detailed review of CHP availability issues and plant sizing relative to anticipated gas yields and report findings to the Environment Agency, together with timetable for necessary works identified (see Proposed Improvement Programme).

[26] Factors from https://www.gov.uk/guidance/assess-the-impact-of-air-emissions-on-global-warming
[27] These calculations do not consider the CO_2 equivalent amount which is avoided through the avoidance of releasing methane which has a much higher GWP than CO_2
[28] Does not include fugitive losses of methane, which are considered low and are not quantified (see LDAR)

6d Explain and justify the raw and other materials, other substances and water that you will use

Information related to raw materials use and selection is provided above in response to Q3c.

Water minimisation

Water use within the installation is not significant due to the nature of operations/activities undertaken within the installation. Water is used in small quantities for domestic use within control buildings and is also used as make up fluid for chemicals (polymer), for sludge thickening/dewatering processes, as boiler feed water and for some cleaning activities i.e. sludge intake screens, thickener drums, washdown in some areas.

Measures are in place to ensure that water is used only where necessary and preference is given to the use of final treated effluent rather than mains water. The primary water users are listed below, along with the source of water.

Table C3:6d-1 – Water use

Use	Source
Domestic use within control / welfare building	Mains potable water
General cleaning/hosing of external hardstanding surfaces	Final treated effluent
Sludge import screen washing (automated)	Final treated effluent
Imported sludge cake re-wetting	Final treated effluent
Mixing with liquid polymer for raw sludge thickening processes	Mains potable water used for product make-up. Final effluent is used as the carrier water during dosing.
Drum thickener cleaning	Mains potable water
Digester anti-foam washwater spray	Final treated effluent
Boiler feed water	Mains potable water
Mixing with powdered polymer for digested sludge dewatering processes	Mains potable water used for product make-up. Final effluent is used as the carrier water during dosing.
Centrifuge (digested sludge dewatering) - automated cleaning	Final treated effluent

6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

Waste Minimisation

The site is designed and operated as a waste recovery plant and as such minimises waste generation from its own operations. Other than sludge cake, generation of waste is generally minimal and, largely limited to packaging or scrap materials associated with engineering projects. Where practical materials are transported to site and stored in bulk or containers are returned to the supplier.

A summary of waste generated as a result of activities undertaken within the BBM STF is provided in Table C3 6e-1 below.

Table C3 6e-1 – Waste streams

Waste Type	Nature of material	Storage and Disposal Method	Annual production (tonnes)[29]
Sludge screenings	Non-hazardous	Stored within a skip prior to collection by approved waste contractor	127
Waste oil	Hazardous	Stored within bunded container prior to collection by approved waste contractor	1.5
General waste	Non-hazardous	Stored within a dedicated container prior to collection by approved waste contractor	1.2
Metals	Non-hazardous	Stored within a skip prior to collection by approved waste contractor	2.6
Mixed recycling	Non-hazardous	Stored within a dedicated container prior to collection by approved waste contractor	1.2
Wood	Non-hazardous	Stored within a skip prior to collection by approved waste contractor	1.8
Empty IBCs	Hazardous	Stored outside of installation boundary within a dedicated container prior to collection by approved waste contractor	0.03
Oil contaminated absorbents	Hazardous	Stored outside of installation boundary within a dedicated container prior to collection by approved waste contractor	0.2
Oil filters	Hazardous	Stored outside of installation boundary within a dedicated container prior to collection by approved waste contractor	0.1
Antifreeze	Hazardous	Stored outside of installation boundary within a dedicated container prior to collection by approved waste contractor	0.3

[29] Waste data provided is a 5 year average from 2016-2020

Best Available Techniques: Waste storage, handling and transfer (*BAT 4 and 5*)

IMS procedures specify appropriate measures to ensure compliance with applicable legislation and to control and minimise pollution risks. Controls to minimise environmental risks associated with waste storage, handling and transfer include:

- Waste materials are stored on site for the minimum period of time, in suitable, fit for purpose containers located on areas of hardstanding and away from sensitive receptors such as the River Don. Waste containers are clearly labelled with their intended contents and container storage capacities are not permitted to be exceeded. Site housekeeping inspections are undertaken to ensure these standards are maintained.
- Very limited quantities of hazardous waste are generated by site activities. This is limited to items such as batteries, aerosols, waste oil and fluorescent tubes. Hazardous waste is always stored in secure containers, away from sensitive receptors and segregated from other waste types.
- Procedures are in place to ensure waste 'duty of care' requirements are met including ensuring that waste is only removed from site by contractors properly licenced and approved for use and accompanied by a fully completed waste transfer or hazardous waste consignment note. Waste transfer and consignment note records are retained electronically or as paper copies on site. Effective implementation of these procedures is supported by training for YW personnel as appropriate.
- Controls are in place to prevent pollution as a result of sludge storage and handling. Following reception on site, sludge is fully contained within tanks and pipework until it is deposited, as digested sludge cake on the cake pad. Surface water runoff from the cake pad is fully contained and is discharged back to BBM WwTW for treatment. Sludge storage and handling areas are located away from sensitive receptors such as the River Don.

Proposed Improvement Programme

IP Ref.	Related Section	Requirement	Time from receiving permit
1	C2: Q6-2	YW commits to undertake a review of OCU plant effectiveness, including measurement of inlet and outlet process and emissions parameters. Any improvements required will be identified and timescales for implementation proposed.	9 months
2	C3: 4a	Measurement of methane slip (speciated VOCs (methane)) in the exhaust gas from engine burning biogas will be carried out at the next scheduled emissions test	Next scheduled permit compliance emission test of CHP engine
3	C3: 6c	YW commits to undertake a detailed review of CHP availability issues and plant sizing relative to anticipated gas yields and report findings to the Environment Agency, together with timetable for necessary works identified.	9 months
4	Appendix 11 (Containment Risk Assessment)	Engineering feasibility assessments and detailed design in respect of identified containment enhancements. YW commits to reporting to the EA the findings of these technical assessments and timescales required to implement the identified solutions.	12 months

Section IV: Figures

Figure 1 Site Location Plan

Figure 2 Site Layout Plan

Figure 3 Principal emission points

Figure 4 Drainage Plan

Section V: Appendices

Appendix 1 Relevant Offences

Form C2 / Q3a1 Have you, or any other relevant person, been convicted of any relevant offence?

Yorkshire Water Services Ltd Relevant Prosecutions Record

Huddersfield Magistrates' Court 9 February 2011

On the above date YW pleaded guilty to breach of Section 85 (1) and (3) of the Water Resources Act 1991.

This incident relates to the Heaton Lodge site which partially treats sewage and then transports this treated sewage to the Cooper Bridge site.

On 9 August 2009 at approximately 4.10pm, an Environment Agency officer found a discharge to the River Calder from the Heaton Lodge site. This was reported to YWS at 4.47pm but an off-duty YW colleague had already noted the discharge and reported it proactively 30 minutes earlier. An operator attended site at 4.30pm and identified the cause of the discharge to be a burst from a cracked rising main on the Heaton Lodge site.

The sludge pumps were immediately isolated, stopping the discharge some 30 – 40 minutes after it had first been noted by the off duty YW operator and the matter was escalated to senior management to inform them of the incident in line with the usual process.

YW offered to clean up the affected area but were informed by the EA officer that no clean-up was necessary. Service partners for YW attended on 10 August to locate the exact position of the main burst which was caused by excessive pressure thought to have been due to a blockage. The discharge from the main occurred in the area where it goes under the river. The area around the main was also bunded to contain any future spillages pending confirmation of the structural condition of the main. Visual inspections of the pipe work were maintained for a number of weeks following this incident as part of the site visits that are routinely undertaken.

Repairs were completed by 12 August when sludge transfer and full operations returned. The length of damaged pipe, 20m, was replaced and 75 metres of the main were jetted and CCTV was also carried out to ensure there were no other defects in the main. The total cost of the works was £16,800.

Since the incident, the main had been pressure tested to ensure the integrity of the main – no further incidents have occurred since August 2009 and the further testing did not establish any need for further repair works. The volumes and pressures pumped in this main were reduced following the incident due to a change in the process of transporting the sludge.

The evidence from the EA covered the potential effect, and the actual chemistry/biology however there's no indication that this incident affected the watercourse in terms of its flora and fauna. There was no fish kill. In fact, YWS offered to clean up the watercourse on the day of the incident and were informed that this was not necessary.

The watercourse recovered rapidly. There was no evidence put forward by the EA to suggest that the effect was medium or long term, supported by the EA's contention that a clean-up was not required.

There was no evidence that the recreational use around the discharge point had been adversely affected. The Magistrates accepted that there had been no "flaunting of the law" by the Company. They noted that there was no significant damage to flora or fauna and that the watercourse recovered rapidly. On the issue of culpability, they accepted that the Company did not deliberately break the law and they further noted that the Company did not achieve any economic gain through the commission of this offence.

YWS was fined £10,000 and ordered to pay the EA's costs of £1,164.34.

Huddersfield Magistrates' Court 9 February 2011

On the above date YW pleaded guilty to breach of Section 85 (1) and (3) of the Water Resources Act 1991. This incident occurred on what is known as the Deighton site. This site receives crude sewage and undertakes preliminary treatment in the form of screening of any debris. The main in question transports this treated sludge to the Calder Valley incinerator, at the time of this incident.

At 7.45pm on 9 September 2009, a call was received from the EA that there had been a report of sewage from a local resident and it is noted what the EA state this resident said when reporting this issue. I would ask the Court to be mindful of the terminology used and place the appropriate reliance on this when considering what the customer may or may not have meant by this comment as there is no further evidence with regard to this statement and it clearly could not relate to actual measured flow. RTS which is the alarm system used by Yorkshire Water on its assets was checked immediately for any alarms but none were found.

An operator attended site at 8.30pm and was unable to safely locate the discharge as daylight was fading and for health and safety reasons, the operator ceased his investigation. Service partners for YW had previously been isolating the pumps on a daily basis as the pumps were being commissioned and therefore these pumps were only running between the hours of 7.30am – 6.00pm at the time of this incident. On 9 September, the pumps had been turned off when the operator attended so there was not a discharge left to continue by the operator leaving site.

On the morning of 10 September, the pumps were set running again at 9.05am. The exact point of the discharge which had proved difficult to find due to the excess of overgrowth on the wall was then located. An EA officer was on site and aware that the pumps had been set to run again and at 10.15am witnessed the discharge point. The pumps were immediately stopped.

On 10 September at 11.30am, service partners for YW began the repairs to the main which resulted in a 4m length being replaced. The repairs were made difficult by the presence of a large tree adjacent to the burst. This is believed to have been a contributing factor to the cause of the burst as the tree had displaced the main. CCTV operations were also undertaken on the main, 100m to establish its overall condition with no defects found.

All sludge was tankered from site and any debris observed in the river was completely removed by YW operations. The main was subsequently flushed with final effluent and a full CCTV survey was undertaken with no defects identified, the main was found to be in good condition and was brought back into service on 12 September.

Following this incident, the tree and its roots were completely removed to avoid any repeat incident once YW were aware of the contribution of this tree to this incident. The entire length of the main has been cleaned out and a pressure monitor has been placed on the main so that in future, if the pressure rises due to a blockage or any problem, the pumps will cease pumping to avoid a burst. The monitor is alarmed to notify YW of a problem. Together with the cost of the repair works immediately after the incident and the further cleaning works, a total of approximately £375k has been spent on this main.

The evidence from the EA covers the potential effect, and the actual chemistry/biology however there's no indication that this incident affected the watercourse in terms of its flora and fauna.

There was no fish kill. YWS offered to clean up the watercourse and carried out these operations immediately with the agreement of the EA. No further actions were requested by the EA following their further investigations.

There was no evidence put forward by the EA to suggest that the effect was medium or long term. There was no evidence that the recreational use around the discharge point has been adversely affected. They noted that this was a Category 1 offence. It was however noted that there was no significant permanent damage to the flora or fauna. In respect of culpability, there was no deliberate pollution to the watercourse and no economic gain. They had considered all the environmental credentials and investment for the company and they also noted the significant investment in this main since the incident had occurred.

YWS was fined £12,000 and ordered to pay the EA's costs of £1,897.93.

Scarborough Magistrates' Court 6 May 2011

YWS was prosecuted for an offence that on or before 26 April 2010 it did cause a water discharge, namely the entry of waste into the Runswick Beck, Runswick Bay other than in accordance with an environmental permit contrary to Regulations 12 (1) (b) and 38 1 (a) of the Environmental Permitting (England and Wales) Regulations. This was the first offence to be prosecuted under the new regulations.

At 4:26pm on 26 April, YWS was contacted by the EA via Loop informing it of potential pollution incident at Runswick Beck. YWS was directly informed by Loop at 4.40pm and a job was raised for the standby operator who was on site for 5:05pm (some 40 minutes after the first contact).

The operator confirmed that the detention tank on site was full and the overflow was active. The pumps appeared to be running but they were failing to keep on top of the flow. No alarms had been received from the site as it was established that the ultrasonic head that records levels in the tank was inoperable as it had been removed from the tank and placed on top of the tank. The reasons for this were unknown as was both the identity of the person who removed the ultrasonic head and when this was done.

The tank was pumped down by the operator by putting both pumps on hand. The site was not designed to operate using both pumps and was on a duty standby arrangement, however, to try to solve the problem both pumps were in use. At 6:45pm, approximately two hours from the report of the incident by the EA, the discharge was stopped. The operator later noted a discharge from the rising main at Hinderwell and believed the rising main to be blocked which would have had the effect of reducing the SPS's capacity to pump in any event. As the operator had stopped the discharge, before he left site, he checked the watercourse and beach for any signs of debris. He found no such debris as the detention tank has a screened overflow.

A high-level flow was placed in the tank as a temporary indicator for any future high levels. The operator confirmed to the EA that he had stopped the discharge. The EA informed YWS that it would be attending the following day to take samples and requested a clean-up of the beck.

A job was raised for Lumsden and Carroll to clean up Runswick Beck but it did seem that the vegetation in the Beck had contained the majority of the flow. No debris was found. In agreement with the EA, only the top 20 metres of the Beck were cleaned for health and safety reasons. Investigations into YWS's own assets on 27 April established that the detention tank was full of sewage debris. The STRATE pump unit was also cleaned out.

On 28 April, the STRATE tank was cleaned out and its controls were also checked by an electrician. A large quantity of silt was found in the unit and the pumping propellers were also found to be worn. The detention tank had been cleaned out two years prior to this in accordance with our accepted process. It was cleaned out on 29 April and impellors were ordered which had to be delivered from Germany.

The rising main was found to have two of the three air valves clogged with fat and the third valve was found to be damaged – all of which were cleaned and replaced. Approximately £6k in costs was incurred in both the clean-up operation and repair and replacement of the relevant assets. Following the incident, the site was visited every other day, with daily monitoring of RTS.

Sample results taken by the EA showed a significant impact at the point of discharge. Sample results 300 metres downstream of the discharge point on 26 April, showed a lesser impact. Samples taken from the same place 300 metres downstream on 27 April showed a greatly reduced impact suggesting that the watercourse had improved significantly within 24 hours of the incident. The site now has an updated maintenance plan and the telemetry has been fully tested.

The Magistrates made the following comments: "We have listened very carefully to all that has been said today regarding this unfortunate incident at Runswick Bay. We have acknowledged that Yorkshire Water did respond exceedingly quickly. In our view, a response time of 25 minutes is exceptional. We have also noted the early guilty plea and given maximum credit for this."

YWS was fined £7,500 fine and ordered to pay the EA's costs of £1,581.67.

Rotherham Magistrates' Court 10 June 2011

YWS was prosecuted for an offence that on or before 24 April 2010 it did cause a water discharge, namely the entry of waste into the Blackwater Dyke, Aldwarke Lane, Rotherham other than in accordance with an environmental permit contrary to Regulations 12 (1) (b) and 38 1 (a) of the Environmental Permitting (England and Wales) Regulations.

At 11:05am on 26 April, YWS was informed via the EA of a discharge to Blackwater Dyke. YWS operatives were on site at Aldwarke Lane SPS at 12:30pm and found that both pumps at the site were inoperative. Pump no 1 was found to be blocked and the fuses had blown at pump no 2.

A job was immediately raised for an electrician and fitter to attend site. In the interim, straw bales were delivered to site and placed at the confluence of the Dyke and River Don to prevent solids moving into the River Don. Pump No 1 was lifted, unblocked and restored to normal operation on the same afternoon but pump no 2 was found to be burnt out so was removed from the wet well. The pumping station operated on a duty/standby basis and therefore one pump was capable of dealing with the flows.

The site was monitored overnight by standby operatives to ensure the pumping station continued to operate satisfactorily using one pump. No further issues were noted. On 27 April, a replacement pump no 2 was delivered but was not immediately fitted due to wet well restrictions. The site was monitored again overnight. Pump No 2 was installed on 28 April. On 30 April, the EA requested a clean-up of the Dyke and a recycler/vactor unit was requested which removed the surface liquids from the Dyke. No further works were required by the EA.

Aldwarke Lane SPS was monitored by telemetry, however, a telemetry failure was identified on 9 December 2009 which was not rectified until 28 April 2010. The pumping station was visited on a monthly basis prior to the incident and the last visit prior to the incident being on 1 April. The EA did not take any samples of the Dyke nor did it produce any photographs. There was therefore no evidence of the impact on the Dyke.

An employee of the EA witnessed this incident on Saturday 24 April whilst in the area socially. For reasons which had not been explained in his statement or elsewhere, he did not report this incident to any party until two days later on 26 April.

The Magistrates made the following comments: "We have been hearing a case prosecuted by the Environment Agency against Yorkshire Water. We have taken into account the statement from the Environment Agency that the breakdown of the telemetry had no bearing on the subsequent breakdown of the pumps. However, telemetry would have given an early indication of the problem and should not have taken 5 months to repair. We do however appreciate that Yorkshire Water took early action on being informed by the Environment Agency. We would have fined the company £5,000 but give maximum credit for the early guilty plea".

YWS was fined £3,750 fine and ordered to pay the EA's costs of £835.38.

Wakefield Magistrates' Court 18 July 2011

YW was prosecuted for an offence that on or before 7 April 2010 it did cause the entry of polluting matter, namely sewage waste, into the un-named tributary of the River Calder to the North of Pugneys Country Park in the district of Wakefield, a controlled water, other than in accordance with a discharge consent contrary to section 85 (1) and 85 (6) of the Water Resources Act 1991.

On 7 April at 11.38am, YWS were informed of a discharge to the tributary by the EA. An operator was sent to site and noted a problem with the Denby Dale Road CSO. Around 1.5 tonnes of fat, rags, silt and grit were removed from the CSO chamber. At the time of the incident, the CSO telemetry data was not visible due to a fault with the alarm points. Data recovered since the incident indicates that the CSO began to discharge to the site detention tank on 11 February 2010 and ceased on 7 April 2010. The flow was being returned to sewer and there is no recorded data to indicate when the discharge to the watercourse may have commenced.

On the day of the incident, a bund was created using straw bales to prevent solid material reaching the River Calder. A litter pick around the CSO outfall was also carried out. On 9 April, fat was again found to be accumulating in the CSO chamber which became partially blocked again. This blockage was cleared on the same day and the asset was proactively checked over the weekend and the watercourse also monitored.

On 12 April, the CSO and continuation sewer were completely cleansed by high pressure jetting. One storm pump was also found to be blocked, this blockage was also cleared that day. During that week, the CSO telemetry was also repaired and modified to make graphical data visible and a supplementary "pollution incident" alarm was created. On 13 April, YWS met with the EA and agreed to bund off the dyke upstream of the overflow and that the site would be monitored daily.

Since this incident, potential sources of the fact have been investigated but have not identified a source. All of these businesses who could be the potential source of the fat have been contacted to inform them of the problem and provide guidance on the correct disposal method. A cyclical monthly inspection of the asset has been raised to help identify any future accumulations of fat. This involves checking the CSO itself and a visual check of the outfall.

Prior to the incident, the Detention Tank was inspected on a routine visit on 2 March with no faults found. The pumping station was visited on 11 March which found a partial blockage in the CSO caused by fats which was removed during the same visit. The CSO itself receives a 3-monthly inspection – YWS guidance is that it should be every 6 months so the asset was already being visited more frequently.

The EA took two sets of samples on 8 April and 16 April. The former sample was taken from the point where the drain emerges from culvert into an open ditch. This sample does demonstrate an impact on the watercourse. The second sample taken by the outfall itself some 9 days after the incident was reported, show significantly lower levels for all of the components tested on 8 April. A number of photographs have also been provided.

YWS was fined £10,500 and ordered to pay the EA's costs of £2,324.67.

Calderdale Magistrates' Court 4 January 2012

On 4 January 2012 YWS pleaded guilty to an offence that on or before 1 April 2011 it failed to comply with Schedule 1, Conditions 11 (a) and 9 (a) (iii) of an environmental permit for waste water treatment and discharge, number WRA7510 in that the levels of biochemical oxygen demand and suspended solids discharged from the works were in excess of the permitted maximum amounts allowed under the said permit and caused pollution of the River Calder contrary to Regulations 12 (1) (a) and 38 (2) of the Environmental Permitting (England and Wales) Regulations 2010 and Section 2 of the Pollution Prevention and Control Act 1999. The levels of BOD were 3.6mg/l over the levels normally permitted to be discharged to the watercourse being 73.6 mg/l rather than 70 mg/l or under.

The works in question suffered greatly as a result of the intense winter of 2010/11. The weather had affected a great deal of authorities and the public alike. By way of background, during this period maintenance work in the area, including this sewage treatment works, increased by 374% in January and 240% in February. The impact on the Copley works was severe. A number of assets were affected at the works which resulted in the increase in the levels of sludge being held back for treatment which resulted in the breach of the permit. It can be described almost as a domino effect on preceding treatment assets caused by the winter which then impacted the operation of the centrifuges which were required to operate consistently in a manner for which they are not designed.

A centrifuge is a large drum which is motorised and spins very fast like a washing machine. Wet sludge enters the drum and is spun such that the water is removed and the thickened sludge is passed forward as a cake. It is one part of the overall treatment process at the works.

At the works, there are two centrifuges and the design is for them to operate on what is known as a duty/standby basis. The importance of that is that only one centrifuge is ever required to operate. The standby is there to be called into operation should a problem arise with the duty asset.

The centrifuges are maintained on a 6-monthly basis by a specialist contractor and were last inspected on 3 February 2011 and in July 2010 prior to that. An issue was identified with one of the centrifuges which in turn led to its removal for repair on 10 February leaving one still in situ which is still within the design capacity.

The remaining centrifuge continued to operate at a lower continuous level of operation. It is important to note that this asset did not fail. However, as it was struggling to maintain required levels, a decision was made to bring in a further centrifuge unit which eventually ran on a 24-hour basis, 7 days a week. This arrived on site on 2 April. The levels of BOD on 10 March were 136mg/l. By 1 April 2011, YW had reduced the level of BOD by 50% to 73.6mg/l, 3.6mg/l over the permitted levels of discharge i.e. the levels which are set by the EA that can be safely discharged without any impact. Therefore, clearly the activity by YW had made a significant impact to the BOD levels.

This incident came to the prosecution's attention as a result of self-reporting by YW, there was no attempt to conceal the events on site nor any potential impact on the watercourse. YW were proactive in their communication to the EA to ensure there was full visibility of what was occurring on site. The EA attendance on site was solely in response to the YW contact.

There was no evidence from the EA of any impact on the watercourse other than the sample results provided and some photographic evidence. The sample results show that the levels of BOD were 3.6mg/l over the levels normally permitted to be discharged to the watercourse. It was submitted therefore that taking this into account, the impact on the watercourse was minimal given the close proximity of the final sample result to what is allowed to be safely discharged in all normal circumstances. Any impact in any event was short term if at all.

There was no fish kill nor is there any evidence submitted by the EA of any damage to flora/fauna or impact on recreational or amenity value.

The Yorkshire Water response was timely and effective with costs of approximately £60k being incurred as an immediate and subsequent consequence of the incident. Since the incident occurred, a full root cause analysis was undertaken resulting in a full review of the maintenance procedures to equipment upstream as it were of the centrifuge assets. Those assets were already on an appropriate system of inspection and maintenance which was adhered to prior to this incident. A further new action is a robust two-phase escalation process to reinforce monitoring levels on site in terms of sludge levels which now instigate new actions within the company. A new team leader has also been brought to the site to give more focus to these sorts of issues.

Yorkshire Water self-reported this incident to the EA and fully cooperated with them under interview. Yorkshire Water now has an understanding as to the impact of such a severe winter event which had not previously been seen for in excess of 30 years.

A fine of £5,000 was imposed against a maximum of £50,000. Costs were also awarded to the EA in the sum of £1,593.98.

Bradford Magistrates' Court 20 March 2012

On 20 March 2012 YWS pleaded guilty to 3 offences all contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2010 as follows:

1. Between 17 April and 3 June 2011 at Copley Sewage Treatment Works there was a failure to comply with the permit in that the works were not operated in accordance with that permit through the storage of sludge in external areas.
2. Between 1 April and 24 June 2011 at South Elmsall Sewage Treatment Works there was a failure to comply with the permit in that sludge originating from Copley works and Wheldale works was stored and treated at the site.
3. Between 1 April and 24 June 2011 at South Elmsall Works there was a failure to comply with the permit through the storage of sludge in external areas for more than 2 days and was not stored in sludge skips.

The works at Copley suffered greatly as a result of the intense winter of 2010/11 which affected a great deal of authorities and the public alike.

By way of background, during this period maintenance work in the area, including this sewage treatment works, increased by 374% in January and 240% in February of 2011. The impact on the Copley works was severe. A number of assets were affected at the works which resulted in the increase in the levels of sludge being held back for treatment which resulted in a discharge outside of the permit for Copley. The Company having seen this discharge occur wished to take all measures to repeat a discharge to the watercourse outside of permitted levels.

There were 3 offences before the court relating to permits at 2 sites Copley and South Elmsall sewage treatment works (STW). The background to all 3 offences is as described above. As a result of the issues being seen on site against the backdrop of the situation referred to, a Company Response Management Team (CRMT) was set up on 5 April to make risk based assessments and decisions on the process to be undertaken to deal with the sludge storage. Both sites have permits to regulate the storage of sludge, at Copley, there is an internal storage area and at South Elmsall, the sludge is permitted to be stored externally in skips for no more than 2 days. The offences were not financially motivated. The Company having set up a CRMT which consists of senior management and operators alike, considered all options for the storage of this sludge. The usual process would have been to send the sludge to the Calder Valley incinerator. This incinerator was undergoing its annual programme of planned maintenance between 1-18 April. This is done on an annual basis with no previous impact on operations.

The other appropriate option was another site which due to potential employee risk, had been temporarily closed down pending works to remove that risk.

The final potential option, other than that taken, was to take this matter to landfill. As an environmental option, due to this not being a particularly environmentally friendly option against all others, the decision was taken not to do so. Therefore, the option to store this substance elsewhere or indeed to use alternative containers was not appropriate or indeed a viable option. In all the circumstances, considering availability and indeed environmental impact, the decision taken was the only decision available so it certainly was not a decision taken without full consideration and assessment of the company's responsibilities both with regards to its regulatory duties but also its duties to the environment.

Offence 1:

The internal storage area was full to capacity by 14 April. The decision was made to store the overflow externally which could be safely stored on areas which were considered appropriate to avoid any external impact via drainage or ground impact. Bales of hay were also placed around the stored substance to protect against any issues in the event of rainfall and to protect against seepage outside of these areas. As soon as the incinerator was available, the sludge was removed from site starting from 23 April and completely removed by 3 June with the vast majority having been removed by 27 May.

Offence 2:

This relates to the transporting of sludge from Copley and Wheldale STW to South Elmsall STW. The sludge was only stored on site but no treatment actually took place. In respect of this offence, during the Environment Agency's (EA) own visit report of 11 May 2011, it was deemed that this was "a non-compliance which has no potential environmental impact". The sludge was transported from Wheldale to South Elmsall from 1 April to ensure as much storage was available at Copley as possible.

Offence 3:

It is permitted to store sludge externally at South Elmsall although it is accepted that this should be carried out by virtue of the use of skips and for no more than 2 days. The background explained above explains the duration and it is estimated that approximately 38 skips would have been required for this storage. As the company was continually making arrangements for transporting of this sludge appropriately and it was not known where 38 skips could have been obtained from, the option was taken to store the substance on the ground which was protected from any escape from the site whether by virtue of drains or ground contamination.

The removal of sludge from Copley was prioritised but as soon as possible with complete removal in accordance with the date on the summons.

The context of these incidents was to be considered amongst Yorkshire Water's regional operations. The issues explained on these sites due to the winter and its longstanding impact were felt regionally. Had the Company been in a position to consider any other options, it would have done so but was heavily constricted by events occurring which were caused by issues outside its control.

Effect on environment

There is no evidence from the EA of any impact on the environment save for reference to complaints of odour which the company does not seek to disregard or indeed argue against the impact. The EA's own guidance on incident classification for odour for significant effects is in summary, odour offensive and persistent enough to cause significant effect on human senses… which lead to some disturbance and significantly more intrusive than normal background and potentially with a significant effect on amenity value. There were two odour complaints on 3 May for South Elmsall over the period of external storage for the duration between 1 April to 24 June. There were 6 complaints from the same two customers over the period of external storage for Copley between 17 April and 3 June.

It was submitted that the odour complaints did not fall within this classification and therefore the incidents should be considered against the EA's own guidance of what constitutes a significant impact.

Further the considered actions taken by Yorkshire Water with regard to actual storage areas were to avoid an impact to the environment via a discharge to a watercourse or otherwise as previously seen.

The response by Yorkshire Water

It was submitted that the Yorkshire Water response was as timely and effective as possible in all the circumstances considering the options available in respect of the shut down for planned and unplanned reasons, of the usual process sites. Costs of approximately £55k were incurred as an immediate and subsequent consequence of the incident. Since these incidents occurred, the level of resource focused on audits and compliance has been increased with further training to be provided for responsible managers and teams.

Yorkshire Water now has an understanding as to the impact of such a severe winter event and the impact this had on assets and resulting operations such as the storage of sludge.

Following the EA's visit on 5 May, an action plan was agreed with them for South Elmsall in which Yorkshire Water confirmed that no additional material would be added to that already in placer and it was fully communicated that all of the cake would be removed by 4 July. There was no requirement by the EA at that stage to remove this material any quicker.

For the Copley site, from 10 May, the Company was in contact with the EA regarding its plans for removal of the sludge from the site. To this extent, in respect of both sites, from 5 May onwards, Yorkshire Water was in regular communication informing them of their plans and next steps.

A fine of £17,000 was imposed per offence against a maximum of £50,000. Costs were also awarded to the EA in the sum of £3,935.70.

Huddersfield Magistrates' Court 25 September 2012

On 25 September 2012 YWS pleaded guilty to one offence contrary to Regulations 12 and 38 (2) of the Environment Permitting (England and Wales) Regulations 2010 as follows:

That on or before 14th June 2011 at Huddersfield (Upper Brighouse) Sewage Treatment Works, Yorkshire Water Services Limited did fail to comply with an Environmental Permit, namely conditions 9 and 10 of Schedule 7 of the conditions of consent to discharge number WRA7409 in that a standby pump was not present.

Upper Brighouse is part of a complex of waste water treatment works which treats effluent from Huddersfield town and the surrounding area. Upper Brighouse is subject to conditions contained within permit number WRA7409. In particular, the discharge of settled sewage in an emergency is subject to conditions set out in Schedule 7 to permit WRA7409. Conditions 9 and 10 provide:-

> "9. The duty pump(s) shall be maintained in good working order, and at least one standby pump shall be provided and maintained.
>
> 10. Standby pump(s) shall automatically activate should the duty pump(s) become inoperative for reasons other than power failure. The pumping station shall be maintained so that the pump shall automatically reactivate as soon as is practical after the power is restored after interruption to the supply".

Conditions 9 and 10 relate to an interstage pumping station at Upper Brighouse. There are three pumps available within the pumping station. Pump A acts as a duty pump which pumps flows forward to treatment, pump B is used intermittently to assist the duty pump at times of high flow following heavy rainfall and pump C acts as the standby pump.

At the end of October 2010 pump A failed and could not be repaired in situ. The pump was removed and sent to the manufacturer for assessment. A decision was taken at that time, based on an assessment of operational risk not to source an alternative pump as pump B was capable of pumping flows to treatment and that pump C (formerly the standby pump) could be used as the assist pump. The permit does not, in any event, specify that an assist pump has to be provided. At the end of January 2011 the manufacturer (Hydrosteel) confirmed that the pump was capable of being repaired and gave a lead time for the work of approximately 3 weeks. As there had been no operational difficulties with the pumping arrangements at Upper Brighouse, the decision not to source a temporary third pump was not reviewed.

As with most large organisations, YWS operates a dedicated work and job scheduling system (SAP). The system has been in place for approximately 10 years and is used to schedule and allocate individual jobs. Each job is given its own individual SAP number but there is no overall unique number given to the whole life of a problem or a piece of work, so that a job such as the removal, repair and reinstatement of a pump is not given a single unique SAP reference number which allows it to be traced and remain "visible" until completed in its entirety. Instead, the current operation of the SAP system breaks jobs down into individual stages with each stage having to be separately scheduled and being capable of being completed without there being visibility for the whole job.

The repaired pump was returned to site at the beginning of March and a job raised for its installation. Throughout this period, there were no operational difficulties with the pumping arrangements and again, the decision to use two pumps was not reviewed. A pump was installed at the interstage pumping station in early May however, that pump that was not correctly rated and had to be removed. On 14th June prior to the correct pump (the repaired pump A) being installed, pump B developed an electrical fault which meant that although it was running and showing on the monitoring system as running, it was not actually pumping. At the same time, pump C which was acting as the assist pump, developed a mechanical failure. The failure of pumps B and C resulted in a discharge of settled storm sewage into the River Calder. That discharge was permitted under the terms of condition 3 of Schedule 7 to consent number WRA7409.

Effect on the Environment

There was no impact on the environment as a result of this offence.

Response by Yorkshire Water

YWS had, prior to the instigation of the prosecution, identified limitations within its current organisational working practices and structures and the current use of the SAP system for allocating and assigning jobs. A review and a programme for change (Operating for Excellence) commenced in 2011 and aims to ensure across all of YWS's business and operational functions that there are effective systems and processes in place, so that there is greater clarity and visibility as to how, when and why decisions are taken and work programmed. One of the issues to be taken into account in considering the criticality of a particular asset will be ensuring full permit compliance can be achieved and maintained. The Operating for Excellence project, which commenced in September 2011, is now in its pilot phase. In relation to Engineering & Reliability, one of the outcomes identified to date, is the need for there to be a central engineering reliability hub to allow improvements in the way that workflows are managed within operational teams including scheduling, planning and procurement.

The Magistrates made no comment when imposing the fine and costs award, save for confirming that the company had been given credit for an early guilty plea. A fine of £1,200.00 was imposed against a maximum of £50,000.00. Costs were also awarded to the Environment Agency in the sum of £913.42.

01 October 2013

Beverley magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR 2010 on 12 October 2011 at Beverley Waste Water Treatment Works, Beverley.

Fine - £4,000.
Costs - £1,248.70.

01 October 2013

Beverley magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR 2010 on 18 April 2012 at Beverley Waste Water Treatment Works.

20 February 2014

Wakefield magistrates' court in connection with an offence contrary to Regulation 12 and 38 of the EPR on 06 March 2013 at Wash Dyke, Pontefract (Sowgate Lane SPS).

19 January 2016 – Shay Lane Pumping Station

Shay Lane pumping station Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR 2010 05 October 2013.

Negligent Harm 2 £600,000 £24,000.

28 April 2016 – Naburn WWTW

3 charges of contravening Regulations 12 and 38 EPR 2010:

1. Discharge of polluted water from Naburn WwTW into the River Ouse on 23 August 2013.

2. Failure to provide and maintain at least one standby pump at Naburn WwTW between March and October 2013.

3. Failure to provide and maintain at least one standby pump at Naburn WwTW between 17 August and 29 September 2014 See under "Offence(s).

Charges 1 and 2 - high degree of negligence.

Charge 3 – Reckless.

Charges 1 and 2 – Harm 3.

Charge 3 – Harm 4 Charges 1 and 2 - £500,000.

Charge 3 - £600,000.

17 August 2016 – Sherwood CSO

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR 2010 12 April 2013.

Negligent Harm 2 £350,000 £30,000.

13 July 2017 – Hinderwell WWTW

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR in July 2015.

Culpability – Reckless.
Harm – 2.
Fine - £600,000.

27 November 2017 – Sandy Lane (aka Belle Vue) Pumping Station, Doncaster

Single offence of causing a water discharge activity contrary to Regulation 12 and 38 of the EPR in 24 / 25 April 2014.

Culpability – Negligent.
Harm – 3.
Fine - £45,000.

Appendix 2 Technical Competence

Appendix 3 ISO14001 Certificate

Appendix 4 Quality and Environmental Policy

Appendix 5 Site Condition Report

Appendix 6 BAT Assessment

A review of Best Available Techniques (BAT) requirements contained in Best Available Techniques (BAT) Reference Document for Waste Treatment, 2018 has been undertaken. For those BAT requirements that are applicable to BBM STF operations, an assessment of compliance has been undertaken. A description of how Yorkshire Water meets each requirement, or proposes to meet the requirement, is provided below. Alternatively, reference is made to the location elsewhere in this application document where this detail is provided.

Requirement	Relevant sections for reference / notes on applicability
Overall Environmental performance	
BAT 1. In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:	
1. Commitment of the management, including senior management; 2. Definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation; 3. Planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment; 4. Implementation of procedures paying particular attention to: (a) structure and responsibility, (b) recruitment, training, awareness and competence, (c) communication, (d) employee involvement, (e) documentation, (f) effective process control, (g) maintenance programmes, (h) emergency preparedness and response, (i) safeguarding compliance with environmental legislation; 5. Checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED installations – ROM), (b) corrective and preventive action, (c) maintenance of records, (d) independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained; 6. Review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness; 7. Following the development of cleaner technologies; 8. Consideration for the environmental impacts from the eventual decommissioning of the plant at the stage of designing a new plant, and throughout its operating life; 9. Application of sectoral benchmarking on a regular basis; 10. Waste stream management (see BAT 2); 11. An inventory of waste water and waste gas streams (see BAT 3); 12. Residues management plan (see description in Section 6.5); 13. Accident management plan (see description in Section 6.5); 14. Odour management plan (see BAT 12); 15. Noise and vibration management plan (see BAT 17).	**BAT in place.** Refer to Section III: Supporting Information, Form C2, Question 3d Management systems. For item 8 see Section V: Appendix 5 Site Condition Report. For item 11 see Section III: Supporting Information, Form C3, Question 2 Point source emissions to air, water and land. For item 12 see Section III: Supporting Information, Form C3, Question 6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste For item 13 see Section III: Form C2, Q6-6 Accident Management Plan. For item 14 see Section V: Appendix 10 Odour Management Plan. For item 15 see Section V: Appendix 9 Noise impact assessment.

Requirement	Relevant sections for reference / notes on applicability
BAT 2. In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.	
a. Set up and implement waste characterisation and pre-acceptance procedures. These procedures aim to ensure the technical (and legal) suitability of waste treatment operations for a particular waste prior to the arrival of the waste at the plant. They include procedures to collect information about the waste input and may include waste sampling and characterisation to achieve sufficient knowledge of the waste composition. Waste pre-acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s). b. Set up and implement waste acceptance procedures. Acceptance procedures aim to confirm the characteristics of the waste, as identified in the pre-acceptance stage. These procedures define the elements to be verified upon the arrival of the waste at the plant as well as the waste acceptance and rejection criteria. They may include waste sampling, inspection and analysis. Waste acceptance procedures are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s). c. Set up and implement a waste tracking system and inventory. A waste tracking system and inventory aim to track the location and quantity of waste in the plant. It holds all the information generated during waste pre-acceptance procedures (e.g. date of arrival at the plant and unique reference number of the waste, information on the previous waste holder(s), pre-acceptance and acceptance analysis results, intended treatment route, nature and quantity of the waste held on site including all identified hazards), acceptance, storage, treatment and/or transfer off site. The waste tracking system is risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s). d. Set up and implement an output quality management system. This technique involves setting up and implementing an output quality management system, so as to ensure that the output of the waste treatment is in line with the expectations, using for example existing EN standards. This management system also allows the performance of the waste treatment to be monitored and optimised, and for this purpose may include a material flow analysis of relevant components throughout the waste treatment. The use of a material flow analysis is risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s). e. Ensure waste segregation. Waste is kept separated depending on its properties in order to enable easier and environmentally safer storage and treatment. Waste segregation relies on the physical separation of waste and on procedures that identify when and where wastes are stored. f. Ensure waste compatibility prior to mixing or blending of waste. Compatibility is ensured by a set of verification measures and tests in order to detect any unwanted and/or potentially dangerous chemical reactions between wastes (e.g. polymerisation, gas evolution, exothermal reaction, decomposition, crystallisation, precipitation) when mixing, blending or carrying out other treatment operations. The compatibility tests are risk-based considering, for example, the hazardous properties of the waste, the risks posed by the waste in terms of process safety, occupational safety and environmental impact, as well as the information provided by the previous waste holder(s).	**BAT in place in respect for requirements 2a, b, c and d.** Refer to Section II: Technical Description and Section III: Supporting Information, Form C2, Question 3d Management systems. **Requirements 2e, f and g not applicable**. Waste received on site comprises only sewage sludge. Waste segregation, sorting and waste compatibility considerations are not relevant. Refer to Section II: Technical Description for more details of sludge reception, treatment and handling processes

Requirement	Relevant sections for reference / notes on applicability
g. Sort incoming solid waste. Sorting of incoming solid waste (1) aims to prevent unwanted material from entering subsequent waste treatment process(es). It may include: — manual separation by means of visual examinations; — ferrous metals, non-ferrous metals or all-metals separation; — optical separation, e.g. by near-infrared spectroscopy or X-ray systems; — density separation, e.g. by air classification, sink-float tanks, vibration tables; — size separation by screening/sieving.	
BAT 3. In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:	
1. Information about the characteristics of the waste to be treated and the waste treatment processes, including: (a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process integrated techniques and waste water/waste gas treatment at source including their performances; 2. Information about the characteristics of the waste water streams, such as: (a) average values and variability of flow, pH, temperature, and conductivity; (b) average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances/micropollutants); (c) data on bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge)) (see BAT 52); 3. Information about the characteristics of the waste gas streams, such as: (a) average values and variability of flow and temperature; (b) average concentration and load values of relevant substances and their variability (e.g. organic compounds, POPs such as PCBs); (c) flammability, lower and higher explosive limits, reactivity; (d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).	**BAT in place.** Refer to Section II: Technical Description and Section III: Supporting Information, Form C3, Question 2 Point source emissions to air, water and land.
BAT 4. In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.	
a. Optimised storage location. This includes techniques such as: — the storage is located as far as technically and economically possible from sensitive receptors, watercourses, etc.; — the storage is located in such a way so as to eliminate or minimise the unnecessary handling of wastes within the plant (e.g. the same wastes are handled twice or more or the transport distances on site are unnecessarily long). b. Adequate storage capacity. Measures are taken to avoid accumulation of waste, such as: — the maximum waste storage capacity is clearly established and not exceeded taking into account the characteristics of the wastes (e.g. regarding the risk of fire) and the treatment capacity; — the quantity of waste stored is regularly monitored against the maximum allowed storage capacity; — the maximum residence time of waste is clearly established. c. Safe storage operation. This includes measures such as: — equipment used for loading, unloading and storing waste is clearly documented and labelled; — wastes known to be sensitive to heat, light, air, water, etc. are protected from such ambient conditions; — containers and drums are fit for purpose and stored securely. d. Separate area for storage and handling of packaged hazardous waste. When relevant, a dedicated area is used for storage and handling of packaged hazardous waste.	**BAT in place.** Refer to Section II: Technical Description and Section III: Supporting Information, Form C3, Question 6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

Requirement	Relevant sections for reference / notes on applicability
BAT 5. In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.	
Handling and transfer procedures aim to ensure that wastes are safely handled and transferred to the respective storage or treatment. They include the following elements: — handling and transfer of waste are carried out by competent staff; — handling and transfer of waste are duly documented, validated prior to execution and verified after execution; — measures are taken to prevent, detect and mitigate spills; — operation and design precautions are taken when mixing or blending wastes (e.g. vacuuming dusty/powdery wastes). Handling and transfer procedures are risk-based considering the likelihood of accidents and incidents and their environmental impact.	**BAT in place.** Refer to Section II: Technical Description and Section III: Supporting Information, Form C3, Question 6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste
Monitoring	
BAT 6. For relevant emissions to water as identified by the inventory of waste water streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	
BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation).	**Not applicable.** There are no direct emissions to water.
BAT 7. BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	
BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	**Not applicable.** There are no direct emissions to water.
BAT 8. BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	
BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	**BAT in place.** Of the parameters listed in BAT 8, only H_2S, NH_3 and odour concentration are applicable to the biological treatment activities carried out within this installation. Monitoring of either H_2S and NH_3, or monitoring of odour concentration, are noted as acceptable alternatives. Odour monitoring programmes are established within the Odour Management Plan. See Section V: Appendix 10 Odour Management Plan. Refer also to Section III: Supporting Information, Form

Requirement	Relevant sections for reference / notes on applicability
	C3, Question 4a Describe the measures you use for monitoring emissions.
BAT 9. BAT is to monitor diffuse emissions of organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.	
a. Measurement b. Emissions factors c. Mass balance	**Not applicable.** Relevant activities are not carried out at this site.
BAT 10. BAT is to periodically monitor odour emissions.	
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 quality. The monitoring frequency is determined in the odour management plan (see BAT 12).	**BAT in place.** Refer to Section V: Appendix 10: Odour Management Plan
BAT 11. BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and waste water, with a frequency of at least once per year.	
Monitoring includes direct measurements, calculation or recording, e.g. using suitable meters or invoices. The monitoring is broken down at the most appropriate level (e.g. at process or plant/installation level) and considers any significant changes in the plant/installation.	**BAT in place** Refer to Section II: Technical Description and Section III: Supporting Information, Form C2, Question 3d Management systems and Form C3, Questions 6a, b, c, d and e.
Emissions to air	
BAT 12. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
— a protocol containing actions and timelines; — a protocol for conducting odour monitoring as set out in BAT 10; — a protocol for response to identified odour incidents, e.g. complaints; — an odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.	**BAT in place**. Refer to Section V: Appendix 10: Odour Management Plan
BAT 13. In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given below.	
a. Minimising residence times. Minimising the residence time of (potentially) odorous waste in storage or in handling systems (e.g. pipes, tanks, containers), in particular under anaerobic conditions. When relevant, adequate provisions are made for the acceptance of seasonal peak volumes of waste. b. Using chemical treatment. Using chemicals to destroy or to reduce the formation of odorous compounds (e.g. to oxidise or to precipitate hydrogen sulphide). c. Optimising aerobic treatment. In the case of aerobic treatment of water-based liquid waste, it may include:	**BAT in place.** Refer to Section V: Appendix 10: Odour Management Plan

Requirement	Relevant sections for reference / notes on applicability
— use of pure oxygen; — removal of scum in tanks; — frequent maintenance of the aeration system. In the case of aerobic treatment of waste other than water-based liquid waste, see BAT 36.	
BAT 14. In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below.	
Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant. a. Minimising the number of potential diffuse emission sources. This includes techniques such as: — appropriate design of piping layout (e.g. minimising pipe run length, reducing the number of flanges and valves, using welded fittings and pipes); — favouring the use of gravity transfer rather than using pumps; — limiting the drop height of material; — limiting traffic speed; — using wind barriers. b. Selection and use of high integrity equipment. This includes techniques such as: — valves with double packing seals or equally efficient equipment; — high integrity gaskets (such as spiral wound, ring joints) for critical applications; — pumps/compressors/agitators fitted with mechanical seals instead of packing; — magnetically driven pumps/compressors/agitators; — appropriate service hose access ports, piercing pliers, drill heads, e.g. when de gassing WEEE containing VFCs and/or VHCs. " c. Corrosion prevention. This includes techniques such as: — appropriate selection of construction materials; — lining or coating of equipment and painting of pipes with corrosion inhibitors. d. Containment, collection and treatment of diffuse emissions. This includes techniques such as: — storing, treating and handling waste and material that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g. conveyor belts); — maintaining the enclosed equipment or buildings under an adequate pressure; — collecting and directing the emissions to an appropriate abatement system (see Section 6.1) via an air extraction system and/or air suction systems close to the emission sources. e. Dampening. Dampening potential sources of diffuse dust emissions (e.g. waste storage, traffic areas, and open handling processes) with water or fog. f. Maintenance. This includes techniques such as: — ensuring access to potentially leaky equipment; — regularly controlling protective equipment such as lamellar curtains, fast-action doors. g. Cleaning of waste treatment and storage areas. This includes techniques such as regularly cleaning the whole waste treatment area (halls, traffic areas, storage areas, etc.), conveyor belts, equipment and containers. h. Leak detection and repair (LDAR) programme. See Section 6.2. When emissions of organic compounds are expected, a LDAR programme is set up and implemented using a risk-based approach, considering in particular the design of the plant and the amount and nature of the organic compounds concerned.	**BAT in place** Refer to Section II: Technical Description, Section III Supporting Information, Form C3, Question 3b General Requirements – LDAR programme, Section V: Appendix 8 Odour Impact Assessment, Section V: Appendix 10 Odour Management Plan, Refer also to Proposed Improvement Programme for details of proposed review of methane slip from engines.

Requirement	Relevant sections for reference / notes on applicability
BAT 15. BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below.	
a. Correct plant design. This includes the provision of a gas recovery system with sufficient capacity and the use of high integrity relief valves. b. Plant management. This includes balancing the gas system and using advanced process control.	**BAT largely in place** Refer to Section II: Technical Description. However, it is noted that there have been significant periods of flaring in recent years. YW commits to undertake a detailed review of CHP availability issues and plant sizing relative to anticipated gas yields and report findings to the Environment Agency, together with timetable for necessary works identified – refer to Proposed Improvement Programme.
BAT 16. In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given below.	
a. Correct design of flaring devices. Optimisation of height and pressure, assistance by steam, air or gas, type of flare tips, etc., to enable smokeless and reliable operation and to ensure the efficient combustion of excess gases. b. Monitoring and recording as part of flare management. This includes continuous monitoring of the quantity of gas sent to flaring. It may include estimations of other parameters (e.g. composition of gas flow, heat content, ratio of assistance, velocity, purge gas flow rate, pollutant emissions (e.g. NOX, CO, hydrocarbons), noise). The recording of flaring events usually includes the duration and number of events and allows for the quantification of emissions and the potential prevention of future flaring events.	**BAT in place.** Refer to Section II: Technical Description
Noise and vibration	
BAT 17. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:	
1. A protocol containing appropriate actions and timelines; 2. A protocol for conducting noise and vibration monitoring; 3. A protocol for response to identified noise and vibration events, e.g. complaints; 4. A noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.	Noise or vibration nuisance at sensitive receptors is not expected and no substantiated noise and vibration nuisance complaints have been received. Noise and vibration management plan not required. Refer to Section V: Appendix 9 - Noise impact assessment. Complaints handling and response procedures are in place – refer to Section III: Supporting Information, Form C2, Question 3d Management systems

Requirement	Relevant sections for reference / notes on applicability
BAT 18. In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.	
a. Appropriate location of equipment and buildings. Noise levels can be reduced by increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating building exits or entrances. b. Operational measures. This includes techniques such as: (i) inspection and maintenance of equipment; (ii) closing of doors and windows of enclosed areas, if possible; (iii) equipment operation by experienced staff; (iv) avoidance of noisy activities at night, if possible; (v) provisions for noise control during maintenance, traffic, handling and treatment activities. c. Low-noise equipment. This may include direct drive motors, compressors, pumps and flares. d. Noise and vibration control equipment. This includes techniques such as: (i) noise reducers; (ii) acoustic and vibrational insulation of equipment; (iii) enclosure of noisy equipment; (iv) soundproofing of buildings. " e. Noise attenuation. Noise propagation can be reduced by inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	**BAT in place.** Refer to Section V: Appendix 9 Noise impact assessment.
Emissions to water	
BAT 19. In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.	
a. Water management. Water consumption is optimised by using measures which may include: — water saving plans (e.g. establishment of water efficiency objectives, flow diagrams and water mass balances); — optimising the use of washing water (e.g. dry cleaning instead of hosing down, using trigger control on all washing equipment); — reducing the use of water for vacuum generation (e.g. use of liquid ring pumps with high boiling point liquids). b. Water recirculation. Water streams are recirculated within the plant, if necessary after treatment. The degree of recirculation is limited by the water balance of the plant, the content of impurities (e.g. odorous compounds) and/or the characteristics of the water streams (e.g. nutrient content). c. Impermeable surface. Depending on the risks posed by the waste in terms of soil and/or water contamination, the surface of the whole waste treatment area (e.g. waste reception, handling, storage, treatment and dispatch areas) is made impermeable to the liquids concerned. d. Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels. Depending on the risks posed by the liquids contained in tanks and vessels in terms of soil and/or water contamination, this includes techniques such as: — overflow detectors; — overflow pipes that are directed to a contained drainage system (i.e. the relevant secondary containment or another vessel); — tanks for liquids that are located in a suitable secondary containment; the volume is normally sized to accommodate the loss of containment of the largest tank within the secondary containment; — isolation of tanks, vessels and secondary containment (e.g. closing of valves). e. Roofing of waste storage and treatment areas. Depending on the risks posed by the waste in terms of soil and/or water contamination, waste is	**BAT in place in respect of items 19a, b, c, e, f, g, h and i.** For details of water use refer to Section III: Supporting Information, Form C3, Question 6d Explain and justify the raw and other materials, other substances and water that you will use For details of techniques to minimise accidental/unplanned discharges to the environment from surfacing, storage areas, tanks, vessels, drainage systems etc refer to the Accident Management Plan (Form C2, Q6-6, Appendix 5: Site Condition Report and Appendix 11: Secondary Containment Risk Assessment. For details of waste water generation and management refer to Section III: Supporting Information, Form C3, Question 2 Point source

Requirement	Relevant sections for reference / notes on applicability
stored and treated in covered areas to prevent contact with rainwater and thus minimise the volume of contaminated run-off water. f. Segregation of water streams. Each water stream (e.g. surface run-off water, process water) is collected and treated separately, based on the pollutant content and on the combination of treatment techniques. In particular, uncontaminated waste water streams are segregated from waste water streams that require treatment. g. Adequate drainage infrastructure. The waste treatment area is connected to drainage infrastructure. Rainwater falling on the treatment and storage areas is collected in the drainage infrastructure along with washing water, occasional spillages, etc. and, depending on the pollutant content, recirculated or sent for further treatment. h. Design and maintenance provisions to allow detection and repair of leaks. Regular monitoring for potential leakages is risk-based, and, when necessary, equipment is repaired. The use of underground components is minimised. When underground components are used, and depending on the risks posed by the waste contained in those components in terms of soil and/or water contamination, secondary containment of underground components is put in place. i. Appropriate buffer storage capacity. Appropriate buffer storage capacity is provided for waste water generated during other than normal operating conditions using a risk-based approach (e.g. taking into account the nature of the pollutants, the effects of downstream waste water treatment, and the receiving environment). The discharge of waste water from this buffer storage is only possible after appropriate measures are taken (e.g. monitor, treat, re-use).	emissions to air, water and land **BAT largely in place in respect of item 19d.** Refer to Appendix 11: Secondary Containment Risk Assessment. Containment enhancements have been identified – refer to Proposed Improvement Programme.
BAT 20. In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of the techniques given below.	
a. Equalisation b. Neutralisation c. Physical separation, e.g. screens, sieves, grit separators, grease separators, oil-water separation or primary settlement tanks d. Adsorption e. Distillation/rectification f. Precipitation g. Chemical oxidation h. Chemical reduction i. Evaporation j. Ion exchange k. Stripping l. Activated sludge process m. Membrane bioreactor n. Nitrification/denitrification when the treatment includes a biological treatment o. Coagulation and flocculation p. Sedimentation q. Filtration (e.g. sand filtration, microfiltration, ultra-filtration) r. Flotation	**BAT in place.** All process liquor including surface water runoff directed to BBM WwTW for full treatment prior to discharge to the River Don. Refer to Section II: Technical Description. For details of process liquor generation and management refer to Section III: Supporting Information, Form C3, Question 2 Point source emissions to air, water and land
Emissions from accidents and incidents	
BAT 21. In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan (see BAT 1).	
a. Protection measures. These include measures such as: — protection of the plant against malevolent acts; — fire and explosion protection system, containing equipment for prevention, detection, and extinction; — accessibility and operability of relevant control equipment in emergency situations. "	**BAT in place.** Refer to Accident Management Plan Table C3:6-6

Requirement	Relevant sections for reference / notes on applicability
b. Management of incidental/accidental emissions. Procedures are established and technical provisions are in place to manage (in terms of possible containment) emissions from accidents and incidents such as emissions from spillages, firefighting water, or safety valves. c. Incident/accident registration and assessment system. This includes techniques such as: — a log/diary to record all accidents, incidents, changes to procedures and the findings of inspections; — procedures to identify, respond to and learn from such incidents and accidents. "	
Material efficiency	
BAT 22. In order to use materials efficiently, BAT is to substitute materials with waste.	
Waste is used instead of other materials for the treatment of wastes (e.g. waste alkalis or waste acids are used for pH adjustment, fly ashes are used as binders).	**BAT in place.** Opportunities to substitute materials with waste are very limited. However, final treated effluent is used in preference to mains water supply wherever feasible. Refer also to Section III: Supporting Information, Form C3, Question 6e
Energy efficiency	
BAT 23. In order to use energy efficiently, BAT is to use both of the techniques given below.	
a. Energy efficiency plan. An energy efficiency plan entails defining and calculating the specific energy consumption of the activity (or activities), setting key performance indicators on an annual basis (for example, specific energy consumption expressed in kWh/tonne of waste processed) and planning periodic improvement targets and related actions. The plan is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc. b. Energy balance record. An energy balance record provides a breakdown of the energy consumption and generation (including exportation) by the type of source (i.e. electricity, gas, conventional liquid fuels, conventional solid fuels, and waste). This includes: (i) information on energy consumption in terms of delivered energy; (ii) information on energy exported from the installation; (iii) energy flow information (e.g. Sankey diagrams or energy balances) showing how the energy is used throughout the process. The energy balance record is adapted to the specificities of the waste treatment in terms of process(es) carried out, waste stream(s) treated, etc. "	**BAT in place.** Refer to Section III: Supporting Information, Form C3, Question 6a and 6b
Reuse of packaging	
BAT 24. In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan (see BAT 1).	
Packaging (drums, containers, IBCs, pallets, etc.) is reused for containing waste, when it is in good condition and sufficiently clean, depending on a compatibility check between the substances contained (in consecutive uses). If necessary, packaging is sent for appropriate treatment prior to reuse (e.g. reconditioning, cleaning).	**BAT in place.** Limited opportunities exist as packaging waste arisings are very low. Refer to Section III: Supporting Information, Form C3, Question 6e for further information about residues management

Requirement	Relevant sections for reference / notes on applicability
BAT conclusions for the mechanical treatment of waste – NOT APPLICABLE	
General BAT conclusions for the biological treatment of waste	
BAT 33. In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.	
The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment, e.g. in terms of nutrient balance, moisture or toxic compounds which may reduce the biological activity.	**BAT in place.** Refer to Section II: Technical Description and Section III: Supporting Information, Form C2, Question 3d Management systems.
BAT 34. In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below.	
a. Adsorption. See Section 6.1. b. Biofilter. See Section 6.1. A pre-treatment of the waste gas before the biofilter (e.g. with a water or acid scrubber) may be needed in the case of a high NH3 content (e.g. 5-40 mg/Nm3) in order to control the media pH and to limit the formation of N2O in the biofilter. Some other odorous compounds (e.g. mercaptans, H2S) can cause acidification of the biofilter media and necessitate the use of a water or alkaline scrubber for pre-treatment of the waste gas before the biofilter. c. Fabric filter. See Section 6.1. The fabric filter is used in the case of mechanical biological treatment of waste. d. Thermal oxidation. See Section 6.1. e. Wet scrubbing. See Section 6.1. Water, acid or alkaline scrubbers are used in combination with a biofilter, thermal oxidation or adsorption on activated carbon.	**BAT in place.** Refer to Section II: Technical Description and Section III Supporting Information Form C2 Summary review of abatement plant and Proposed Improvement Programme.
BAT 35. In order to reduce the generation of waste water and to reduce water usage, BAT is to use all of the techniques given below.	
a. Segregation of water streams. Leachate seeping from compost piles and windrows is segregated from surface run-off water (see BAT 19f). b. Water recirculation. Recirculating process water streams (e.g. from dewatering of liquid digestate in anaerobic processes) or using as much as possible other water streams (e.g. water condensate, rinsing water, surface run-off water). The degree of recirculation is limited by the water balance of the plant, the content of impurities (e.g. heavy metals, salts, pathogens, odorous compounds) and/or the characteristics of the water streams (e.g. nutrient content). c. Minimisation of the generation of leachate. Optimising the moisture content of the waste in order to minimise the generation of leachate.	**BAT in place.** Final treated effluent is used in preference to mains water supply wherever feasible. Surface water runoff is limited and is all directed to BBM WwTW for full treatment prior to discharge – refer to Section II: Technical Description
BAT conclusions for the aerobic treatment of waste – NOT APPLICABLE	
BAT conclusions for the anaerobic treatment of waste	
BAT 38. In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.	
Implementation of a manual and/or automatic monitoring system to: — ensure a stable digester operation; — minimise operational difficulties, such as foaming, which may lead to odour emissions;	**BAT in place.** Refer to Section II: Technical Description and Section III:

Requirement	Relevant sections for reference / notes on applicability
— provide sufficient early warning of system failures which may lead to a loss of containment and explosions. This includes monitoring and/or control of key waste and process parameters, e.g.: — pH and alkalinity of the digester feed; — digester operating temperature; — hydraulic and organic loading rates of the digester feed; — concentration of volatile fatty acids (VFA) and ammonia within the digester and digestate; — biogas quantity, composition (e.g. H2S) and pressure; — liquid and foam levels in the digester.	Form C3, Question 4a: Monitoring
BAT conclusions for the physico-chemical treatment of waste – NOT APPLICABLE	
BAT conclusions for the treatment of water-based liquid waste	
BAT 52. In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2).	
Monitoring the waste input, e.g. in terms of: — bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge)); — feasibility of emulsion breaking, e.g. by means of laboratory-scale tests. The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment, e.g. in terms of nutrient balance, moisture or toxic compounds which may reduce the biological activity.	**BAT in place** Refer to Section II: Technical Description and Section III: Supporting Information, Form C2, Question 3d Management systems.
BAT 53. In order to reduce emissions of HCl, NH3 and organic compounds to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below.	
a. Adsorption. See Section 6.1. b. Biofilter. See Section 6.1. c. Thermal oxidation. See Section 6.1. d. Wet scrubbing. See Section 6.1.	**BAT in place** Refer to Section II: Technical Description and Section III Supporting Information Form C2 Summary review of abatement plant and Proposed Improvement Programme.

Appendix 7 Review of Air Quality Risk Assessment

Appendix 8 Odour Impact Assessment

Appendix 9 Noise Impact Assessment

Appendix 10 Odour Management Plan

Appendix 11 Secondary Containment Risk Assessment