

Permitting Decisions – Variation

Document recording our decision-making process following the requirement for waste and wastewater sewerage treatment activities permitted as an installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2016 (as amended)

We have decided to grant the variation for Esholt Sludge Treatment Facility operated by Yorkshire Water Services Limited.

The variation number is EPR/VP3130GZ/V005.

Purpose of this document

On 2 April 2019, the Environment Agency confirmed to the Water and Sewerage Companies (WaSCs) operating in England that their sewage sludge anaerobic digestion (AD) facilities needed to comply with the Industrial Emissions Directive (IED).

The IED entered into force on 6 January 2011 and was transposed into UK law on 20 February 2013. The IED recast the Directive on integrated pollution prevention and control (IPPC) and introduced a revised schedule of industrial activities falling within the scope of its permitting requirements. The schedule of waste management activities includes the recovery of non-hazardous waste with a capacity exceeding 75 tonnes per day involving biological treatment, but excludes activities covered by the Urban Waste Water Treatment Regulations (UWWTR).

In July 2014 we deferred the need for the WaSCs to submit permit applications for these facilities to allow for further consideration of whether they were already covered under the UWWTR. All the UK environmental regulators subsequently concluded this was not the case, and therefore they come within the scope of the IED.

The IED seeks to achieve a high level of protection for the environment, taken as a whole, from the harmful effects of industrial activities. It does so by requiring each of the industrial installations to be operated under a permit with conditions based around the use of best available techniques (BAT).

The IED set a deadline of 7 January 2014 for existing installations to obtain an environmental permit. Therefore, the implementation of this aspect of the IED

had been delayed for over five years at the point of our confirmation to the WaSCs on 2 April 2019.

The BAT Conclusions for Waste Treatment was published on 17 August 2018 following a European Union wide review of BAT, implementing decision (EU) 2018/1147 of 10 August 2018. BAT applies to new waste sewage sludge treatment not covered by the UWWTR. The installation operations at Esholt Sludge Treatment Facility are existing but will be brought under environmental regulation for the first time and are required to operate using BAT.

Given the delay in implementing the IED in England, we subsequently have sought to ensure that all sewage sludge AD facilities obtain and operate under an environmental permit in as short a timescale as can reasonably be achieved. We asked the WaSCs to provide a definitive list of all facilities used to carry out biological treatment of sewage sludge. A submission schedule was provided to the WaSCs, allowing applications for these facilities to be submitted to us in stages between 1 April 2021 and 1 October 2022. This application is part of this programme of work.

The application is for the variation of the existing Combined Heat and Power (CHP) permit through the addition of 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. The existing engines are directly associated activities (DAA) to the Section 5.4 anaerobic digestion activity. Other DAAs now part of the permit include;

- Raw materials storage
- Digestate storage and treatment
- Emergency flare operation
- Gas storage
- Physical treatment of waste (including screening, pressing, thickening, centrifugation / dewatering and heat treatment through thermal hydrolysis process)
- Steam and electrical power generation utilising biogas produced on site
- Uncontaminated surface water collection for reuse, and discharge
- Process water collection and discharge to Esholt Wastewater Treatment Works (WwTWs)
- Air collection and treatment prior to release to the atmosphere.

As part of this variation Yorkshire Water Services Limited propose to bring a gas connection onto site to provide mains natural gas, and CHP 1 (emission point A5) will be converted to natural gas as its sole fuel source. Improvements to the sludge screening is also proposed with the existing Rotamat rotating screens being replaced with enclosed Huber strain presses.

We consider in reaching this decision that we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

This decision document provides a record of the decision-making process. It:

- summarises the decision making process in the [decision considerations](#) section to show how the main relevant factors have been taken into account
- highlights [key issues](#) in the determination
- shows how we have considered the [consultation responses](#)

Unless the decision document specifies otherwise, we have accepted the operator's proposals.

This permitting decision should be read in conjunction with the environmental permit.

Key issues of the decision

Best Available Techniques (BAT)

Article 3(12) of the IED defines BAT conclusions as:

a document containing the parts of a BAT reference document [BREF] laying down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures.

The *emission levels associated with the best available techniques* (BAT-AELs) in IED BAT conclusions are mandatory emission levels. These are generally numerical limits on point source emissions to water and air. We recognise that many sludge treatment facilities were constructed prior to the current permitting requirements and their design may not be readily compatible with the best available techniques as described in the BREF and BAT conclusions. Where this is the case, risk assessments and alternative proposals can be used to demonstrate that an equivalent level of environmental protection is being or can be achieved. Where an operator is not yet compliant with relevant BAT conclusions, we may accept an application where the operator describes how they will meet the required BAT conclusion within an acceptable timeframe. The Waste Treatment (2018) BREF provides a minimum standard of operation across the waste industrial sector. Alongside BAT-AELs, the BREF outlines general BAT conclusions, which apply to all waste sectors. It also contains BAT conclusions specifically for waste sectors which waste water treatment works operate within, namely; the biological treatment of waste and the treatment of water-based liquid wastes.

Yorkshire Water Services Limited (referred to in this document as the 'operator') provided supporting information with their application to demonstrate that their methods of operating are in accordance with the relevant BAT conclusions. We have assessed these documents. In this *Key issues* section, we provide a commentary of the following areas which helped determine how the operator will operate in accordance with the relevant BAT conclusions:

- Secondary containment (BAT conclusion 19)
- Minimise diffuse emissions to air (BAT conclusion 14)
- Inventory of waste waters (BAT conclusion 3)
- Point source emissions to water – indirect emissions (BAT conclusions 7 and 20)
- Odour management (BAT conclusion 12)

Where this document does not discuss a BAT conclusion in detail, we have accepted the operator's supporting information and justifications that they are compliant with the respective BAT conclusion.

Bespoke permit conditions

The technical determination of this application identified key issues where the operator struggled to show how they would meet the relevant BAT conclusion requirements. These are standard pieces of information and evidence which would be expected upon receipt of a new bespoke permit application for a new anaerobic digestion installation facility. In this application, we identified that the operator was unable to provide detailed supporting evidence that key issues would achieve BAT conclusion requirements. These key issues were:

- Sufficient secondary containment measures (permit conditions 3.2.3 and 3.2.4).
- Enclosure of waste storage tanks (permit conditions 3.2.5 and 3.2.6).
- Enclosure of tanks storing and treating digestate still generating biogas (permit conditions 3.2.7 and 3.2.8).

We have performed an assessment of these aspects during the permit determination. A detailed account of these assessments is outlined in the sections below. Where we have not been able to fully assess the operator's proposals to meet BAT conclusion requirements but have received commitments to implement BAT, we have set time sensitive improvement conditions alongside backstop bespoke permit conditions.

Improvement conditions alone would not contain sufficient legal certainty to require an operator to have BAT in place. However, we acknowledge that this application is for an existing activity which has been operating for several years and we recognised that a pragmatic approach was needed to bring this unpermitted installation activity into environmental regulation.

To issue permits without agreeing that an activity fully meets BAT is in essence a permitted local enforcement position (LEP). LEPs are used by the Environment Agency for activities operating outside of a permit. This method will be implemented by setting prescriptive bespoke conditions in the permit for the outstanding BAT issue. These bespoke conditions include the definitive requirement plus a deadline for those techniques to be implemented – a backstop. We have also set improvement conditions for the timely submissions of detailed plans. Should an operator not comply with an improvement condition, a bespoke condition will be in place for the Environment Agency to enforce against.

For these improvement conditions, we have set a final deadline of 31 March 2025. It should be noted that the implementation date for operators to be compliant with the Waste Treatment BAT conclusions was 17 August 2022. Our deadline specified in the improvement condition provides a sufficient timeframe in which the operator can produce detailed plans to meet BAT and a timetable for their implementation. Where operators do not satisfy the requirements of the improvement condition by 31 March 2025, the Environment Agency may commence enforcement action against the WaSC. Failure of the WaSCs to

achieve BAT or failure to take steps to implement BAT by the backstop will be at the operator's risk.

Secondary containment

Secondary containment is a fundamental principle of pollution prevention at industrial sites and waste management facilities. We assess secondary containment provision when determining permit applications. Secondary/tertiary containment is an appropriate protective measure and is a standard requirement of an environmental permit. The Waste Treatment BREF includes BAT conclusion 19 which identifies several relevant techniques *to prevent or, where that is not practicable, to reduce emissions to soil and water.*

WaSC anaerobic digestion facilities store and treat significant volumes of waste sludge and liquids that have the potential to cause pollution to land, air and water and to impact detrimentally on any nearby sensitive habitats or areas of human occupation (also known as sensitive receptors). These facilities are co-located with wastewater treatment works (WwTW) and, by the nature of these operations, are usually located near to watercourses. They have tended to have little in the way of secondary containment, such as impermeable surfacing or bunding, that would protect the environment in the event of a loss of containment.

The most common receptors we consider could be impacted by a loss of containment include groundwater (aquifers), water courses, designated conservation areas (such as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites), the adjacent WwTW and nearby human receptors such as residential and commercial premises.

Given the number, significance and complexity of the WaSC's sludge AD facilities, we have provided advice on what they should have regard to when assessing their facilities. We consider that this advice, and the timescales afforded to the WaSCs to submit information in support of their permit applications, is above and beyond that which would typically be given to permit applicants.

We advised the WaSCs to provide two main components of assessment aimed at clearly identifying where a facility has sufficient measures in place to protect sensitive receptors, and where improvements may need to be implemented.

The two components were:

- Containment assessment against the recommendations of CIRIA C736 guidance - *Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises* (2014).
- Completion of the ADBA tool to identify sources, pathways and receptors, and risks.

We also advised applicants to submit spill modelling as supporting evidence to demonstrate the effectiveness of current containment measures and assess any identified necessary improvements.

We advised the WaSCs (including this operator) of the requirements of containment assessments on multiple occasions, including:

- At a workshop held by Water UK in February 2020 (Water UK members are UK water and wastewater service suppliers for England, Scotland, Wales and Northern Ireland, the operator is a member of Water UK) – Presentation Title: Permitting Overview – Including section on containment – Surfacing, bunding and capacity, presented by a Senior Permitting Officer of the Environment Agency National Permitting Service.
- Written advice sent in March 2021 by us including.
 - Sector specific pre-application advice note.
 - BAT gap analysis template tool.
- Presentation on 14 July 2021, delivered to Water UK, titled, *IED Permitting TaF + Spill Modelling*, which the operator attended, in which spill modelling was specifically discussed, along with a reiteration of application requirements. Spill modelling seminar presented by a Member of the Project Steering Group of CIRIA C736.

There are also various additional references to containment in guidance that is widely disseminated in the industry including:

- Waste Treatment BAT Conclusions.
- [Environmental permitting guidance on the control of emissions \(gov.uk\)](#).
- *How to comply with your environmental permit. Additional guidance for: Anaerobic Digestion* Reference LIT 8737 Report version 1.0 dated November 2013.
- [Appropriate measures for the biological treatment of waste](#) – consultation document and response comments.
- [Biological waste treatment: appropriate measures for permitted facilities - Guidance - GOV.UK \(www.gov.uk\)](#)
- [Emissions control - Non-hazardous and inert waste: appropriate measures for permitted facilities](#) - This is not directly applicable to biological treatment but will be replicated in the appropriate measures as mentioned in the above bullet point.
- [SR2021 No 10: anaerobic digestion of non-hazardous sludge at a waste water treatment works, including the use of the resultant biogas](#). This specifically applies to sludge AD facilities.

CIRIA C736

CIRIA C736 is considered the industry containment assessment standard of choice and is based on the source-pathway-receptor approach to risk assessment. It provides a clear methodology for demonstrating BAT, appropriate measures and compliance with permit conditions.

It is applicable for identifying and managing the risk of storing substances which may be hazardous to the environment and applies to activities ranging from small commercial premises to large chemical facilities. It primarily considers the potential consequences of tank failure and provides a risk assessment methodology to support a classification system for containment, providing different levels of performance for different risks. The aim is to break the pathway between source and receptor.

The guidance provides containment options and examples of good practice, but it is not prescriptive and there may be circumstances where it could be appropriate to use other methods where at least an equivalent level of environmental protection is provided, however this would need to be provided at the point of permit determination.

Due to the nature of sewage sludge, waste cake or waste liquors, it is clear that this would be considered to be both a short and long-term hazard to the environment if released. Given the locations of sites that deal with these materials generally, it is reasonable to conclude that any major tank failure at an individual site will have the potential to cause significant damage to sensitive receptors.

Where CIRIA C736 measures are not considered to be relevant or appropriate for a specific facility, an explanation should be provided using a risk-based approach. For existing facilities where measures cannot easily be achieved, we expect site based specific risk assessments associated measures and any alternative measures to be proposed at permit determination which achieve at least an equivalent standard to provide at least the same level of environmental protection. It should be recognised however that CIRIA C736 includes specific guidance for operators who need to implement secondary containment provisions at existing facilities.

Newly built facilities and assets should be designed and built to CIRIA C736 report recommendations or to at least an equivalent approved standard. Newly built facilities and assets not designed and built to CIRIA C736 report recommendations, or to at least an equivalent approved standard would not be considered to provide suitable primary and secondary containment, and as such would not comply with BAT. Existing facilities may be unlikely to be compliant with CIRIA C736 due to the viability of retrofitting to meet the recommendations. However, the same containment assessments are still required, and improvements should be proposed to demonstrate at least equivalent appropriate measures of environmental protection.

ADBA tool and guidance

The ADBA tool and guidance have been specifically designed as a guide for secondary containment for anaerobic digestion. The guide states ‘Both the guide and the classification tool draw upon the principles and methodologies within CIRIA C736. The principles within CIRIA C736 are generally accepted as good practice in the design and construction of containment systems. The principles of CIRIA C736 are distilled into this accessible guide, which attempts to draw out the parts relevant to the AD sector’.

The tool itself is clearly set out to provide an inventory of sources, pathways and receptors and aligns with the containment system class types in CIRIA C736. It provides risk ratings and allows mitigation measures to be considered.

Alternative assessment methods

Where our guidance refers to CIRIA C736 it also allows for other equivalent approved standards. This does provide operators with the option of using other approved standards, but they must offer at least the same level of environmental protection.

Where CIRIA C736 and ADBA tool assessments, or equivalent approved standards, are not provided, it is difficult or impossible to satisfactorily assess permit applications for compliance with BAT, appropriate measures or an environmental permit.

Assessment of this facility

The operator did submit an assessment which has given regard to CIRIA C736, including proposals for improvements.

- The operator did submit a completed ADBA tool.
- The operator did submit spill modelling.
- The operator provided initial secondary containment proposals in accordance with Environment Agency guidance, [Control and monitor emissions for your environmental permit](#).
- Detailed secondary containment design will be provided to the Environment Agency in response to improvement conditions (IC3).

The containment options proposed for Esholt Sludge Treatment Facility include; permeable areas of land made impermeable, containment trief kerbing, sleeping policemen, ramps and walling added, with consideration of potential jetting scenarios, rainwater allowances and freeboard requirements for tanks. As part of the schedule 5 response received 05/12/2024 the Operator confirmed that the final solution will prevent any effluent from spilling outside of Esholt Sludge Treatment Facility installation boundary.

As proof of concept the containment solution was modelled in PondSIM to demonstrate that the proposals would contain spillages within the permit boundary and stop any pathway to potential receptors. The proposed solution met the requirements of section 4.2.1 of CIRIA 736 that requires “Where two or

more tanks are installed within the same bund, the recommended capacity of the bund is the greater of:

- 1) 110% of the capacity of the largest tank within the bund.
- 2) 25% of the total capacity of all the tanks within the bund, except where tanks are hydraulically linked in which case they should be treated as if they were a single tank.

The Operator has specified three separately banded areas as part of their proposed containment options:

- Multi-tank area 1 containment volume of 24,797 m³ contains 25% of the total capacity of 6,199 m³ for all the tanks.
- Multi-tank area 2 containment volume 5,538 m³ contains 1,764 m³ of the 110% of the capacity of the largest tank within the banded area.
- Multi-tank area 3 containment volume 1,000 m³ contains 1,100 m³ of the 110% of the capacity of the largest tank within the banded area.

For each scenario the largest volume has been selected from 1) and 2) as specified above.

Reasons for accepting secondary containment proposals

The Environment Agency recognises that the operator's proposals for secondary containment measures at the installation are not complete. Our established environmental permitting process outlines that where information is missing or insufficient, that information can be requested. Where information is unsatisfactory, we may proceed to return an application as not duly made or refuse a duly made application. Our processes state that we generally don't set improvement conditions that require BAT to be demonstrated at some date after the permit application has been consulted on and determined. Generally, we should be satisfied whether operations will use BAT at the appropriate time, and we should make that assessment at the time we issue any permit or variation.

However, we recognise that this industrial activity is already existing and being undertaken and consider it appropriate, where possible, to bring these activities into environmental regulation as an installation. While the current operations are a pollution risk, the operator is not introducing new risks to the environment. It is important to note that any applications including new plant and bulk tanks would require a demonstration that secondary containment is designed in line with CIRIA C736 (or possible equivalent alternative) before a permit could be issued.

While detailed secondary containment infrastructure design was not supplied, the proposals describe what they plan to implement and follow the primary requirements for bund design (as outlined in our guidance [Control and monitor emissions for your environmental permit](#)). The operator has also confirmed that the secondary containment measures will be designed in compliance with CIRIA

C736 by a qualified structural engineer. We have received an effective risk assessment which demonstrates the extent and impact of bulk tank failure on the receiving environment. This was via a spill modelling assessment within the Esholt Secondary Containment Assessment dated December 2024 based on the failure of worst-case tanks. These risk assessments/spill models show that the proposed containment strategies would contain effluent/digestate on site.

The section, *Bespoke permit conditions* of this document, provides a general explanation why we have issued this permit without a full determination of various key issues with the application.

We have included an improvement condition in the permit for the operator to progress the proposals submitted within the application and to provide additional details as they are developed and implemented. We require that the proposals must be implemented by 31 March 2025.

Open treatment or storage tanks pre-anaerobic digestion

The process includes, prior to AD, the thickening and dewatering of indigenous and imported sewage sludge which is a directly associated activity (DAA) of the AD process.

The BREF defines this activity as the 'Treatment of water-based liquid waste' providing examples of wastes that would be considered as water-based liquid wastes. These include wastes under the category '19 08 wastes from waste water treatment plants not otherwise specified'. The treatment of this waste in the dewatering and thickening stage, and the subsequent emissions to air from connected abatement will be subject to the BAT AELs specified within BAT conclusion 8 and any odour control unit that serves this DAA must meet the requirements of BAT 53.

BAT 53 requires that in order to reduce emissions of hydrogen chloride (HCl), Ammonia (NH₃), and organic compounds to air, BAT is to apply BAT 14d (which requires the containment, collection and treatment of diffuse emissions) and to use one or a combination of the techniques including adsorption, biofilter, thermal oxidation and/or wet scrubbing.

The applicant identified open tanks and processes pre-AD which include the screen sludge transfer pumping station, consolidation tank 5, cake import reception unit and thickener liquor sump. We therefore asked the operator to provide written confirmation that they will provide enclosures/covers for these open tanks along with any associated emission abatement systems in line with BAT 14 and BAT 53.

To ensure the operator implements these changes, we have set improvement condition IC5 with a final deadline of 31 March 2025. It should be noted that the implementation date for operators to be compliant with the Waste Treatment BAT conclusions was 17 August 2022. We believe that the deadline specified in the improvement condition provides a sufficient timeframe in which the operator can

produce and implement detailed plans to meet BAT. Where operators do not satisfy the requirements of the improvement condition by 31 March 2025, the Environment Agency may commence enforcement action for that failure the WaSC. Failure of the operator to achieve BAT or failure to take steps to implement BAT by the backstop will be at the operator's risk.

We consider the adoption of this more flexible approach to be pragmatic and proportionate, securing adequate progress towards, and delivery of, BAT within a reasonable timescale. Allowing a longer timescale would not, in our view, be acceptable because of the ongoing risks to the environment and human health. A stricter approach would most likely have meant that we would refuse the application.

The permit also includes bespoke permit conditions alongside the ICs. These bespoke permit condition requires the operator to have the appropriate infrastructure installed on the site by 31 March 2025. Should the operator fail to implement the changes required by that deadline, the Environment Agency may undertake enforcement proceedings against the operator. This position is in place to facilitate the opportunity for operators to become BAT compliant and install necessary infrastructure. The Environment Agency recognises that this approach is different to standard environmental permitting processes. However, we consider that the operator has provided sufficient commitment that they will undertake the necessary improvements to prevent uncontrolled emissions from open tanks. Backstop conditions in the permit will ensure this is achieved.

The section, *Bespoke permit conditions* of this document, provides a general explanation as to why we have issued this permit without a full determination of various key issues with the application.

Uncontrolled biogas and waste gas emissions – open treatment or storage tanks

Anaerobic digestion is a biological treatment of waste which uses natural processes where microorganisms break down organic matter in the absence of oxygen into biogas and digestate. Feedstock of sewage sludge and separately collected waste materials may have wide-ranging physical and chemical characteristics which have varying biogas production potential. Biogas has a varied composition but typically contains predominantly methane, carbon dioxide and nitrogen with traces of hydrogen sulphide and ammonia. Due to the methane component, biogas is combustible and has a significant global warming potential. In addition, fugitive emissions of biogas could also risk fire or explosion, as well as toxicity from gases such as hydrogen sulphide.

The Waste Treatment BREF and BAT conclusion 14 states:

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...., as listed in the BAT Conclusion.

An extract from the appropriate techniques listed in BAT Conclusion 14 for the prevention, or where that is not practicable, the reduction of diffuse emissions to air from open tanks is set out in Table 1 below.

Table 1			
Technique		Description	Applicability
d	Containment, collection and treatment of diffuse emissions	<p>This includes techniques such as:</p> <ul style="list-style-type: none"> • 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, via an air extraction system and/or air suction systems close to the emission sources. 	The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste.

BAT require that waste stored which produces waste gases must be enclosed. Gases must then be appropriately abated. Section 2.3.5.5 of the Waste Treatment BREF states:

Because flaring is both a source of pollution and leads to the burning of a potentially valuable product, its use should be limited to non-routine, momentary stoppages or emergency releases. Uncontrolled emissions (especially VOCs) from vents and relief valves should be routed to recovery systems, with flares serving only as a backup system.

This section of the BREF is in reference to the flaring of biogas and not directly relevant to open tanks. However, it is important to stress that due to the pollution potential from uncontrolled emissions of biogas, it is essential that these emissions are collected and utilised either as a fuel, in storage or for further treatment to refine the biogas. It is not appropriate to store or treat digestate producing biogas within open tanks.

We acknowledge that BAT conclusion 14d provides limits on the applicability for enclosing waste where there is a potential risk from explosion. Storage of unstable digestate will release unspecified quantities of combustible gases. However, the standard industry practice within the commercial anaerobic digestion sector is to minimise unstable digestate storage by typically using longer residence times within sealed digesters to maximise biogas generation.

The Health and Safety Executive (HSE) provide general guidance on bulk storage tank design:

Design Codes – Plant

<https://www.hse.gov.uk/comah/sragtech/techmeasplant.htm>

Storage of flammable liquids in tanks

[Storage of flammable liquids in tanks HSG176 \(hse.gov.uk\)](https://www.hse.gov.uk/comah/hsg176/)

We have been advised that, in the view of the HSE, the competent installation of tank covers is possible using current tank standards. We believe it is possible to design and modify tanks that meet both the specific circumstances and relevant engineering standards.

We also recognise that the covering of tanks may have an impact on whether the site needs to consider the requirements of the Control of Major Accident Hazards (COMAH) Regulations 2015. The creation of additional enclosed space(s) in the site (inside the newly enclosed tanks and any associated new abatement equipment) where dangerous substances are present (or anticipated to be present) would have the consequence of increasing the COMAH inventory, which could in turn move a site from *Lower* to *Upper* Tier or bring a site into the scope of the regulations. An operator will need to consider these requirements when producing plans and designs for tank covers.

The Environment Agency considers the covering of tanks generating biogas (and channelling the gas to utilisation plant/storage) as BAT. It must be undertaken by any operators treating waste via anaerobic digestion (and subsequent storage). Any alternative approach to this must form part of a permit application supported by evidence-based justifications.

This installation currently uses four tanks/vessels to undertake anaerobic digestion. The site's annual throughput of waste treated via anaerobic digestion is 2,250,825 m³/year. The waste undergoes this treatment in these tanks with a Hydraulic Retention Time (HRT) of 12 days. HRT is defined as the working volume of the digester divided by the rate of feeding as volume per unit time and is expressed in days. It is a fundamental design parameter and is typically a determining factor in sizing the AD plant. Biogas produced during this stage is collected in two standalone gas storage infrastructure and subsequently channelled via sealed pipework to gas utilisation structures. This site uses four CHP engines to combust the biogas to use the energy generated on site. The treated waste, described as sludge or digestate is discharged into two degassing tanks, two export dewatering feed tanks, two conditioning dewatering feed tanks and the two liquor/centrate balancing tanks. These tanks are uncovered, therefore, any waste gases, including biogas will be emitted from the tank to atmosphere.

The operator is not able to identify the levels of biogas that may be discharged to atmosphere during this step as no evidence or analysis has been conducted. The large quantities of waste feedstock and relatively short HRT indicate that the digestate could still be producing biogas after it has been discharged into the open degassing tanks, export dewatering feed tanks, conditioning dewatering feed tanks and liquor/centrate balancing tanks. From our regulatory experience, we know biogas levels are still discharged to air from post digestion treatment (such as dewatering). This step can be over a week since the digestate was stored in open tanks. Therefore, emissions of biogas is likely to be even higher during the periods of storage in open 'secondary digester' tanks.

We therefore asked the operator to provide written confirmation that they will commit to covering the two degassing tanks, two export dewatering feed tanks, two conditioning dewatering feed tanks and the two liquor/centrate balancing tanks and a description that shows the tank enclosure will be in line with guidance, [Biological waste treatment: appropriate measures for permitted facilities](#). We also asked how biogas generated from the degassing tanks, export dewatering feed tanks, conditioning dewatering feed tanks and liquor/centrate balancing tanks will be utilised as a fuel or stored for utilisation off site. The Environment Agency recognises that the use of open tanks across the wastewater industry is widespread. While the operator did not provide detailed proposals to enclose tanks, they have committed to develop plans to put these infrastructure changes in place to prevent uncontrolled emissions of biogas from open tanks in the near future.

To ensure the operator implements these changes, we have set an improvement condition IC6 to capture the gases produced within the open secondary digester storage tanks. The IC requires the tanks to be enclosed and connected to the gas management infrastructure, or in rare cases, to a suitable odour abatement system which treats the potentially polluting components of the waste gas. We state that an odour abatement system will only be suitable in rare cases because without evidence to demonstrate otherwise, these tanks and storage infrastructure likely continuously emit a methane rich gas to the environment. It is unlikely that emissions will be comprised of gases which can be controlled by traditional odour abatement techniques. Its therefore most likely that the operator will need to capture and use the gas or treat for the purpose of producing a viable biomethane.

The methane component of a biogas will not be treated by odour abatement techniques and will be discharged into the atmosphere. Only if methane is not a relevant component in the waste gas will odour abatement plant be justified for use on the two degassing tanks, two export dewatering feed tanks, two conditioning dewatering feed tanks and the two liquor/centrate balancing tanks.

This improvement condition does not allow the operator to determine that the open tanks can remain uncovered. The improvement condition is not an

opportunity for the operator to propose alternative methods to enclosing tanks, capturing gases and treating/using the gas.

The operator did not propose an appropriate alternative to the BAT technique of enclosing their tanks with any supporting evidence. The operator is therefore required to enclose the open tanks, the two degassing tanks, the two export dewatering feed tanks, two conditioning dewatering feed tanks and the two liquor/centrate balancing tanks.

IC6 requires the operator to produce a 'post anaerobic digestion vessel cover plan'. The plan requires the operator to include detailed design information on tank cover design and associated biogas gas management infrastructure (or in rare cases waste gas abatement plant). In addition to the design requirements, the operator must present appropriate evidence that the waste gases will be controlled by the proposed design. The operator has confirmed their commitment to enclosing these tanks and to the requirements of the improvement condition.

The permit also includes bespoke permit conditions alongside the ICs. This bespoke permit condition requires the operator to have the appropriate infrastructure installed on the site by 31 March 2025. Should the operator fail to implement the changes required by that deadline, the Environment Agency may undertake enforcement proceedings against the operator. This position is in place to facilitate the opportunity for operators to become BAT compliant and install necessary infrastructure. The Environment Agency recognises that this approach is different to standard environmental permitting processes. However, we consider that the operator has provided sufficient commitment that they will undertake the necessary improvements to prevent uncontrolled biogas emissions and/or other waste gas emissions from open tanks. Backstop conditions in the permit will ensure this is achieved.

The section, *Bespoke permit conditions* of this document, provides a general explanation as to why we have issued this permit without a full determination of various key issues with the application.

Emissions to air – Combustion

Biogas generated through the AD of waste contains a high quantity of methane and is often used to provide energy to onsite operations. Biogas is commonly combusted within on-site combined heat and power engines (CHP) or boilers. CHP engines produce heat and electricity. Heat is used to provide energy in the form of steam or hot water and is directed to the anaerobic digestion plant processes, while electricity can be utilised to power other plant on site.

Combustion of biogas or other fuels such as natural gas produces waste gas emissions which are discharged to the atmosphere via a stack. The combustion of biogas releases the following products of combustion; oxides of nitrogen (expressed as NO₂), sulphur dioxide (SO₂), carbon monoxide (CO) and volatile organic compounds (VOC).

While the WaSC anaerobic digestion activity has not until now been regulated under the Environmental Permitting (England and Wales) Regulations 2016 (EPR) as an installation, across the sector, the combustion plant may have been permitted. Some combustion plant in this sector will already have permits as standalone medium combustion plant. If emissions have previously been assessed, our approach is not to undertake any additional assessment unless there is a site-specific reason to do so. If emissions had not been previously assessed, or there had been subsequent changes, we would require a WaSC to undertake a new quantitative air risk assessment during determination.

This installation uses combustion plant to provide power and heat to the plant and anaerobic digestion process. This includes three combined heat and power (CHP) engines operating on biogas with thermal inputs of 3.63 MWth, 3.63 MWth and 1.53 MWth. As part of this variation the Operator proposes to bring a gas connection onto site to provide mains natural gas source to the fourth CHP engine with a thermal input of 1.53 MWth. There are also two auxiliary boilers operating on biogas or natural gas with thermal inputs of 6.2 MWth each.

The emissions from the combustion plant at Esholt Sludge Treatment Facility has been previously assessed under the previous CHP permit, however with the new natural gas CHP a new air assessment was submitted with this variation. The operator provided a quantitative risk assessment to determine the predicted impacts on human receptors (for example dwellings, work places and parks) and ecological sites.

A methodology for risk assessment of point source emissions to air is set out in our guidance, [Air emissions risk assessment for your environmental permit](#). The operator provided an assessment of the impact of emissions to air with the application which is detailed in document “Esholt Wastewater Treatment Works Air Emissions Risk Assessment” dated January 2023.

We have reviewed the assessment and are satisfied that it has taken into account all relevant ecological and human health receptors, that the model and its inputs are appropriate and that the assessment has been carried out in accordance with our guidance.

We agree with the operator’s conclusions that the impact of the emissions at human receptors are insignificant.

For North Pennine Moors SAC and South Pennine Moors Phase 2 SPA: We agree with the operator’s conclusions that there will be no significant effect on the ecological receptors.

For Yeadon Brickworks Railway Cutting SSSI: We agree with the operator’s conclusion that emissions from the proposal are unlikely to damage the interest features of the Yeadon Brickworks Railway Cutting SSSI.

We have ensured that individual combustion plant is subject to the required emission limit value (ELV) as stated in the permit. This includes those required by the Medium Combustion Plant Directive (MCPD) which are currently in effect, or which have a future effective date. See Table S3.1 in the permit.

We have included improvement condition IC9 in the permit which requires the Operator to assess methane slip resulting from the combustion of biogas via the CHP engines. Following an assessment of the data, the Environment Agency shall consider whether emission limits for volatile organic compounds are applicable for this installation.

Indirect emissions of waste water

AD installations produce a series of liquid wastes. These waste waters (also known as 'liquid digestate' or 'liquors') are discharged to the adjacent WwTW. As explained at the start of this document, WwTW are regulated under separate legislation, the UWWTR and does not form part of this installation. The discharge of waste waters to the WwTW is therefore a point source emission and classed under the Waste Treatment BREF as an indirect emission to water. This AD has been in operation for several years but previously unpermitted as an installation.

The current permit in place which has been varied as part of this application was for the operation of CHP's.

The waste water discharged to the WwTW is not currently subject to monitoring or control. Waste waters, after discharge to the WwTW and treatment under UWWTR are discharged to surface waters (rivers, streams) or in some cases direct to the sea. Across the sewage sludge industry, a wide variety of incoming wastes, trade effluents and indigenous sewage sludges are treated via anaerobic digestion (combined they are subject to regulation under the EPR). Once discharged into the main WwTW, any pollutants within the discharge will be diluted with no control over the level of pollutants emitted to the works. This means that across the sewage sludge industry, there is no knowledge of the extent of pollutants entering the main works for treatment. This lack of knowledge means that WaSCs do not know if their WwTW are capable of treating the waste waters produced at an AD installation.

Description of waste water discharge

Effluent is generated on site during the dewatering and thickening of sludge during the anaerobic digestion process, as a result of surface water run-off, condensate produced from the CHP plant and biogas lines, and from surface water drainage.

The waste waters are discharged to the adjacent Esholt WwTW. Any treatment of this effluent once it arrives at the WwTW is currently regulated under the UWWTR process, not under control of an environmental permit. However, the effluent being discharged from the WwTW is controlled by a permit. As the

UWWTR waste water is discharged to a watercourse, we consider the effluent generated through the AD process constitutes an indirect discharge to water.

As such operators of an installation must establish and maintain inventories, including information about the characteristics and composition of waste waters in accordance with BAT conclusion 3 of the Waste Treatment BREF. BAT conclusion 3 states:

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, that incorporates all of the following features which are identified for waste water as:

Information about the characteristics of the waste water streams, such as:

- *average values and variability of flow, pH, temperature, and conductivity;*
- *average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances / micropollutants);*
- *data on bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge))*

The operator did not have this data prior to submitting their application for a bespoke installation permit. The Environment Agency has found that across the waste water sector, WaSCs have not undertaken a comprehensive analysis of their emissions from the installation activities to the WwTW. In general, WaSC installations accept trade effluents (via consented discharges in the catchment), indigenous sludges and separate waste streams via road tanker. The waste materials treated via the AD plant are potentially diverse and the composition of the feedstock and treated digestates could contain significant variation in pollutants.

Operators of installations under the Waste Treatment BREF must establish an emissions inventory. The operator should be compliant with this BAT conclusion requirement at the point of submitting a permit application. The waste water emissions inventory informs treatment methodologies, environmental risk assessments and monitoring requirements. However, across the sector, this information is not available. The Environment Agency recognises that the operator's emissions discharged to the WwTW have never been fully quantified, and therefore, accept that emissions to the WwTW have not been subject to a quantitative risk assessment. In addition, the operator also cannot demonstrate that they are compliant with BAT AELs for indirect discharges to water (as specified within BAT conclusion 20 of the Waste Treatment BREF).

The waste water discharged to the WwTW is treated via the requirements under the UWWTR. However, this approach may not effectively treat all the pollutants that could enter the WwTW after discharge from the installation. For example,

characteristic treatment methods at WwTW do not typically treat and remove heavy metals or other specified pollutants from the waste water.

We understand and recognise that this industrial activity is already existing and consider it appropriate, where possible, to bring these activities into environmental regulation as an installation. While the operations are a pollution risk, the operator is not introducing new risks to the environment. It is important to note that any applications including a new emission to water would require a demonstration that emissions would not adversely impact any receiving waters, or breach relevant BAT AELs before a permit could be issued.

Our guidance, [Surface water pollution risk assessment for your environmental permit](#), indicates that establishing a representative composition of the waste water streams requires a number of samples over a long period (12 – 36 samples). The scope of pollutants to be identified in the waste water depends on what substances are likely to be within the waste water at the point it is discharged from the installation. To determine what is in the waste water, the operator will need to examine and have a good understanding of the inputs to the installation. It is the responsibility of the operator producing the effluents/waste waters/liquors to understand what pollutants need to be assessed based on their understanding of the waste waters.

To establish a waste water inventory and to facilitate a quantitative risk assessment from this indirect emission point, we have set improvement conditions. Our processes state that we generally don't set improvement conditions that require BAT to be demonstrated at some date after the permit application has been consulted on and determined. Generally, we should be satisfied whether operations will be BAT at the appropriate time, and we should make that assessment at the time we issue any permit or variation. However, for the reasons set out above, this assessment is not possible due to the lack of data in this area across the WaSC sector. We consider setting improvement conditions as a pragmatic approach to identify what is in the waste water to then implement future improvements.

The permit includes improvement conditions IC8a, IC8b and IC8c. There are three stages to this improvement programme. The first (IC8a) requires the operator to submit and carry out a sampling and analysis program and gather the relevant data on the waste water. In accordance with the Waste Treatment BREF, the IC requires the operator to determine the composition of the pollutants which have BAT-AELs (these include heavy metals). Due to the variety of inputs to the waste treatment process and the unknown composition of the waste waters proposed for discharge to the WwTW, we cannot consider this effluent as straightforwardly a 'biodegradable waste'. Therefore, the IC also sets the requirement on the operator to establish an inventory of pollutants of 'all relevant substances'. The scope of pollutants the operator must identify depends on what substances are likely to be within the waste water at the point it is discharged

from the installation. To determine what is in the waste water, the operator will need to examine and have a good understanding of the inputs to the installation. This installation accepts waste inputs from; indigenous and imported sludges, and imported sludge cake.

Due to this variety of inputs and the requirements for a minimum of 12 samples, we have specified that this monitoring period be for at least a year to determine a representative understanding of the discharge.

The Environment Agency recognises that 12 months is a long period but establishing the composition of the waste water will facilitate long term improvements and ensure that all potential pollutants are able to be controlled.

On completion of IC8a, IC8b requires the operator to undertake a full assessment of the results providing a summary of the sample results, a completed H1 risk assessment(s) and detailed modelling (where necessary) with an assessment made against the parameters specified in the relevant environmental standards as specified within our guidance. We also require the operator to submit proposals and/or additional measures required to prevent or minimise any significant emissions from the installation along with timescales for implementation. IC8c requires the implementation of any relevant improvements identified.

The operator has provided written confirmation that it will initiate a sampling programme to determine the composition of the waste water.

The overarching aim of the improvement programme is to establish comprehensively what the operators of AD installations discharge to WwTW and to drive long term improvements. The lack of existing data across the industry means that the Environment Agency, rather than refusing environmental permit applications, facilitates a process for WaSC operators to achieve BAT and to meet environmental standards for long term environmental protection.

Odour management

The Waste Treatment BREF outlines techniques for minimising the impact from odour pollution from operations which are likely to cause odour. Anaerobic digestion and the handling/storage of various waste sludges and organic wastes can be highly odorous. The Waste Treatment BREF includes general BAT conclusions which operators must implement (BAT 10 and 12 where odour nuisance at sensitive receptors is expected and/or has been substantiated).

These include:

- BAT 10 – Monitoring of odour emissions
- BAT 12 – Odour management plan
- BAT 13 – Techniques to reduce odour emissions
- BAT 14 – Reduce diffuse emissions to air

Odour and BAT

BAT requires that processing and treatment of odorous wastes be carried out in a sealed system. This means that tanks/vessels or areas must be connected to an odour abatement system. Odorous gas streams are to be directed to the abatement plant (odour control unit) to be treated prior to release to the atmosphere via emission stacks. The stacks are point source emissions to air.

BAT-associated emission levels (BAT-AELs) for the treatment of water based liquid wastes, (the dewatering and thickening activity identified as a directly associated activity of the AD process) are identified as Hydrogen chloride (HCl), Ammonia (NH₃), and Total volatile organic compounds (TVOC), however the monitoring only applies for HCl and TVOC when the substance concerned is identified as relevant in the waste gas stream based on the inventory mentioned in BAT 3. As the operator has not provided evidence to demonstrate that HCl and TVOC are not present in the emission, we have specified these limits in the permit as, not more than 5mg/m³ for HCl, not more than 20mg/m³ for TVOC and no more than 20 mg/Nm³ for NH₃. These channelled emission limits to air will apply upon determining if the pollutants are identified as relevant within the waste gas emissions inventory in line with BAT 8.

For the biological treatment of waste relating to the AD process we require that odour concentrations are limited to less than 1,000 ou_E/Nm³ at the point of release or, in the case of an ammonia release, no more than 20 mg/Nm³. The upper BAT-AEL limit for ammonia is specified in the permit.

The odour abatement technology at Esholt Sludge Treatment Facility comprises of seven odour control units (OCU). OCU 1 (A10) extracts and treats air from the sludge screen feed tank. OCU 2 (A11) extracts and treats air from the two mixed sludge tanks and two SAS transfer tanks. OCU 3 (A12) extracts and treats air from the two THP feed silos, THP hopper and dewatering centrifuge pumping station. OCU 4 (A13) extracts and treats air from the four drum thickeners and thickener liquor sump. OCU 5 (A15) is a proposed new OCU that extracts and treats air from the screen sludge transfer pumping station. OCU 6 (A16) is a proposed new OCU that extracts and treats air from the cake import reception area. OCU 7 (A17) is a proposed new OCU that extracts and treats air from the consolidation tank 5. All seven OCU's are single stage carbon filters.

This odour control technology meets the requirement of BAT 34 and 53 which identifies relevant appropriate techniques for the reduction of odour as adsorption.

We have also added IC4 to the permit to ensure that OCU 1 (A10), OCU 2 (A11) and OCU 3 (A12), that are currently not operational and are working as dispersion stacks, are reinstated as odour control units within 6 months of the permit being issued.

Odour management plan

The site is required to have an odour management plan in place that details the measures and procedures to prevent or otherwise minimise, odour releases from the site. We assessed the applicant's odour management plan which included relevant odour sources, included process monitoring, identified control measure and trigger actions to prevent odour emissions, and provided contingency plans in the event on an emergency. We have included the odour management plan as part of the permit.

To verify the effectiveness of the odour management systems in place at Esholt Sludge Treatment Facility, we have requested that the operator carry out a review of the abatement plant on site, to determine whether the measures have been effective and adequate to prevent and where not possible minimise emissions released to air including; but not limited to odour, NH₃, TVOC and HCl. The required review is included in the permit through improvement condition IC11.

Air/odour abatement systems

The abatement plant at Esholt Sludge Treatment Facility consists of seven OCU's. OCU 1 to OCU 4 are existing and all consist of a single stage active carbon adsorption filters, and OCU 5 to OCU 7 are proposed future assets all consisting of a single stage active carbon adsorption filter implemented in line with improvement conditions IC5. These meet the BAT requirements for appropriate techniques.

Odour conclusions

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise odour and to prevent pollution from odour.

Bioaerosols

Site-specific bioaerosols risk assessments (SSBRA) are required where:

- The operational area (including abatement plant) is located within 250 metres of sensitive receptors: or
- Where area or point source emissions may pose a risk to the nearest sensitive receptor's location.

SSBRAs demonstrate that the process and/or abatement measures adequately prevent, or where this is not possible, significantly reduce the risk of bioaerosols release, and that the resulting activity will be unlikely to expose the nearest sensitive receptor to elevated concentrations of bioaerosols.

There are external site operational processes within 250 metres of a sensitive receptor.

We consider it appropriate to insert the bioaerosols monitoring requirements in the permit in accordance with our guidance TGN M9 Environmental monitoring of

bioaerosols at regulated facilities (version 2, July 2018). The operator is required to comply with the new monitoring requirements from the date of permit issue.

The operator submitted a SSBRA (Esholt STF Bioaerosol Risk Assessment, V002, dated October 2024) that included sampling and subsequent analysis taken upwind and downwind of the area of the site containing the installation boundary in line with M9 guidance.

We did note exceedances in bioaerosols in sample point 3, 5, and 7 within the bioaerosols risk assessment submitted as part of this application. When questioned about this as part of the schedule 5 response received 05/12/2024, the Operator confirmed that they will monitor bioaerosols in line with permitted requirements. They also said on review of the 2022 data, sample point 3 was outside of the installation boundary and sample point 5 may have been impacted by construction activities. They confirmed that bioaerosols are subject to a continuous monitoring programme and future results will be reviewed and shared with the Environment Agency compliance team.

Improvement conditions

Primary tank/vessel condition

We recognise that many sludge storage and treatment vessels were constructed prior to the current permitting requirements and their design may not be compatible with BAT as described in the relevant BREF documents. The operator provided an inventory of their tanks and described the condition of those assets. Comprehensive evidence was not provided to assess the condition of the tanks and determine whether they are suitable for containing potentially polluting wastes and waste waters. However, as these tanks are already existing and perform an ongoing industrial operation, we have set an improvement condition in the permit to address any potential deficiencies in the existing site's primary containment.

IC7 requires the operator to review (undertaken by an appropriately qualified engineer) the physical condition of the primary containment and establish a program of works to implement any necessary individual measures to ensure that the primary containment is fit for purpose. The Environment Agency will review these submissions with regard to the guidance, *CIRIA C736 Containment systems for the prevention of pollution*.

Stability of whole digestate

The Waste Treatment BREF indicates that to prevent diffuse pollution to air, waste which potentially poses a risk should be stored in enclosed buildings or equipment. Solid digestates, also described as sludge cake are routinely stored externally before being removed from the site. Instead of requiring the sludge cake to be covered and fugitive emissions to be collected and abated we are requiring operators to determine the stability of this material. A digestate or

sludge cake which is unstable will produce fugitive emissions including biogas, odour and ammonia. The operator has not presented evidence of the stability of the externally stored digestates. Stability is defined in the specification for digestate, BSI PAS 110:2014. The standard defines digestate stability as the 'point at which the rate of biological activity has slowed to an acceptably low and consistent level and will not significantly increase under favourable, altered conditions'. The wider water industry does not have reliable data on the stability of the digestate they produce. We have therefore set an improvement condition (IC12) for the operator to produce stability data for their output digestate. This improvement condition applies to all sludge treatment installations and will enable the Environment Agency to gather data to understand the levels of stability across the industry. Where operators produce digestates which have not been stabilised by the AD process, the Environment Agency will require an operator to:

- Improve the stability of the AD process (for example longer residence times)
- Enclose cake storage areas and treat diffuse gas emissions.

Furthermore, this data will feed into future work with the industry in establishing a benchmark to determine stability of the digestate.

The stability of the digestate depends on numerous factors, including type of feedstock, pre-treatment and digestion process and how this is managed in terms of organic load and residence time. For example, shortening residence times will increase the organic load and reduce the degree to which organic matter within the digester is converted to gas. Where this happens the digestate will be more active and capable of further biodegradation.

The method for understanding the stability of the digestate is by determining the residual biogas potential within the digestate. Residual biogas potential can be worked out by using the methodology, OFW004-005 [N6] as outlined within *BSI PAS 110: Producing Quality Anaerobic Digestate or an equivalent methodology for determining digestate stability*. We have not specified a threshold for residual biogas potential. The threshold defined within PAS 110 is part of a published standard operators use for producing an 'end-of-waste' digestate and not necessarily for establishing a definitive assessment of the potential for biogas generation. However, establishing the residual biogas potential will contribute to the operator's understanding of how stable the anaerobic digestion process has been.

This IC will allow the operator to gather evidence and produce an evaluation of their digestate. There are no definitive thresholds for the operator to meet.

Methane slip

We have included improvement condition (IC9) in the permit which requires the operator to assess methane slip resulting from the combustion of biogas via the

CHP engines. Following an assessment of the data, the Environment Agency shall consider whether emission limits for volatile organic compounds are applicable for this installation.

Effectiveness of abatement systems

Existing abatement systems

The installation includes industrial processes which produce waste gas and odour emissions that are discharged to air via vents or stacks. BAT conclusion 14 of the Waste Treatment BREF states that emissions from diffuse sources should use techniques like, *collecting and directing the emissions to an appropriate abatement system via an air extraction system and/or air suction systems close to the emission sources*. This installation includes the storage and treatment of wastes in tanks/vessels and on the cake pad and cake barn. To prevent diffuse emissions of pollutants such as odour, ammonia and VOCs, emissions are extracted and treated by an air abatement system. The abatement technology used at pre-anaerobic digestion comprises of seven carbon adsorption units.

- OCU 1 (A10) extracts and treats air from the sludge screen feed tank.
- OCU 2 (A11) extracts and treats air from the two mixed sludge tanks and two SAS transfer tanks.
- OCU 3 (A12) extracts and treats air from the two THP feed silos, THP hopper and dewatering centrifuge pumping station.
- OCU 4 (A13) extracts and treats air from the four drum thickeners and thickener liquor sump.
- OCU 5 (A15) is a proposed new OCU that extracts and treats air from the screen sludge transfer pumping station.
- OCU 6 (A16) is a proposed new OCU that extracts and treats air from the cake import reception area.
- OCU 7 (A17) is a proposed new OCU that extracts and treats air from the consolidation tank 5.

As part of the determination, we reviewed the operator's abatement plant and its suitability in providing effective abatement to diffuse air emissions. OCU 1, OCU 2 and OCU 3 currently operate as dispersion stacks but the Operator has agreed to reinstate the odour control units. IC4 has been added to the permit to ensure these three OCU's are reinstated within 6 months of the permit being issued. The proposed abatement systems meet the requirements of BAT, as identified in BATc 53 and BATc34, and will monitor emissions in line with BATc 8.

Improvement condition IC5 sets out how we expect the operator to implement an effective abatement system for the new OCU's and for their waste gas emissions.

It involves providing detailed evidence for recommissioning and testing data, and a full explanation of works carried out.

Additionally, to verify whether existing measures have been effective and adequate to prevent and/or minimise emissions released to air, we have set an improvement condition IC11. The improvement condition requires the operator to demonstrate via determining the composition of waste gas emissions, monitoring and additional risk assessment that the existing abatement system effectively treats the emissions to air. Where further improvements are identified, the operator is required to implement these measures. It should be noted that a review of the existing system could determine that the existing systems are not suitable for the waste gas emissions. Should a review identify that a new abatement system is required, the improvement condition indicates that a variation application is needed.

Any new abatement plant should be designed to reduce odours and where required ammonia. For new abatement plant, an operator will need to ensure that new abatement systems achieve the BAT AEL for odour or limits defined by the plant design, whichever is less. The BAT AEL for odour concentration is 1,000 ouE/m^3 . Should the operator seek to install an abatement system which cannot meet this requirement, it is unlikely that the abatement plant will be BAT.

Abatement systems from dispersion stacks

This installation includes the storage and treatment of wastes in the two degassing tanks (emission point A14) and the operator extracts these emissions to air via a dispersion stack. There is no odour abatement system in place to prevent or reduce diffuse emissions. Therefore, the dispersion of the waste gases does not demonstrate compliance with BAT conclusion 14 of the Waste Treatment BREF.

The operator's application did not propose an abatement technique for preventing or reducing emissions from the dispersion stack.

We understand and recognise that this industrial activity is already existing and consider it appropriate, where possible, to bring these activities into up-to-date environmental regulation. The current site waste gas control measures are not in line with BAT. While the operations are a pollution risk, this permit does not introduce new risks to the environment. For these reasons, we consider setting an improvement condition for determining an abatement system after a permit has been granted as a pragmatic approach to ensure operations are brought into regulation and provisions are in place to ensure that appropriate abatement systems will be proposed. Subsequently, improvement condition IC10 sets out how we expect the operator to propose an effective abatement system for their waste gas emissions. It involves selecting abatement technologies which will suitably treat the odorous compounds and waste gases with detailed evidence.

Decision considerations

Confidential information

A claim for commercial or industrial confidentiality has not been made.

The decision was taken in accordance with our guidance on confidentiality.

Identifying confidential information

We have not identified information provided as part of the application that we consider to be confidential.

The decision was taken in accordance with our guidance on confidentiality.

Consultation

The consultation requirements were identified in accordance with the Environmental Permitting (England and Wales) Regulations (2016) and our public participation statement.

The application was publicised on the GOV.UK website. No responses were received.

We consulted the following organisations:

- Director of Public Health & UK Health Security Agency (UKHSA) – response received
- Food Standards Agency (FSA) – no response received
- Health and Safety Executive (HSE) – no response received
- Local Authority – Environmental Health – no response received

The comments and our responses are summarised in the [consultation responses](#) section.

Operator

We are satisfied that the operator is the person who will have control over the operation of the facility after the grant of the permit. The decision was taken in accordance with our guidance on legal operator for environmental permits.

The regulated facility

We considered the extent and nature of the facility at the site in accordance with RGN2 'Understanding the meaning of regulated facility', Appendix 2 of RGN2 'Defining the scope of the installation', Appendix 1 of RGN 2 'Interpretation of Schedule 1', guidance on waste recovery plans and permits.

The operator has provided the grid references for the emission points from the medium combustion plant.

The extent of the facility is defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit.

The site

The operator has provided plans which we consider to be satisfactory.

The plans are included in the permit.

Site condition report

The operator has provided a description of the condition of the site, which we consider is satisfactory. The decision was taken in accordance with our guidance on site condition reports and baseline reporting under the Industrial Emissions Directive.

Nature conservation, landscape, heritage and protected species and habitat designations

We have checked the location of the application to assess if it is within the screening distances we consider relevant for impacts on nature conservation, landscape, heritage and protected species and habitat designations. The application is within our screening distances for these designations.

We have assessed the application and its potential to affect sites of nature conservation, landscape, heritage and protected species and habitat designations identified in the nature conservation screening report as part of the permitting process.

We consider that the application will not affect any site of nature conservation, landscape and heritage, and/or protected species or habitats identified.

We have not consulted Natural England on our Habitats Regulation and SSSI assessments. The HRA stage one was sent to Natural England for information only.

The decision was taken in accordance with our guidance.

Environmental risk

We have reviewed the operator's assessment of the environmental risk from the facility.

The operator's risk assessment is unsatisfactory and required additional Environment Agency assessment.

See the [key issues](#) for more information. We were unable to fully assess all elements of the operators' risk assessment during determination of the application. The sludge treatment activities are existing and have not been previously regulated as an installation. We have set a number of improvement conditions requiring the Operator to submit updated and finalised assessments in a number of areas; including but not limited to the following:

Secondary Containment:

A fully worked up finalised secondary containment assessment in accordance with published guidance, validated and signed off by competent individuals using the methodologies set out in CIRIA C736 and BAT requirements most notably BAT conclusion 19 of the Waste Treatment BREF/BAT conclusions specifically referencing secondary containment.

Enclosure of open processes / tanks:

Improvement conditions have been included in the permit to ensure that any legacy open processes are to be appropriately enclosed and connected to odour abatement. Where biogas is still being produced, a process is to be connected to the gas infrastructure. Where tanks are potentially biologically active (post AD), to determine how these open processes need to be managed, the improvement programme seeks to understand the stability of the produced digestates and residual biogas potential. The results will demonstrate the level of abatement required, and/or optimisation of digester processes. or connection to site gas management infrastructure. Tanks pre-AD will need to be enclosed and if required abated.

Emissions of process wastewater:

The installation activities generate process wastewater. Effluent arises from pre-treatment operations such as sludge dewatering and thickening as well as post-treatment (via anaerobic digestion) where final dewatering occurs using centrifuges. These emissions are discharged to the adjacent WwTW for treatment. However, the emission characteristics have not been characterised through sampling and analysis at the time of the application. BATc 3 is to establish and maintain an inventory of wastewater streams including (from the Waste Treatment BREF/BAT conclusions):

- (i) *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;*

- (ii) *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);*

To ensure that the wastewater streams are fully characterised and an analysis of any pollutants of concern are undertaken, we have included improvement conditions (IC8a, IC8b and IC8c) requiring a sampling programme, analysis, and proposals for any additional measures required to prevent or minimise any significant emissions from the installation along with timescales for implementation. BAT associated emission levels (BAT-AELs) have been applied to the emission points S1, S2 and S3 on the permit. The limits apply if a pollutant of concern is identified in the wastewater characterisation. The emission limits can be found in table S3.3 of the permit.

General operating techniques

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. Where there are measures approaching BAT, we have where appropriate implemented an improvement programme. The improvements set out in table S1.3 must be completed by the times stipulated in that table or the backstop conditions identified in the permit.

We have reviewed the techniques against the Best Available Techniques (BAT) Reference Document for Waste Treatment (BAT conclusions), [Biological waste treatment: appropriate measures for permitted facilities - 1. When appropriate measures apply - Guidance - GOV.UK \(www.gov.uk\)](#) and [Non-hazardous and inert waste: appropriate measures for permitted facilities.](#)

The operating techniques that the operator must use are specified in table S1.2 in the environmental permit.

Operating techniques for emissions that do not screen out as insignificant

Indirect emissions to water

Indirect emissions to water arising from sludge treatment operations cannot be screened out as insignificant due to insufficient information available at the time

of determination of the permit. To establish if any emissions are of significance or may have an impact on the receiving waters, we have included improvement conditions that provide a framework for the operator to carry out sampling, analysis and to submit proposals to prevent or minimise any significant emissions from the installation along with timescales for implementation, with proposals to be implemented as approved. The permit includes the emission limits for substances with BAT associated emission levels (BAT-AEL). The limits apply if the sampling program identifies the listed substances as present in the discharge (emission points S1, S2 and S3). The parameters and limits may be found in table S3.3 of the permit.

The permit conditions enable compliance with relevant BAT reference documents (BREFs) and BAT Conclusions, and Emission Limit Values (ELVs) deliver compliance with BAT-AEL. We consider that the emission limits included in the installation permit reflect the BAT for the sector.

Operating techniques for emissions that screen out as insignificant

Emissions from the existing CHP's and boilers have been screened out as insignificant, and so we agree that the operator's proposed techniques are Best Available Techniques (BAT) for the installation.

We consider that the emission limits included in the installation permit reflect the BAT for the sector.

National Air Pollution Control Programme

We have considered the National Air Pollution Control Programme as required by the National Emissions Ceilings Regulations 2018. By setting emission limit values in line with technical guidance we are minimising emissions to air. This will aid the delivery of national air quality targets. We do not consider that we need to include any additional conditions in this permit.

Odour management

We have reviewed the odour management plan in accordance with our guidance on odour management.

We consider that the odour management plan is satisfactory and we approve this plan.

We have approved the odour management plan as we consider it to be appropriate measures based on information available to us at the current time. The operator should not take our approval of this plan to mean that the measures in the plan are considered to cover every circumstance throughout the life of the permit.

The operator should keep the plans under constant review and revise them annually or if necessary sooner if there have been complaints arising from operations on site or if circumstances change. This is in accordance with our guidance 'Control and monitor emissions for your environmental permit'.

To verify the effectiveness of the odour management systems in place at site, we have requested that the operator carry out a review of the abatement plant on site, to determine whether the measures have been effective and adequate to prevent and where not possible minimise emissions released to air including, but not limited to odour and ammonia. The review is included in the permit in the form of an improvement condition IC11 which is part of the improvement programme detailed in table S1.3.

The plan has been incorporated into the operating techniques S1.2.

Use of conditions other than those from the template

Based on the information in the application, we consider that we need to include conditions other than those in our permit template. See the Key issues section for more details on the bespoke permit conditions we have set in this permit.

Raw materials

We have specified limits and controls on the use of raw materials and fuels.

Waste types

We have specified the permitted waste types, descriptions and quantities, which can be accepted at the regulated facility.

We are satisfied that the operator can accept these wastes for the following reasons:

- they are suitable for the proposed activities
- the proposed infrastructure is appropriate; and
- the environmental risk assessment is acceptable.

Improvement programme

Based on the information on the application, we consider that we need to include an improvement programme. See the Key issues section for more details on the bespoke permit conditions we have set in this permit.

Emission Limits

Emission Limit Values (ELVs) and equivalent parameters or technical measures based on Best Available Techniques (BAT) have been added for emissions to air and indirect discharges of waste water to surface waters.

Emission limit values are derived from:

- Waste Treatment BREF for BAT associated emission limits.
- Schedule 25A of the Environmental Permitting (England and Wales) (Amendment) Regulations 2018.

Emissions to air

Odour abatement system

There are discharges of emissions to air from the odour control units (channelled emissions to air from abatement plant) and combustion appliances (combined heat and power plants and boiler). The odour control plant discharges emissions to the air via a stack. BAT requires that BAT-AELs be applied when biological treatment of waste, or the treatment of water based liquid waste is carried out. The dewatering and thickening of received sludge prior to AD are classed as the treatment of water based liquid waste, and the AD is a biological process therefore the limits are included in the permit.

- 20 mg/Nm³ for Ammonia (NH₃)
- 5 mg/Nm³ for Hydrogen Chloride
- 20 mg/Nm³ for Total Volatile organic compounds

The Waste Treatment BREF provides examples of wastes that would be considered as water-based liquid wastes. These include wastes under the category '19 08 wastes from wastewater treatment plants not otherwise specified' as there are channelled emissions of odorous air from the treatment of these wastes, we have included BAT-AELs of 5 mg/Nm³ Hydrogen Chloride (HCL) and 20 mg/Nm³ of Total Volatile Organic Compounds (TVOC). It should be noted that the limits for HCL and TVOC only apply when the substances of concern are identified in the waste gas streams characterised in BAT conclusion 3. Improvement condition IC11 requires full investigation and characterisation of waste gas streams within 6 months of issue of the permit. A full characterisation of waste gas streams was not available at the time of submission of the application.

Combustion sources:

Biogas is produced as a result of the AD process. Combustion of the produced biogas takes place in four CHP engines and two boilers. The engine produces heat and electricity that may be used to power on site processes while the boilers

provide additional heat to the AD processes. Combustion of biogas discharges pollutants to the air via stacks and exhausts. We have therefore applied emission limits to the four CHP engines and two boilers for the following substances;

- Nitrogen oxides
- Sulphur dioxide
- Carbon monoxide
- Total VOC's

For further detail of emission limits, refer to table S3.1 of the permit.

Emissions to water

There are no emissions of waste waters direct to a receiving water body. The operator will discharge waste waters to the waste water treatment works prior to discharge to the River Aire. The Waste Treatment BREF specifies BAT AELs for indirect emissions to a water body. Where non-hazardous wastes are imported for storage, blending or treatment prior to discharge into the wastewater treatment works, the permitted waste operation ceases once the waste is mixed with the waste waters in the WwTW. BAT AELs or emission limits will be applied to the discharge into the wastewater treatment works for substances of concern.

The BAT AELs are appropriate for the activity defined under the BREF as 'Treatment of water-based liquid waste'. The BREF provides examples of wastes that would be considered as water-based liquid wastes. These include wastes under the category '19 08 wastes from waste water treatment plants not otherwise specified'. The treatment of this waste including heat treatment (thermal hydrolysis), dewatering, and thickening treatment through the AD and the subsequent discharge to the waste water treatment works will be subject to the BAT AELs specified within BAT conclusion 20 (Table 6.2 of the Waste Treatment BREF).

As outlined within the Key issues section, *Indirect emissions of waste water*, the operator did not provide a composition of the waste water (in line with BAT conclusion 3), therefore, all BAT AELs have been applied. We have set improvement condition (IC8a) for the operator to determine the composition of the waste in a waste inventory. The limits will only apply when the substance concerned is identified as relevant in the waste water inventory.

Until the operator has completed IC8a the permit specifies limits for:

- Hydrocarbon oil index (HOI) (mg/l).
- Free cyanide (CN⁻) (mg/l).
- Adsorbable organically bound halogens (AOX) (mg/l).
- Metals and metalloids; arsenic (expressed as As), cadmium (expressed as Cd), chromium (expressed as Cr), hexavalent chromium (expressed as

Cr(VI)), copper (expressed as Cu), lead (expressed as Pb), nickel (expressed as Ni), mercury (expressed as Hg), zinc (expressed as Zn) ($\mu\text{g/l}$).

Monitoring

We have decided that monitoring should be carried out for the parameters listed in the permit, using the methods detailed and to the frequencies specified.

These monitoring requirements have been included in order to comply with the Waste Treatment BAT conclusions. We made these decisions in accordance with Waste Treatment BAT conclusions.

Based on the information in the application we are satisfied that the operator's techniques, personnel and equipment have either MCERTS certification or MCERTS accreditation as appropriate.

Reporting

We have specified reporting in the permit. We made these decisions in accordance with the Waste Treatment BAT conclusions.

Management System

We are not aware of any reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.

The decision was taken in accordance with the guidance on operator competence and how to develop a management system for environmental permits.

A full review of the management system is undertaken during compliance checks.

Technical Competence

Technical competence is required for activities permitted. The operator is a member of the CIWM/WAMITAB scheme. We are satisfied that the operator is technically competent.

Previous performance

We have assessed operator competence. There is no known reason to consider the operator will not comply with the permit conditions.

We have checked our systems to ensure that all relevant convictions have been declared.

Relevant convictions were found and declared in the application. We considered relevant convictions as part of the determination process.

Financial competence

There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.

Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit.

Paragraph 1.3 of the guidance says:

‘The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation’.

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Consultation Responses

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section:

Response received from UK Health Security Agency 21/11/2024.

Brief summary of issues raised:

UKHSA has no significant concerns regarding the risk to the health of the population from the installation.

1. Within the odour assessment it is noted that a “significant number of odour complaints have been received in the past”. It is recommended in the report that these complaints require investigation for confirm if the sewage treatment facility contributes to these complaints or if there is another source.
2. Following the bioaerosol risk assessment further monitoring and assessment was required, along with on-going monitoring as part of the permit conditions.
3. A number of odour control units are not operational and are planned to be re-instated.
4. Future monitoring of effluent discharge and secondary containment plans will require implementation.
5. Pests and vermin have not been considered in the application therefore this should be followed up.

Summary of actions taken:

1. This Industrial Emissions Directive (IED) permit seeks to achieve a high level of protection for the environment. The sludge treatment facility will be operated under an Installations permit with conditions based around the use of best available techniques (BAT), which will lead to a higher level of environmental protection, including improvements to odour from the site. Improvement conditions IC4 and IC5 are included to cover and enclose open tanks on sites which will reduce odour. Also, improvement condition IC4 ensures the implementation and re-instatement of the odour control

units on site, and improvement condition IC11 will review the effectiveness of the abatement plant, which will lead to improvements from odour from the site. We are satisfied with the Esholt Sludge Treatment Facility Odour Management Plan, V004, December 2024 which is also referenced in table S1.2 of the permit. Any future odour problems will be investigated by the compliance team and appropriate action taken as necessary.

2. Table S3.5 within the permit will ensure ambient bioaerosol monitoring requirements are carried out at this site.
3. Improvement condition IC4 ensures the implementation and re-instatement of the odour control units on site. Further to this improvement condition IC11 will review the effectiveness of the abatement plant, this will ensure that the odour control units are fit for purpose.
4. Improvement condition IC3 is for the final secondary containment design and improvement condition IC8 is for establishing an inventory (monitoring) of liquid waste water discharged from the anaerobic digestion and associated activities. These two improvement conditions will ensure that these requirements are fulfilled.
5. Pest and vermin are not a big concern from sewage sludge facilities as there are no relevant waste sources. Improvement conditions IC4 and IC5 are included to cover and enclose open tanks on sites, which will keep the waste covered and contained to prevent risks from pest and vermin.

No other responses were received to our consultation exercise.