Sludge Treatment Centre Permitting

Environmental Permit Variation Application - Riverside Sludge Treatment Centre

Resubmission

TW_STC_EPR_16a_RVE_ASD | Resubmission

December 2023

Thames Water

EPR/GB3739DY/V003

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Project No:	B22849AM
Document Title:	Environmental Permit Variation Application - Riverside Sludge Treatment Centre Resubmission
Document No.:	TW_STC_EPR_16a_RVE_ASD
Revision:	Resubmission Draft
Document Status:	<DocSuitability>
Date:	December 2023
Client Name:	Thames Water
Client No:	EPR/GB3739DY/V003
Project Manager:	Harindra Gunasinghe
Author:	James Killick
File Name:	TW_STC_EPR_16a_RVE_ASD

Jacobs U.K. Limited

7th Floor, 2 Colmore Square
38 Colmore Circus, Queensway
Birmingham, B4 6BN
United Kingdom
T +44 (0)121 237 4000

www.jacobs.com

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
Draft	Nov 21	Draft for review	JK	MKM	MKM	DF
Draft v2	17 Dec 21	Updated following comments and additional information	JK	MKM	MKM	MKM
Final	23 Dec 21	Final for issue	JK	MKM	MKM	MKM
Resubmission draft	04/12/2023	Updated application for resubmission.	JK			

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Introduction

This substantial variation application relates to a biological treatment permit for the Riverside Sludge Treatment Centre (STC), located at the Riverside Sewage Treatment Works (STW), operated by Thames Water Utilities Limited (Thames Water). It is being made due to sludge treatment operations within sewage treatment works requiring a suitable Environmental Permit under the Environmental Permitting Regulations 2016 (as amended), in order to comply with the requirements of the Industrial Emissions Directive.

Previously, sewage treatment sites operated by sewerage undertakers treating indigenous sewage sludges ('sludge') separated from the main urban waste water treatment stream at the site along with the importation of similar wastes such as cess wastes and interworks sludge and cake transfers, were regulated under the Urban Waste Water Treatment Directive (UWWTD) and Environmental Permitting Regulations as exempt or waste management activities, although some works had parts of the process, specifically biogas utilisation covered by the Environmental Permitting regime.

Now, all aspects of the sludge treatment process at the site, from the blending of separated sludge from the main aerobic treatment flow with imported waste of a similar nature to indigenous sludge, thickening of sludge, , sludge pre-treatment, anaerobic digestion of sludge, through to the storage of digested sludge cake prior to recovery to land offsite, including biogas storage and utilisation will fall within the scope of this permit variation application.

The previous permit in place at the site, EPR/ GB3739DY/V002, for the operation of biogas engines will be merged and remain in place as a directly associated activity to this listed process. This application is for the purposes of varying the existing permitted activities to include the anaerobic digestion process as an installation activity.

A number of other sewage treatment related activities are undertaken at the site, outside of the scope of this permit, relating to the treatment of waste waters from the sewer network through aerobic processes. These activities are covered by the UWWTD.

Non-Technical Summary

This variation application is for a bespoke installation permit for the biological treatment of sludge by anaerobic digestion, with a capacity above the relevant thresholds. The biological treatment of sludge includes treatment of the indigenous sewage sludge and Surplus Activated Sludge (SAS) from the onsite aerobic treatment process, the treatment of imported sewage sludges from other sites arriving by road, and the treatment of imported sewage sludges arriving from the Beckon sludge main to a dedicated sludge import point. The indigenous sewage sludges are generated from the aerobic treatment of waste waters from the sewer network arriving into the site at the works inlet.

The operation of biogas fuelled Combined Heat and Power (CHP) Engines and dual fuelled boilers for the generation of electricity, heat and steam at the site, (which are classified as 'existing' combustion sources under the Medium Combustion Plant Directive), although already permitted will be classified as a directly associated activities to this main listed activity.

The STC is located within the Riverside STW, west of Rainham in the London Borough of Havering between the A13 road and a railway line.

The STC treats both indigenous sludge and import sludges. Indigenous sludge is generated from the incoming flow to the STW which passes through the aerobic treatment process under the UWWTD. Indigenous sludge from the Sludge Buffer Tanks is pumped via Sludge Screens to the Sludge Blending Tanks.

Imports of sludge from other works are delivered to a sludge offloading point into the Sludge Buffer Tanks from tankers. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance. Indigenous sludge and imported sludge combine in the Sludge Buffer Tanks and are then pumped to

the Sludge Blending Tanks. From the Sludge Buffer Tanks, sludges can also be pumped to the Sludge Holding Tank, as required.

Beckton Sludge Imports are pumped to the Sludge Blending Tanks, where they combine with the indigenous and imported sludge. Blended sludge is then subject to dewatering in the Pre-THP Dewatering Plant, with liquors being returned via the Liquor Return Tank and Return Liquor Pumping Station to the Works Inlet for treatment via the aerobic process. Dewatered sludge is pumped to the THP Feed Silos.

Thickened sludge is stored within THP Feed Silos before being pumped to the Thermal Hydrolysis Plant (THP) Process which is a pre-treatment stage prior to digestion. Anaerobic digestion takes place within one of four aboveground concrete Primary Digester Tanks.

Following treatment over an appropriate number of days with the Primary Digester Tanks, sludge is transferred to one of the two Digested Sludge Dewatering Buffer Tanks. Digested sludge is transferred to Sludge Dewatering Presses where the digested sludge is dewatered using belt presses before it is transferred to the enclosed Cake Barn for storage prior to removal from site under the Sludge Use in Agriculture Regulations 1989 (SUiAR), and in accordance with the Biosolids Assurance Scheme (BAS). Liquor from the dewatering plant is returned via the Liquor Return Tank and Return Liquor Pumping Station for further treatment via the aerobic process.

This application includes the import of Undigested Sludge Cake from other works imported to the Cake Barn for rewetting using the Mobile Cake Rewetting Plant followed by biological treatment. Following rewetting with final effluent, the sludge is pumped to the Sludge Blending Tank and mixes with other sludges before being dewatered with the Pre-THP Dewatering Plant.

Biogas from the Primary Digester Tanks is captured and transferred to one of two double membrane Biogas Storage holders. The biogas transfer pipeline is equipped with condensate pots that capture entrained moisture from the generated biogas and allow it to be drained into the site drainage system for treatment. The Biogas Storage holders and Primary Digester Tanks are fitted with pressure release valves (PRVs) as a safety precaution in the event of over pressurising of the system.

The biogas is taken from the Biogas Storage for combustion in CHP Engines, generating electricity for use both within the site and for export to the grid, and heat (to raise steam) for the THP process. These are classified as an 'existing' combustion plant under the Medium Combustion Plant Directive. In the event that additional steam is required for the THP process, biogas or natural gas may be used in the onsite dual-fuelled heat recovery boilers to provide heat to the THP plant. In the event there is excess biogas, i.e. more than the CHP Engines or boilers can utilise, or in the event that the CHP Engines are unavailable, there is one ground mounted Emergency Flare. The flare is utilised under 10% of the year or less than 876 hours per year. The CHP Engines and heat recovery boilers are currently operated under an Environmental Permit which will be merged with this permit.

This application includes a waste activity for the import of treated sludge cake from other works, for temporary storage within the Cake Barn, pending offsite recovery. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS.

Imported treated sludge cake is offloaded into an area within the Cake Barn, so as to be stored separately to indigenous sludge cake. The waste stream is the same as that arising from the treatment of sludge within the Riverside STC with the same characteristics, composition and eventual end use – application to land. As such, the infrastructure which is acceptable for use for site cake is appropriate for the imported material. Cake is stored on an impermeable engineered surface within the cake barn, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

There are also two emergency generators at Riverside STW that are now both used for emergency only and regular testing (i.e. are not DAAs).

Technical Description

This is a substantial variation for a bespoke installation permit under the Environmental Permitting (England and Wales) Regulations 2016 (as amended), following a change of interpretation of the Urban Waste Water Treatment Directive by the Environment Agency. It relates to a biological waste treatment permit for the Riverside STC, located at the Riverside STW, operated by Thames Water.

Scope

The variation application covers the biological treatment of sewage sludge, both indigenous and imported from other waste water treatment sites by anaerobic digestion, with a capacity above the relevant thresholds. There are a number of directly associated activities, including the operation of combustion plant for the generation of electricity and heat at the site, which is classified as an 'existing' combustion source under the Medium Combustion Plant Directive (MCPD).

The combustion plant, consisting of three biogas CHP Engines and three dual fuelled heat recovery boilers are covered by an existing environmental permit under number EPR/GB3739DY/V002. This permit is subject to a substantial variation to convert it to an installation permit with the CHP Engines and heat recovery boilers becoming a Directly Associated Activity (DAA) to the listed activity. An additional waste activity, the import of treated sludge cake is also added to the permit by this variation.

Site Location

The Riverside STC is located at Riverside STW, to the north of the River Thames near to the town of Rainham within the London Borough of Havering. The site is located within an industrial area, bounded by a railway line to the north and the A13 to the south. To the west and east are industrial/commercial estates including a number of large-scale warehouses, logistic operations and waste operations (including commercial physical treatment and transfer station sites). There are also residential properties close to the site entrance. Rainham Creek flows from the north to the south, into the River Ingrebourne, approximately 40m away from the STW boundary and a drainage ditch can be found to the north and west of the site.

Riverside STW is in close proximity to a number of designated habitats. There is a designated Marine Protection Area (MPA) within 10 km of the site. This is the Swanscombe Marine Conservation Zone located approximately 9.2 km south east of the site. There are also a number of Sites of Special Scientific Interest (SSSIs) and Local Nature Reserves (LNRs) within 2 km of Riverside STW. Inner Thames Marshes and Ingrebourne Marshes are SSSI located 350 m south east and 470 m north east, respectively. Rainham Marshes, Ingrebourne Valley and Beam Valley are LNRs located 435 m south east, 830 m north east and 1350 m north west of the site, respectively. There are no Ramsar, Special Areas of Conservation (SAC) or Special Protection Area (SPA) designated sites within 10 km of Riverside STW, and no NNRs located within 2 km. There are 15 non-designated, local wildlife sites (LWS) within 2 km of the site and no areas of Ancient Woodland within 2 km of the site.

The STW site and STC is within a Flood Zone 3 area that benefits from flood defences. This means that the STC would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year. Riverside STW is located within an Air Quality Management Area (AQMA) which has been declared for Nitrogen dioxide NO_2 - Annual Mean and Particulate Matter PM10 - 24-Hour Mean AQMA by the London Borough of Havering. This is the Havering AQMA an area encompassing the entire London Borough of Havering.

A site plan, showing the permitted area of the STC and the wider STW can be found in Appendix A.2 while a Process Flow Diagram summarising the sludge treatment process can be found in Appendix A.5. A site tank inventory is included below, followed by the site process description which identifies where tanks are located within the sludge treatment process.

Site tank inventory

Tank Purpose	Number	Operational Volume (m^3)	Total Operational Volume (m^3)	Construction
Sludge Blending Tank	2	745	1,490	Steel
Primary Digester Tanks	4	4,863	19,450	Steel
Digested Sludge Dewatering Buffer Tanks	2	166	332	Steel
Liquor Return Tank	1	54	54	Concrete
Sludge Buffer Tanks	2	1,700	3,400	Concrete
Sludge Holding Tank	1	3,173	3,173	Concrete
THP Feed Silos	2	25	50	Steel
THP Streams	2	Consisting of the following		
THP Pulper Tank	2	34	68	Steel
THP Reactor Tank	8	13	104	Steel
THP Flash Tank	2	42	84	Steel
Centrifuge polymer silo	1	25		Steel
Digested sludge polymer silo	1	25		Steel
Anti-foam silo	1	38 m3		Plastic
Ferric Chloride tank	2	35 m3		Plastic

Waste Activities

The STC comprises of imports of waste for biological treatment and one additional waste activity (import of non-hazardous waste to the cake barn). Biological treatment processes at the installation are for indigenous sludge separated from the UWWTD areas of the site and for treatment processes for imported sludge that arrives at Riverside STC by tanker and consists of sludge from other Thames Water sites and via a subsurface rising sludge main.

Import of non-hazardous waste is considered a secondary waste operation to the main listed activity. Imports to the cake barns are for temporary storage, pending recovery offsite; and are a contingency option primarily that will not be routinely used.

Co-settled indigenous sludge is removed from the Primary Settlement Tanks of the UWWTD permitted area of the STW, and is passed to the Sludge Buffer Tanks. The Sludge Buffer Tanks are of concrete construction, covered, subject to odour control and mostly below ground. Sludge is pumped from the Sludge Buffer Tanks, via Sludge Screens to the Sludge Blending Tanks and mixes with incoming sludges from offsite sources. In the event of excess sludge in the Sludge Buffer Tanks, sludge will be diverted to the Sludge Holding Tank which is an aboveground concrete tank that is covered. The tank is fitted with mixer pumps to prevent settling of the sludge and is subject to odour control. Pumps transfer sludge from the Sludge Holding Tank to the Sludge Blending Tanks, via Sludge Screens.

Riverside STC also receives thickened, blended sludge for biological treatment from offsite sources, via the Beckon sludge main.

Imports

Sludge from Beckton in the two sludge rising mains join at Riverside STC, and are split evenly between the two Sludge Blending Tanks. Flow meters at either end of the sludge line measures the volume of sludge received by Riverside STC. The two Sludge Blending Tanks are of steel construction on a concrete base, are covered and connected to an Odour Control Unit (OCU) for odour abatement. Sludge enters in at the top of the tanks and is removed from near to the bottom of each tank. The tanks are fitted with mixer circulation pumps to prevent settling of the sludge and the tanks are connected to the site drainage in the event of being overfilled.

There is an import point at Riverside STC for permitted imports of sludge from other sites. Sludge is also imported to a Sludge Import Point near to the Sludge Buffer Tanks. Imported sludge is accepted through a site supplied transfer hose is provided to prevent misconnections. A data logger measures both the transferred volume and records the originating site of the material. Access to the sludge logger is via a key fob that is issued to drivers. Imported sludge is discharged into one of the two Sludge Buffer Tanks where it is mixed with indigenous sludge and is subject to screening, as described above.

This application includes the import of Undigested sludge cake from other works for treatment at Riverside STC initially for rewetting using Mobile Cake Rewetting Plant, followed by biological treatment. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import. The undigested sludge cake is delivered to the Cake Barn, is discharged onto the impermeable floor and processed immediately. The undigested sludge cake is loaded into the cake hopper of the Mobile Cake Rewetting Plant for processing, is re-wet using final effluent, before it is pumped to the Sludge Blending Tank where it mixes with other sludges. The sludge is then subject to dewatering within the the Pre-THP Dewatering Plant. The waste stream is the same as undigested sludges arising from Riverside STC with the same characteristics.

This application includes a waste operation at the same site is for the import of non-hazardous treated dewatered sludge cake from other works for temporary storage pending transfer offsite. All such imports will be subject to appropriate waste pre-acceptance and acceptance checks, prior to import, including checking whether the incoming cake complies with the requirements of SUiAR and BAS. The waste stream is the same as that arising from the treatment of sludge within the Riverside STC with the same characteristics, composition and eventual end use – application to land. As such, the infrastructure which is acceptable for use for site cake is appropriate for the imported material.

Cake is stored within the enclosed Cake Barn on an impermeable surfaced, for the shortest time practicable, the duration depending on factors such as prevailing weather and availability of the landbank.

Sludge Processes

Sludge is removed from the two Sludge Blending Tanks by dedicated feed pumps which transfer the sludge via a subsurface pipeline, to the Pre-THP Dewatering Plant that are located within the dewatering building. There are seven centrifuges which are each serviced by a dedicated centrifuge feed pump. A powder polymer from a silo is made up using final effluent / potable water and the stock polymer is stored within a day tank before it is dosed into each centrifuge to aid coagulation of the sludge. The dewatered sludge falls into a common line where a screw conveyor transfers the thickened sludge to one of two Thermal Hydrolysis Plant (THP) Feed Silos. Liquor from the Pre-THP Dewatering Plant gravitates to an external Liquor Return Tank outside of the dewatering building. This Liquor Return Tank is of concrete construction, covered and connected to an OCU for odour abatement with a subsurface element. Liquor is returned to the Works Inlet for further treatment via the UWWTD route. The Pre-THP Dewatering Plant is subject to odour abatement via an OCU.

Thermal Hydrolysis Plant

The THP Feed Silos are aboveground tanks of steel construction, which are covered and connected to an OCU for odour abatement. Sludge is subject to re-wetting on extraction from the THP Feed Silos and two sets of pumps transfer the sludge into one the THP streams via an aboveground sludge line within a pipe-bridge, with each THP Feed Silo dedicated to a single THP stream. Level controls within the THP Feed Silos prevent the overfilling of the tanks by inhibiting the upstream dewatering pumps in the event of a high-level alarm.

The THP Process uses the application of temperature and pressure to enhance the digestion of the sludge which enhances the availability of biogas within the digestion process. At Riverside STC, the THP Process operates 24/7 using approximately 6 bar of pressure and a temperature of approximately 165° C for approximately 30 minutes. This process also sterilises the sludge, destroying pathogens in the sludge so it exceeds the requirements for subsequent use in agriculture. The THP Process is entirely aboveground, of steel construction, located within a bunded area of engineered concrete that is connected to the site drainage. The THP Process is monitored by the site Supervisory Control and Data Acquisition (SCADA) equipment.

The THP Process is a batch process with the two streams operating in parallel. The first stage is for a fresh batch of sludge to be pumped to the THP Pulper Tank where it is mixed with warmer sludge by an external recirculation pump and warmed by steam recovery from the Reactor Tanks. Level controls within each Pulper Tank inhibit the transfer pumps to prevent overfilling of a tank. When a THP Reactor Tank is ready to receive sludge, the required volume is pumped from the Pulper to the duty Reactor Tank for treatment and the cycle commences. Once filled with sludge, the reactor is filled with steam until the required pressure and temperature is reached in order to hydrolyse the sludge and held for the appropriate duration of time. Once the hydrolysis has been completed, a valve is opened to gradually reduce the pressure, with the steam released to the Pulper Tank for pre-heating of another batch of sludge. The sludge is then discharged via a second valve in the base of the tank into the Flash Tank where any excess steam is vented back to the Pulper Tank.

The sludge is transferred onwards to the THP Coolers to lower the temperature to be more optimal for anaerobic digestion. The THP Flash Tank provides a thermal buffer to release excess energy from the sludge prior to it entering downstream processes. Tanks are fitted with high-level floats to prevent overfilling and PRVs to prevent over-pressurisation of the vessels, which are linked to the site SCADA system, amongst other monitoring and safety features. THP Process Gas Coolers are also used to further cool the sludge prior to it being pumped to the downstream processes.

Digestion Processes

Sludge is then pumped to the Primary Digester Tanks by one of three digester feed pumps. The two THP streams feed dedicated digester tanks, with THP stream A feeding two Primary Digester Tanks and THP stream B feeding the other two Primary Digester Tanks. There are four Primary Digester Tanks at Riverside STC, which are all of the same concrete construction, with fixed roofs and are mostly aboveground except for a small subsurface extent which is conical in shape. Each of the Primary Digester Tanks is fitted with mixer pumps to prevent settling of the sludge and Pressure and Vacuum Relief Valves (PVRVs) that would operate in an emergency. Each digester operates on a continuous basis with the normal retention time being approximately 12 days. Fresh hydrolysed sludge is introduced by the feed pumps depending on the levels within the digester, which is monitored by levels

connected to the site SCADA system. Digested sludge gravitates out of each tank via a limpet chamber to a subsurface sludge line to the two Digested Sludge Dewatering Buffer Tanks (DSDBTs). Anti-foam and Ferric Chloride is dosed in as required via the sludge recirculation lines. There is no additional heat input to the Primary Digester Tanks at Riverside, instead the Primary Digester Tanks are kept at the optimal temperature via a re-circulation loop of the incoming warm hydrolysed sludge which under normal operations requires cooling to maintain the optimal temperature for anaerobic digestion. Biogas generated within the digestion process, largely methane, rises through the digester and is captured and transferred via a mostly aboveground common line into one of the two double membrane Biogas Storage holders which are located between the Primary Digester Tanks.

Ferric chloride is dosed into the Primary Digester Tanks from one of two ferric chloride tanks on the site. Ferric chloride is automatically dosed into the top of each digester, as required, to control H_2S within the biogas which is subsequently combusted on site. The ferric chloride tanks are suitable bunded and the delivery areas are fitted with penstock valves.

Sludge gravitates to the two DSDBTs located at the site. Digested sludge rises from a subsurface line and enters into each DSDBT near to the top of the tank, which is of steel construction and situated on a concreate base. The tanks are enclosed and connected to an OCU for odour abatement with air mixing to prevent settling of the sludge.

Cake Storage

Fully digested sludge is then pumped via a subsurface sludge line from the DSDBT and into the dewatering building where the digested sludge is dewatered by Sludge Dewatering Presses.

Each of the Sludge Dewatering Presses is serviced by a dedicated feed pump. A powder polymer coagulant, stored in a bulk silo, is automatically made up using final effluent / potable water and stored within a storage tank before it is dosed into each belt press by dedicated polymer feed pumps. Liquor from each Sludge Dewatering Press joins the liquor generated from the Pre-THP Dewatering Plant (located within the same building) in a common line that drains to the external Liquor Return Tank before it is returned to the inlet for further treatment via the UWWTD route without any additional form of liquor treatment. Digested sludge cake is deposited into the Cake Barn below. The Sludge Dewatering Presses are odour abated via an OCU and fitted with sensors that would inhibit the feed pumps if a blockage was identified.

Digested sludge cake falls onto the floor of the cake barn into one of five bays. The cake barn is fully enclosed with solid concrete floors and solid concrete internal walls. Digested sludge cake is subject to removal from site under the SUiAR and in accordance with BAS. If the digested sludge cake is not suitable for application immediately, remedial actions are undertaken which includes isolation for an increased amount of time. Due to the THP process at Riverside, non-compliant sludge is not a common occurrence. As the cake barn is totally enclosed there is a low risk from bioaerosols from stored digested sludge cake although there are sensitive receptors within 250 m of the cake barn. A site-specific bioaerosol risk assessment for the STC is provided as Appendix F.

Biogas

Biogas from the Primary Digester Tanks is captured and transferred via a common biogas line that is predominantly aboveground to the two double membrane Biogas Storage holders at Riverside STC. Each Biogas Storage holder is equipped with emergency PRVs, leak detection and slam shut valves. Each Biogas Storage holder has a dual membrane with an inner and outer bag that is fitted with biogas detection systems which monitors for methane leaks. The area surrounding the two Biogas Storage holders is classified as a potentially explosive atmosphere, fenced off for security, provided with lightning protection and there are strict management provisions on the control of potential ignition sources. When the levels of biogas within the Biogas Storage holder reaches a high setpoint, biogas is automatically diverted to an emergency flare.

The aboveground biogas transfer pipeline is equipped with condensate pots that removes entrained moisture from the generated biogas and allows it to be automatically drained to the site drainage system and returned to the Works Inlet for treatment. This improves the quality of the biogas and reduces impurities that could reduce the

efficiency of the CHP Engines. Biogas passes through biogas boosters that increase the pressure of the biogas to the CHP Engines, boilers and emergency flares.

Two carbon-based siloxane filters are located upstream of the CHP Engines on the biogas line and operate in duty/standby to remove impurities from the biogas prior to combustion in the CHP Engines. Use of carbon-based siloxane filters reduces incidence of operational issues for the CHP Engines.

The site has three biogas CHP Engines located within the CHP building which combust biogas. The CHP Engines operate on biogas and under normal conditions will have one CHP Engine operating as the duty engine with one engine as back-up and the third engine offline. The three CHP Engines are all Cummins C2000 M5C V18 engines with a thermal input of 5.1 MWth, generating electricity for the wider STW or export to the National Grid when there is excess electricity being generated. This is classified as 'existing' combustion plant under the Medium Combustion Plant Directive and permitted by the existing Riverside CHP Plant and Standby Diesel Generator Environmental Permit (EPR/GB3739DY/V002). Emissions from the three CHP Engines are emitted via three 19 m tall stacks, which are shared with a boiler. The CHP Engines also generate recoverable heat which is used by the dual fuelled heat recovery boilers that are also located within the CHP building to supplement steam raising for the THP process. There is a crossover between the CHP Engines and boilers, with CHP Engine number 1 and Boiler number 1 linked, CHP Engine number 2 and Boiler number 2 linked and CHP Engine number 3 and Boiler number 3 linked. The heat recovery boilers are dual fuelled and supply steam to the THP process. The heat recovery boilers are all 3.3 MWth Wellman Robey ULS 1E models with combustion gases emitted via the same 19 m stack, that is shared with a CHP Engine. Under normal conditions a maximum of two boilers will be in operation with the third boiler offline. In the event there is excess biogas, i.e. more than the CHP Engines or boilers can utilise, or in the event that the CHP Engines or boilers are unavailable, there is a ground mounted emergency flare which is used during periods of essential maintenance and emergency use. This is utilised under 10% of the year, less than 876 hours per year and operational hours are recorded.

Emergency Standby Generators

The STW has two emergency generators both of 5.92MWth each, which are in immediate geographic proximity to each other and where the 2024/25 MCPD permitting/compliance date applies. The first is already permitted by the existing Environmental Permit (EPR/GB3739DY/V002). Since 1/3/2023 this is now operated solely as an excluded generator for less than 50 hours per annum for activities such as maintenance testing. The second emergency standby generator is not currently permitted and identical to the first in all respects (size/running mode). Neither emergency standby generator is a Directly Associated Activity to the STC as neither meets the criteria under Guidance '*RG2 Understanding the meaning of regulated facility*'. As of December 2023, Generator 2 is subject to advice under the enhanced pre-application service to confirm the best approach to permitting.

BAT Considerations

A BAT gap analysis has been completed for the STC against the associated BAT conclusions and this gap analysis is attached as Appendix D.

2.1 BAT 3; 6; 7: Return Liquors

The Riverside STC does not have a liquor treatment plant. Liquor treatment for waste waters arising within the permitted area is part of the urban waste water treatment process of the STW and does not fall within the permit boundary.

There are no direct emissions to water from the STC. The only indirect emissions are of the sludge related liquors, primarily sludge dewatering liquor, and surface (rain) waters, which are returned to the wastewater treatment works for aerobic treatment under Urban Wastewater Treatment Regulations.

Return Liquor Monitoring is included in Appendix M.

2.2 Management of Diffuse Emissions – BAT 14

Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the potential need to cover open topped tanks. Thames is not able to commit to covering tanks by the stated deadline of December 2024 delivery timescales will be subject to the outcome of PR24 and subsequent price review discussions.

2. 3 Site Infrastructure

Management of emissions to water – BAT 19

Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the detailed design for Riverside secondary containment, the secondary containment options report (see Appendix G) is an outline solution that may be subject to change. Thames is not able to commit to secondary containment requirements by the stated deadline of December 2024, delivery timescales will be subject to the outcome of PR24 and subsequent price review discussions.

A figure showing the current site surfacing within the permit boundary is included within Appendix A, Figure A.3.

Process Controls

Anaerobic digestor operations are monitored automatically from the control centre at the site. Checks include digester health, temperature and operation, including for the presence of foaming, which is treated with anti-foam as appropriate. As described, tanks are equipped with appropriate high-level alarms and automatic cut off valves to minimise releases. The Primary Digester Tanks and Biogas Storage holders are also fitted with dual pressure relief valves which operate in an emergency to minimise releases from over- or under-pressurisation. Site operations are covered by Thames Water's management system, including the preventative maintenance programme for the site.

A range of process parameters are subject to routine monitoring or checking to ensure that the digestion process is operating optimally so that the required sewage cake output quality is achieved.

- pH: At a THP digestion site such as Riverside the processes is maintained around pH 8 but within the range 7.5-8.6 (this is % dry solids and digester load dependant) for healthy operation.
- alkalinity: Levels dependant on feedstock characteristics (primary sludge: surplus activated sludge (SAS) ratio). Advanced digestion (THP) typically, 5,000 - 10,000mg/litre (target range from 6,000-8,000 mg/litre) but is dependent on % dry solids and digester load.
- temperature: minimum target of 40°C for advanced digestion. This is maintained within the range 36-45°C for THP AD.
- HRT (hydraulic retention time): minimum target is 15-days, there is no upper limit. Retention times shall not be less than 12-days during plant outages to keep the product pathogen kill efficiency control.
- OLR (organic loading rate): see table below - this is dependent on the primary/SAS ratio. Riverside fits into the fourth row of the table.
- Dry solids feed: see table above, Riverside has a target of 10%DS, but this can vary between 8-14%DS and impacts the HRT.

Type of Digestion	0%- 35% SAS[x]	36%- 45% SAS	46%- 50% SAS	51%- 55% SAS	>55% SAS	Max Feed %DS
MAD* in Conventional Digestion	3	2.5	2	1.75	n/a	6

MAD after Pre-pasteurisation	4.5	4	3.5	3	n/a	7
MAD after Acid Hydrolysis	4.5	4	3.5	3	n/a	7
MAD after Thermal Hydrolysis	7	6.5	6	5.5	5.5	14

* mesophilic anaerobic digestion

[X] surplus activated sludge, arising from the UWWTD treatment route.

- VFA (volatile fatty acid) concentration: There is no specific range for VFAs as it depends on the feedstock. It is used as an indicator of digester health rather than a process control. The production of organic acids depends on the volume of solids fed to the digester. The typical range for VFAs in a primary digester is between 50 and 800 mg/L. When VFA concentrations climb above 1000 mg/L, the digester could be overloaded or experiencing other problems.

- Ammonia - Ammonia concentrations of 50 to 1000 mg/L are beneficial, but ammonia levels of 1500 to 3000 mg/L (pH greater than 7.4) could be inhibitory but not always. An ammonia concentration higher than 3000 mg/L for prolonged period is toxic.

- VFA to Alkalinity ratio: Very important parameter to monitor for digestion process. The VFA to alkalinity ratio of below 0.4 is good and above this threshold value means diminishing alkalinity and low pH i.e. sour digester content. As long as this ratio is maintained higher VFA and alkalinity digester content can be acceptable and the digestion process is deemed healthy. Anaerobic digestion process is always controlled based on holistic parameters but not based on single parameter.

Waste Tracking

Because of the nature of the waste accepted at the site for treatment, and the processes undertaken, the location of any specific load of waste cannot be tracked directly within the installation. Instead, tracking, if required, is based on the normal operational periods for treatment, which can locate the approximate location of the imported material with the process, based on the number of days post acceptance.

Cake imports are stored separately in the Cake Barn, and their location can be identified on this basis.

Odour

The facility has an Odour Management Plan which is supplied as Appendix E.

Bioaerosols

Digested sludge cake at Riverside STC is stored in an enclosed cake barn which is within 250 m of the nearest sensitive receptor, where people live or work for more than 6 hours at a time. See Appendix F for the site specific bioaerosol risk assessment.

Other Items

A Leak Detection and Repair (LDAR) Plan has been prepared for the site and this is presented as Appendix H.

Please see Appendix A, A.6 Site Photographs for photographs of key plant infrastructure.

Other Risk Assessments

There is no requirement for a fire prevention plan, due to the nature of the wastes treated at the site and the processes utilised, in accordance with Environment Agency guidance.

2.4 Regulatory Listing

The installation is permitted as a Schedule 1 listed activity under the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

The relevant listing under Schedule 1 is:

Section 5.4 Disposal, recovery or a mix of disposal and recovery of non-hazardous waste

Part A(1) (b); 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 one or more of the following activities, and excluding activities covered by Council Directive 91/271/EEC—

(i) biological treatment;

In addition to the listed activity at the site, there is a directly associated activity of a biogas combustion plant which is also a specified generator (SG), covered by the Medium Combustion Plant Directive (MCPD) under Schedule 25 B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended)

- Imports of waste, including sludge from other sewage treatment works;
- Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;
- Pre-treatment of sewage sludge by Thermal Hydrolysis Process;
- Storage of digestate prior to dewatering;
- Dewatering of digested sewage sludge;
- Transfer of dewatering liquors via site drainage back to the works inlet of the sewage treatment works;
- Transfer of surface water runoff back to the works inlet of the sewage treatment works;
- Storage of dewatered digested sludge cake prior to offsite recovery;
- Storage of biogas;
- Transfer of biogas condensate via site drainage back to the works inlet of the sewage treatment works;
- Combustion of biogas in MCPD and SG compliant biogas CHP Engines and biogas or natural gas in MCPD boiler units;
- Emergency flare;
- Storage and handling of wastes, including waste oils;
- Storage of raw materials; and
- Imported sludge rewetting.

The waste activity at the site is:

- Imports of digested sludge cake for temporary storage pending off-site removal;

In addition to the listed activity at the site, there is a directly associated activity of a biogas combustion plant which is also a specified generator, covered by the Medium Combustion Plant Directive under Schedule 25A and B of the Environmental Permitting (England and Wales) Regulations 2016 (as amended). This comprises:

- 3 x 5.1 MWth CHP Engines; and
- 3 x 3.3 MWth heat recovery boilers

The CHP Engines form the Specified Generator with a total aggregated thermal input 15.3 MWth. The total thermal input of the site is approximately 25.2 MWth however not all of the combustion plant will operate

simultaneously as existing permitted combustion plant operations are limited to the maximum simultaneous operation of two engines and two boilers at any one time.

Form C2 Questions

1 About the permit

1a Discussions before your application

The pre-application process is currently not available due to Environment Agency resourcing issues, discussions have been held with the local area Environment Agency staff. Nature and heritage conservation screening was requested and received via email from the pre-application advice service of the Environment Agency.

1b Permit number

What is the permit number that this application relates to?

EPR/GB3739DY/V002 issued 19/11/2020

1c What is the site name, address, postcode and national grid reference?

Riverside Sludge Treatment Centre

Riverside Sewage Treatment Works

Creekside

Rainham

Essex

RM13 8QS

2 About your proposed changes

2a Type of variation

This is a substantial variation

2b Changes or additions to existing activities

Table C2-1 Proposed changes to current activities.

Name	Installation schedule 1 references	Description of the installation activity	Description of waste operations	Proposed changes document reference
Riverside STC	*Section 5.4 Part A(1) (b); i*	Biological treatment by means of Anaerobic digestion		This document
Riverside CHP Plant			Operation of CHP engines and boilers,	

			now a DAA to installation	

2c Consolidating (combining) or updating existing permits

Yes

2c1 Do you want to have a modern style permit?

Yes

2c2 Identify all the permits you want to consolidate (combine)

EPR/GB3739DY - Riverside CHP Plant and Standby Diesel Generator

2d Treating batteries

2d1 Are you planning to treat batteries?

No, this application is not for the treatment of batteries

2e Ship recycling

2e1 Is your activity covered by the Ship Recycling Regulations 2015?

No, this application is not covered by the Ship Recycling Regulations 2015

2f Low impact installations (installations only)

2f1 Are any of the regulated facilities low impact installations?

No, this application is not for a low impact installation

2g Multi - operator installation

No. This is not a multi-operator installation

3 Your ability as an operator

3a Relevant offences

3a1 Have you, or any other relevant person, been convicted of any relevant offence?

Yes. The applicant has been convicted of a relevant offence within the last 12 months.

Event Name	Court	Date of hearing	Fine	Summary
EA v Thames Water Utilities Limited	Lewes Crown Court	Hearing Date 03 - 04 July 2023.	Fine £3,334,000.00 Prosecution Costs £128,961.05 and victim surcharge of £120.00	Thames Water pleaded guilty to four charges under the Environmental Permitting (England and Wales) Regulations 2016. The detail of each summons is included below: Summons 1: Between 9 October 2017 and 14 October 2017 TW caused a water discharge activity, namely A discharge of sewage effluent from Crawley Sewage Treatment Works into the Gatwick Stream and the River Mole, except under and to the extent authorised by an environmental permit contrary to Regulation 38(1)(a) and Regulation 12(1)(b) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 2: On and /or before 14 October 2017 TW did contravene condition 11 of environmental permit CNTM.1402 by failing to have capacity of not less than 11,000 m3 in the storm lagoon at Crawley Sewage Treatment Works contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 3: Between 9 October 2017 and 14 October 2017 TW contravened condition 12 of environmental permit CNTM.1402 by failing to discharge when the rate of flow at the inlet sewer at Crawley Sewage Treatment Works is in excess of 840 l/s due to rainfall and /or snowmelt contrary to Regulation 38(2) of the Environmental Permitting (England and Wales) Regulations 2016. Summons 4: On and /or before 14 October 2017 TW did contravene condition 13 of environmental permit CNTM.1402 by failing to empty the storm lagoon at Crawley Sewage Treatment Works and return the contents for full treatment as soon as practicable after cessation of the overflow to the lagoon contrary to Regulation 38(2) of the

Event Name	Court	Date of hearing	Fine	Summary
				Environmental Permitting (England and Wales) Regulations 2016.

3b Technical ability

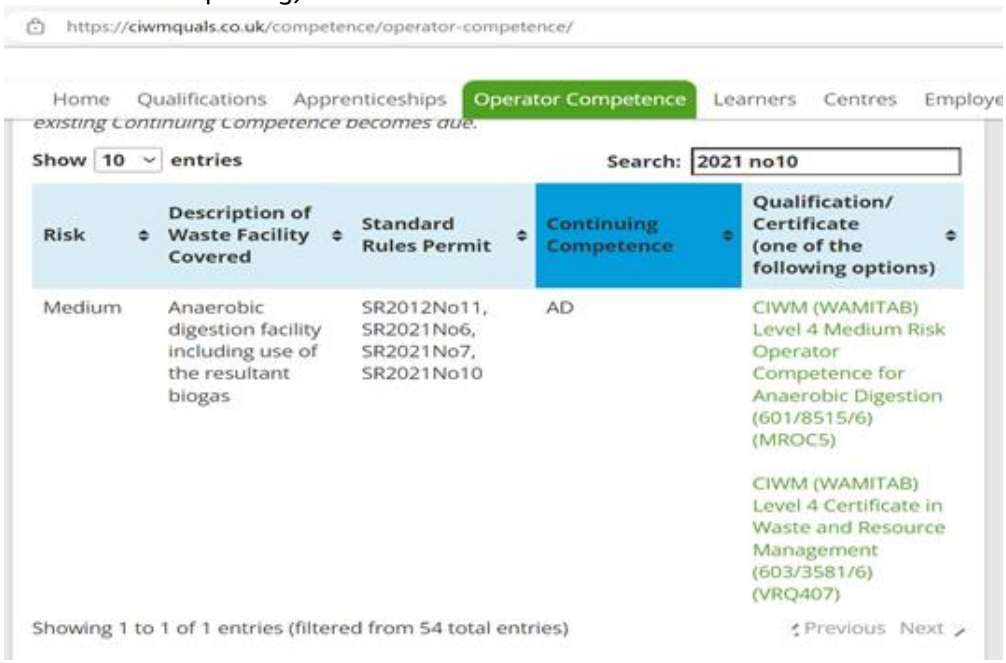
Thames Water uses WAMITAB qualified staff at their waste facilities. The relevant person for the site has been named below and full details have been provided separately on a spreadsheet:

Christian Squibb

Please see Appendix B for evidence of competency

Following original communications with the Environment Agency and CIWM (WAMITAB), Thames Water understands there are two routes to holding an appropriate CoTC for the permit as laid out in the screen shot below:

a) CIWM (WAMITAB) Level 4 medium risk operator competence for anaerobic digestion (MROC5)
b) CIWM (WAMITAB) Level 4 Certificate In waste and Resource Management – VRQ" and optional "VRQ407 – Principles and practices of managing a biological treatment processing facility (Anaerobic Digestion and Composting)"



Thames intend to follow option B at this site.

Thames Water understands from the CIWM website that the proposed option is acceptable.

3c Finances

Installations, waste operations and mining waste operations only.

Do you or any relevant person or a company in which you were a relevant person have current or past bankruptcy or insolvency proceedings against you?

No

3d Management systems

What management system will you provide for your regulated facility?

Identify the form of the management system from the list:

• Own management system

Thames Water has a SharePoint based Environmental Management System, with site specific elements and procedures linked from across the organisation Thames Water also has an Asset Management System accredited to ISO 55001 and an Energy Management System accredited to ISO 50001.

Scope

Thames Water has an EMS in place for its permitted assets.

Environmental Policy

Implementation of Thames Water's Environmental Policy is approved by the Thames Water Executive Committee of the Thames Water Board and is the responsibility of all employees, with the Chief Executive being accountable for its implementation. The policy covers all company activities, including this installation, and applies to all individuals who are employed by, or carry out work on behalf of, any Thames Water company including contractors, temporary staff and agency workers. The Management Systems Team is responsible for the implementation and assurance of the EMS, the site operations teams will be responsible for maintaining ongoing compliance with the EMS and managing the site.

Management and Responsibilities

The Management Systems Team (EMS specialists) have responsibility for the management and upkeep of the EMS. Compliance with specific elements of environmental legislation is managed by the relevant Business Areas across the Company. The Environmental Assurance Team maintain a Legal Register and, in consultation with Operations Teams, the environmental permitting team and other specialists, assess environmental risks for in-scope areas using a significance scoring method under normal, abnormal and emergency conditions. Significant environmental aspects and impacts consider legal and other requirements, cost to the business, scale of impact and interested parties.

Management Systems Team are responsible for setting internal environmental standards which are then implemented by the relevant business areas. The Standards and other relevant information are communicated through several routes. Incident and corrective action routes exist to promote continual improvement. The team run a programme of Management System Audits to determined adherence to the environmental policy and environmental standards.

Local operating procedures are the responsibility of the operational teams that operate the sewage works.

The defined roles and responsibilities are allocated to relevant personnel, depending on their job description, qualifications, knowledge, experience and training. Training and competency are based on specific roles.

Operational Control

Procedures are in place within the EMS to identify and control environmental issues arising from company activities. Each department is required to achieve operational control of its activities using standardised systems.

Routine sewage treatment operations and activities are recorded within the corporate management database, SAP. These include routine inspections, monitoring and maintenance tasks.

Non-routine activities, such as major overhauls/refurbishments, which involve the use of sub-contractors are assessed for health& safety concerns; relevant environmental risks and with accompanying method statements to respond to these.

Contractors who are required to carry out major services are closely managed by operational or other staff to ensure that compliance with Thames Water's H&S and environmental policies is achieved. No contractors may work on site without having undergone a full site induction and being issued with a Thames Water Operational Safety Authorisation (TWOSA) for the task(s) they intend to complete.

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

Maintenance and Monitoring

Management will have the ultimate responsibility for the effective maintenance of plant throughout the company. The facility has named staff that are responsible for day-to-day maintenance operations and contractors are also used as required. All maintenance is logged on SAP. The following basic inspections and maintenance activities are indicative of those carried out on site:

- Daily operation of plant (24/7) involves visual inspection of operational assets;
- Daily inspection of temporary pipe work installed;
- Routine maintenance programme for plant; and
- Routine lubrication programme.

Personnel responsible for the inspection, testing and maintenance of pollution prevention infrastructure are trained to an appropriate level.

All regular maintenance of all plant and equipment will be completed on the time scale specified by the equipment manufacturer including routine inspections.

Environmental Improvement

Thames Water is committed to environmental improvements and has established environmental targets and plans relating to materials and waste management, transport, climate change mitigation and adaptation (energy efficiency and renewable energy generation), water resources, biodiversity, river water quality, and drainage asset performance. TWUL's Environmental Governance Board meets on a regular basis to provide strategic direction, and interrogative review, attached to any environmental issue of substantive concern including emerging risks as well as current topics.

Competence, Training and Training Records

Thames Water aims to ensure that all employees are in possession of the knowledge, skills and experience necessary to perform their role in accordance with the company's operating procedures and in full compliance with the law. Training needs are identified by the employee's immediate supervisor or line manager.

For those sites treating 'waste' as defined by the Waste Regulations 2011, coverage at all permitted sites by staff who hold the appropriate level of WAMITAB 'Certificate of technical Competence' is monitored centrally. This aspect of the staff training is currently being reviewed in light of the change in permitting requirements for sludge treatment centres.

For each internal training course held a Training Record is issued.

Induction training is carried out by the responsible line manager and consists of an introduction to the Company's Environmental Health and Safety Policy and description of emergency response and spill prevention procedures.

Staff receive specific training in the plant's operation and the environmental impact of the process as well as health and safety. The operators will have a detailed understanding of the operational procedures for the site for both normal and abnormal operation. As part of the training, operators will receive specific instructions relating to those aspects of plant operation that have the potential for a negative impact on the environment. This training will be provided by the equipment manufacturers or in-house staff as appropriate.

Contractors

There are several procedures to ensure contractors have the required skills and environmental competencies to carry out works at the site.

Initially, contractors are assessed by the procurement department for inclusion on the approved supplier list, which includes health and safety and environmental criteria for example, waste documentation such as waste carrier's licence/training certificates. Even when the contractors are on the approved supplier list, they are still further assessed for each specific contracted activity.

The contactor is required to submit a method statement prior to any commencement of work, identifying how work is to be undertaken and the associated risks. The method statement must be approved by the Site Manager, who will also identify any site hazards and issue an Authorisation to Work/Enter the site, following a site induction. When on-site, the contractor must carry this Authorisation to Work at all times.

Incidents, Non-Compliances and Complaints

Thames Water has procedures for incidents, non-compliances and environmental complaints.

Incidents are managed through corporate and site-specific procedures which ensure that all incidents are logged and that necessary preventative and/or corrective actions are taken.

Customer complaints are made via the Customer Services Centre which will log all complaints electronically. An action is raised to Waste Operations Control Centre (WOCC) who contact the CSM by telephone and email the complaint information to both the CSM and Performance Manager. The CSM and Performance Manager will review the complaint and take action to investigate the complaint. The CSM is responsible for contacting the customer and updating them on the outcome of the investigation and any actions taken. Where complaints relate to odour/noise/amenity, typical follow up action would include physical checks onsite of the operation of plant; offsite checks where needed; with all the actions taken being logged. Where appropriate, site management may contact the customer to discuss the outcome of the complaint, otherwise, there is a customer communication plan that identifies how and when contact will be made with customers and other stakeholders.

Information regarding complaints is recorded to allow determination of an appropriate response (corrective action) and identify what measures need to be taken in the future to prevent its reoccurrence (preventive action).

Communication

There are regular meetings held on site to discuss all aspects of the treatment works and performance against targets. These meetings include the operation and performance of the installation. Other communication methods to promote environmental management issues and continual improvement include: toolbox talks, environmental

alerts, OSC portal forums, formalised event learning processes following an operational incident and compliance audits.

4 Consultation

Could the waste operation or installation involve releasing any substance into any of the following?

4a A sewer managed by a sewerage undertaker?

Yes. The site discharges into a drainage system of the wider sewage treatment works, controlled and operated by the applicant.

4b A harbour managed by a harbour authority?

No

4c Directly into relevant territorial waters or coastal waters within the sea fisheries district of a local fisheries committee?

No

4d Is the installation on a site for which:

4d1 a nuclear site licence is needed under section 1 of the Nuclear Installations Act 1965?

No

4d2 a policy document for preventing major accidents is needed under regulation 5 of the Control of Major Accident Hazards Regulations 2015, or a safety report is needed under regulation 7 of those Regulations?

Yes, Riverside Sewage Treatment Works is a Lower Tier site under COMAH due to flammable liquids and gases. The existing policy document is unchanged

5 Supporting information

5a Provide a plan or plans for the site

Please see Appendix A:

- A.1 Site Location Plan
- A.2 Installation Boundary and Air Emission Points Plan
- A.3 Site Impermeable and Permeable Surfacing Plan
- A.4 Site Drainage Plan
- A.5 Process Flow Diagram
- A.6 Site Photographs

5b Do any of the variations you plan to make need extra land to be included in the permit?

Yes. See Appendix C for the Site Condition Report.

5c Provide a non-technical summary of your application

Please see earlier text in Chapter 1.

5d Risk of fire from sites storing combustible waste

No. The site processes sit outside the scope of the Environment Agency fire prevention plan guidance, as set out in the Environment Agency guidance.

5f Adding an installation

Please see the response to Q5b for the baseline report which is in the H5 template.

6 Environmental risk assessment

An environmental risk assessment of the site changes has been carried out in line with the requirements of the Horizontal Guidance Note H1 and Guidance given on gov.uk. This guidance specifies the following approach to carrying out an environmental risk assessment for a proposed activity:

- Identify potential risks that your activity may present to the environment;
- Screen out those that are insignificant and don't need detailed assessment;
- Assess potentially significant risks in more detail if needed;
- Choose the right control measures, if needed; and
- Report your assessment.

Designated site review

Site Name	Designation	Direction from site	Distance from site
Swanscombe Marine Conservation Zone	MPA	South East	9200 m
Inner Thames Marshes	SSSI	South East	350 m
Ingrebourne Marshes	SSSI	North East	470 m
Rainham Marshes	LNR	South East	435 m
Ingrebourne Valley	LNR	North East	830 m
Beam Valley	LNR	North West	1350 m
n/a	Ramsar		

n/a	SPA		
n/a	NNR		
n/a	Ancient Woodland		
List of Local Wildlife Sites			
Belvedere Dykes Rainham Railsides Beam Valley South in Dagenham and the Wantz Stream Mid Beam Valley in Dagenham and Dagenham East Lake Beam Valley South in Havering Mid Beam Valley in Havering Riverside Sewage Treatment Works Lower River Beam and Ford Works Ditches Mudlands Dagenham Breach and the lower Beam River in Dagenham River Thames and tidal tributaries Ingrebourne Valley Hornchurch Country Park Wennington, Aveley and Rainham Marshes Brett Havering Aggregates west			All sites <2,000m

Data taken from MAGIC.gov.uk website, accessed April 2021. For habitat sites, the relevant distance for consideration are: International designations (SAC, MPA, SPA and Ramsar - 10km); National designations (SSSI – 2km); Local Nature Reserves, Local Wildlife Sites and Ancient Woodland (2km).

Riverside STW is in close proximity to a number of designated habitats. There is an MPA designated site within 10 km of the site. This is the Swanscombe Marine Conservation Zone located approximately 9.2 km South East of the site. There are also a number of SSSI and LNRs within 2 km of Riverside STW. Inner Thames Marshes and Ingrebourne Marshes are SSSI located 350 m South East and 470 m North East, respectively. Rainham Marshes, Ingrebourne Valley and Beam Valley are LNRs located 435 m South East, 830 m North East and 1350 m North West of the site, respectively. There are no Ramsar or SPA designated sites within 10 km of Riverside STW, and no NNRs located within 2 km.

There are 15 non-statutory Local Wildlife Sites (LWS) within 2km of the site, including a LWS covering the STW site. There is one protected species recorded within the specified screening distance (within 500m) of the site – the European eel migratory route.

There is no Ancient Woodland within 2 km of the site.

The STW site and STC is within a Flood Zone 3 area that benefits from flood defences. This means that the STC would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

Riverside STW is within a Nitrogen dioxide NO_2 - Annual Mean and Particulate Matter PM10 - 24-Hour Mean AQMA. This is the Havering AQMA an area encompassing the entire London Borough of Havering. The site sits outside any source protection zones (SPZ).

Consideration	Receptors	Discussion	Detailed Environmental Risk Assessment?
Amenity issues: Litter, vermin and pests	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, amenity and recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. Riverside STC is located within Riverside STW in an urban industrial area of the London Borough of Havering and to the north of the River Thames. To the north is a railway line and the south the A13, while industrial and commercial estates can be found to the west and east. The nearest residential properties are located at the site entrance. Ecological receptors: the nearest ecological receptor is Inner Thames Marsh SSSI, 350 m to south-east. Ingrebourne Marshes SSSI is approx. 470 m north-east. There are three LNRs within 2 km of the site, including Rainham Marshes, 435 m south-east; Ingrebourne Valley830 m south-east; and Beam Valley 1.35 km north-west. A designated MPA, the Swanscombe Marine Conservation Zone is approx. 9.2 km to the south-east of the site. There are no Ramsar, SACs or SPAs within 10 km of the site, and no NNRs within 2 km. There are 15 non-designated LWSs within 2 km of the site but no areas of Ancient Woodland.	The wastes handled at the site are primarily liquids and sludges, along with UWWTD derived material delivered by sewer. As such, there is no source of litter within the materials handled at the site. In the unlikely event pests or vermin are observed on site a suitable contractor is called in as soon as practicable.	X
Dust and bioaerosols	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Litter above. The impact of dust on human health will depend on the distance and wind direction. For bioaerosols, this distance is 250 m.	The wastes handled at the site are liquids, sewage sludges and digested sludge cake, along with UWWTD derived material delivered by sewer. The site will not be handling inherently dusty or powdery wastes. Digested sludge cake retains a high moisture content and is not dusty. Sludge cake is stored towards the north of the site, within a totally enclosed and ventilated cake barn that is approx. 100 m from industrial sites to the west or north-east of the site. Roads will be maintained to avoid the production of dust. A wheelwash is used for vehicles exiting the cake barn. Please see Appendix F for the site specific bioaerosol risk assessment.	✓

Assessment of point source emissions to air Emissions deposited from air to land	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Amenity issues above. The impact of emissions from air on human health will depend on the distance and wind direction.	The site is located within an AQMA, the Havering AQMA, declared for Nitrogen dioxide NO_2 - Annual Mean and Particulate Matter PM_{10} - 24-Hour Mean. Air emissions have previously been assessed by the Environment Agency and deemed satisfactory. Use of the emergency flare is limited to emergency situations and during planned maintenance activities to either the CHP engines or the boilers. There are multiple outlets at Riverside STC that use biogas to reduce the likelihood of flaring, for which incidents of flaring are recorded by the site Pressure relief valves are not used routinely to control biogas volumes and would only operate in an emergency. Fugitive emissions to air are assessed in Table C3-3b(i).	X
Assessment of point source and fugitive emissions to water	Rainham Creek flows from the north to the south, into the River Ingrebourne, approximately 40m away from the STW boundary and a drainage ditch can be found to the north and west of the site. The STW site and STC is within a Flood Zone 3 area that benefits from flood defences. This means that the STC would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year. Surface water drainage within the site drains to the inlet of the adjacent sewage treatment works for full treatment prior to discharge.	The main product of the process is a digested sludge cake, which is stored within a Flood Zone 3 that is protected by flood defences. The digested sludge cake is stored within a fully enclosed cake barn. Other aqueous discharges generated by process are limited (comprising only biogas condensate, dewatering liquors, and surface water run off). These sources are discharged to the on-site drainage system where they are transferred to main sewage works inlet. Due to the nature and small quantity of these emissions no further assessment of point source emissions is deemed necessary.	X
Assessment of odour	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. For human health and ecological receptors, see notes for Amenity issues above. The impact of emissions from odour on human receptors will depend on the distance and wind direction.	The wider sewage treatment works, which includes the area of the STC to be permitted has processes in place to minimise odour which includes physical containment, odour abatement, management systems, procedures and monitoring to control fugitive emissions of odour at the plant. Odour from the STC cannot be considered in isolation from the wider works. The sewage treatment works has an odour management plan, which is appended as Appendix E. Odour emissions are assessed in Table C3-3b(ii).	X

Energy	Global atmosphere (direct and indirect emissions)	Use of biogas on site within the CHP engines and/or boilers minimises the need to import non-renewable electricity from the National Grid. Export of renewable electricity to the National Grid can offset consumption of fossil fuels within the energy mix, lowering the carbon intensity of power. Good maintenance procedures will help the plant run efficiently and reduce site energy consumption. Use of LED lighting reduces site consumption.	**X**
Land and disposal of waste to other processes	Rivers and streams – see Assessment of point source and fugitive emissions to water above. Drainage systems/sewers. The site lies outside any Groundwater source protection zones (SPZ). Aquifers are classified as unproductive (solid deposits) and Secondary (undifferentiated) (superficial deposits).	All waste streams are disposed of off-site for recovery or disposal and will continue to be transferred (and consigned where hazardous) to appropriately permitted facilities.	**X**
Noise and vibration	Human health receptors: Single houses or groups of houses (estates, villages etc.). Schools and hospitals. Footpaths, amenity and recreation areas such as playing fields and playgrounds. Industrial estates and rail stations. Riverside STC is located within Riverside STW in an urban industrial area of the London Borough of Havering and to the north of the River Thames. To the north is a railway line and the south the A13, while industrial and commercial estates can be found to the west and east. The nearest residential properties are located at the site entrance. Ecological receptors: the nearest ecological receptor is Inner Thames Marsh SSSI, 350 m to south-east. Ingrebourne Marshes SSSI is approx. 470 m north-east. There are three LNRs within 2 km of the site, including Rainham Marshes, 435 m south-east; Ingrebourne Valley830 m south-east; and Beam Valley 1.35 km north-west. A designated MPA, the Swanscombe Marine Conservation Zone is approx. 9.2 km to the south-east of the site. There are no Ramsar, SACs or SPAs within 10 km of the site, and no NNRs within 2 km. There are 15 non-designated LWSs within 2 km of the site but no areas of Ancient Woodland.	Site design has been chosen to minimise the impact of noise on offsite receptors through building orientation, finishes and location of openings. Noise from plant and equipment will be minimised through purchasing decisions and a robust preventative maintenance programme There will be no sources of vibration within the facility. Noise and vibration emissions are assessed in Table C3-3b(iii).	**X**

Other issues (including visual impact)	Protected Species and Habitats	There are records of protected species (European eel migratory route) located within the specified screening distance (up to 500m) of the site. There are no records of protected habitat located within the specific screening distance of the site.	X
Climate Change	Risks of increased temperature impacts resulting in digesters heating beyond optimal operating temperature and increased odour potential from site process. For human health and ecological receptors, see notes for Amenity issues above.	Primary Digester Tanks may require reduced heat input to digester via heat exchange system and Primary Digester Tanks are insulated against worse impacts. The THP may require additional cooling during warmer periods. Warmer temperatures may require less boiler input/use as a result of less heat demand, or increased heat dumping via air cooled radiator. If less biogas is used, the site may require a new consumptive biogas solution e.g. a CHP engine or other technology that is appropriately sized to utilise additional biogas. However, the CHP engines will need to be replaced prior to 2050 when they reach the end of their operational lifespans. Pre-digestion tanks are already covered and OCU's to be utilised as appropriate. OCU's may require oversizing compared to current use.	X
	Risks of increased storm events that causes surface water runoff exceeds capacity of site drainage system, or additional dewatering operations due to rainwater ingress, or caused bunds to infill. Increased precipitation may increase flooding on agricultural land, decreasing ability to spread digested sludge cake to land. For water environment receptors, see notes for Assessment of point source and fugitive emissions to water above	The STW design may require expansion or additional storm capacity; however, this would apply to UWWTD operations at the site rather than permitted activities. May need to increase bund or containment volume for sewage treatment works or individual assets. Land spreading activities could be restricted during very wet, winter months. Although the site has a large cake pad which would allow digested sludge cake to be stored prior to application, contingency plans to move digested sludge cake to other sites may be required.	

Appendix 2 – Date of birth information for Relevant offences and/or Technical ability questions only

This information has been supplied separately for the ease of exclusion from the public register.

Form C3 Questions

1 – What activities are you applying to vary?

Table 1a – Types of activities

Installation name	Schedule 1 references	Description of the Activity	Activity Capacity	Annex I and II codes and descriptions	Non-hazardous waste treatment capacity
Riverside Sludge Treatment Works AR1	S5.4 A1 (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 Anaerobic digestion of permitted waste in four Primary Digester Tanks followed by combustion of biogas produced from the process	From receipt of permitted waste through to digestion and recovery of by-products (digestate and biogas).	1,717 wet tonnes per day (throughput based on 20,600 m3 / 12 days = 1,717 m3 per day)	R1 Use principally as a fuel or other means to generate energy R3: Recycling reclamation of organic substances which are not used as solvents R13 Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage, pending collection, on the site where the waste is produced) D15: Storage pending any of the operations numbered D1 to D14 (excluding temporary storage, pending collection, on the site where it is produced)	Maximum waste throughput 3,500,000 wet tonnes per annum including indigenous UWWTD derived sludge from within the wider Sewage Treatment Works. As per calculation in Note 1 below.
Directly Associated Activities					
AR2	Imports of waste, including sludge from other sewage treatment works;				
AR3	Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;				
AR4	Pre-treatment of sewage sludge by Thermal Hydrolysis Process;				
AR5	Storage of digestate prior to dewatering;				
AR5	Dewatering of digested sewage sludge;				

AR7	Transfer of dewatering liquors via site drainage back to the works inlet of the sewage treatment works;
AR8	Transfer of surface water runoff back to the works inlet of the sewage treatment works;
AR9	Storage of dewatered digested sludge cake prior to offsite recovery;
AR10	Storage of biogas;
AR11	Transfer of biogas condensate via site drainage back to the works inlet of the sewage treatment works;
AR12	Combustion of biogas in MCPD and SG compliant biogas CHP Engines and biogas or natural gas in MCPD boiler units; [note 2]
AR13	Emergency flare;
AR14	Storage and handling of wastes, including waste oils; and
AR15	Storage of raw materials.
AR16	Imported sludge rewetting

Specified Generator Activities

	National Grid Reference and/or activity reference/emission point	Activity listed in the EP Regulations	Description of specified generator	Fuel	Operating hours limit per unit per annum
AR17	CHP1 10195067 551396,182378	Schedule 25B – Specified Generator	1 x 5.1 MWth spark ignition engine	Biogas	Not restricted [note 3]
AR18	CHP2 10195393 551390,182374	Schedule 25B – Specified Generator	1 x 5.1 MWth spark ignition engine	Biogas	Not restricted [note 3]
AR19	CHP3 10195394 551385,182383	Schedule 25B – Specified Generator	1 x 5.1 MWth spark ignition engine	Biogas	Not restricted [note 3]
AR20	Emergency Standby Generator 10190129 551581,182253	Schedule 25B – Specified Generator	1 x 5.92 MWth generator. NB: Now operated as an excluded generator.	Diesel	50 hours per annum

Waste Operations

	Description of the waste operation	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity	Non-hazardous waste treatment capacity

AR21	Imports of waste: Digested sludge cake for temporary storage pending off-site removal	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced). R3: Recycling or reclamation of organic substances which are not used as solvents	n/a	Maximum waste throughput 1,000 wet tonnes per annum
For all Waste Operations		**Total capacity**	**31,205**	**[a] + [b]**
		Total STC treatment capacity (tank volume)	28,205 wet tonnes	[a]
		Total Cake Barn storage capacity	3,000 wet tonnes	[b]
For waste imports of digested sludge cake for temporary storage		Annual throughput (tonnes each year)	Imports: 1,000 wet tonnes	
Notes: Note 1 – Import Calculation is based on: Co-settled Sludge: 27.50 tds/day; worse case 0.70% dry solids = 3,929 m3/day = 1,433,929 m3/year Imports - Liquids: 82.50 tds/day; worse case 1.50% dry solids = 5,500 m3/day = 2,007,500 m3/year Total Combined Import Calculation: 3,441,429 m3/year round to 3,500,000 m3/year Note 2 – The three CHP engines are DAAs to the installation and part of the specified generator Note 3 - Three CHP engines each 5.1MWth and three boilers each 3.3MWth with total thermal input of 25.1MWth, limited to the maximum simultaneous operation of two engines and two boilers at any one time.				

Table 1b Types of waste accepted

Table C3-1b(i): Waste accepted for Anerobic Digestion

Waste Code	Description of Waste
19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge only)
19 06 06	digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only)
19 08 05	sludges from treatment of urban waste water
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11 (sewage sludge only)

Table C3-1b(ii): Waste accepted for temporary storage and transfer off site

Waste Code	Description of Waste
19 06 06	digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only)

1c Recovery of hazardous waste on land

Are you applying for a waste recovery activity involving the permeant deposit of inorganic hazardous waste to land for construction or land reclamation?

No - Where the answer is no, there is no requirement to answer further questions in 1c.

2 – Point source emissions to air, water and land

Table C3-2a – Emissions to Air

Air emission points currently permitted under permit EPR/GB3739DY/V002 are in bold

Emission point reference and location	Source	Parameter	Limit	Unit	Reference Period	Monitoring frequency	Monitoring standard or method
A1 (a) flue within combined A1 stack [Point A1 on site plan]. [Note 1]	**CHP Engine 1 (unit 1)**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**400**	**mg/m^3**	**Hourly average**	**Twice yearly [note 2]**	**BS EN 14792**
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	**400**	**mg/m^3 24 hour daily average**	**Continuous**	**-**	**BS EN 15267-3**
		Carbon Monoxide	**- [Note 4]**	**-**	**Hourly average**	**Annual**	**BS EN 15058**
		Total Volatile Organic Compounds	**- [Note 4]**	**-**			**BS EN 12619:2013**
A1 (b) flue within combined A1 stack [Point A1 on site plan]. [Note 1]	**Steam boiler 1 (unit 1). Dual fuel where ELV reflects operation on biogas.**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**120**	**mg/m^3**	**Hourly average**	**Annual**	**BS EN 14792**
A2 (a) flue within combined A2 stack [Point A2 on site plan]. [Note 1]	**CHP Engine 2 (unit 2)**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**400**	**mg/m^3**	**Hourly average**	**Twice yearly [note 2]**	**BS EN 14792**
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	**400**	**mg/m^3 24 hour daily average**	**Continuous**	**-**	**BS EN 15267-3**
		Carbon Monoxide	**- [Note 4]**	**-**	**Hourly average**	**Annual**	**BS EN 15058**

		Total Volatile Organic Compounds	**- [Note 4]**	**-**			**BS EN 12619:2013**
A2 (b) flue within combined A2 stack [Point A2 on site plan]. [Note 1]	**Steam boiler 2 (unit 2) Dual fuel where ELV reflects operation on biogas.**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**120**	**mg/m^3**	**Hourly average**	**Annual**	**BS EN 14792**
A3 (a) flue within combined A3 stack [Point A3 on site plan]. [Note 1]	**CHP Engine 3 (unit 3)**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**400**	**mg/m^3**	**Hourly average**	**Twice yearly [note 2]**	**BS EN 14792**
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	**400**	**mg/m^3 24 hour daily average**	**Continuous**	**-**	**BS EN 15267-3**
		Carbon Monoxide	**- [Note 4]**	**-**	**Hourly average**	**Annual**	**BS EN 15058**
		Total Volatile Organic Compounds	**- [Note 4]**	**-**			**BS EN 12619:2013**
A3 (b) flue within combined A3 stack [Point A3 on site plan]. [Note 1}	**Steam boiler 3 (unit 3) Dual fuel where ELV reflects operation on biogas.**	**Oxides of nitrogen (NO and NO_2 expressed as NO_2)**	**120**	**mg/m^3**	**Hourly average**	**Annual**	**BS EN 14792**
A4 (point A4 on site plan)	**Emergency Flare**	**No parameters set**	**No limit set**	**-**	**-**	**-**	**-**
A6	THP PRV	-	-	-	-	-	-
A7	Primary Digester Tank PRV	-	-	-	-	-	-
A8	Primary Digester Tanks PRV	-	-	-	-	-	-
A9	Primary Digester Tanks PRV	-	-	-	-	-	-

A10	Primary Digester Tanks PRV	-	-	-	-	-	-
A11	Biogas Storage PRV	-	-	-	-	-	-
A12	Biogas Storage PRV	-	-	-	-	-	-
A13	OCU1	Hydrogen Sulphide	No limit set	-	Average over sampling period	Once every 6 months	CEN TS 13649 for sampling NIOSH 6013 for analysis or US EPA M11
		Ammonia	20	mg/m^3			EN ISO 21877 CEN TS 1369 for sampling Or NIOSH 6016 for analysis
A14	OCU3	Hydrogen Sulphide	No limit set	-	Average over sampling period	Once every 6 months	CEN TS 13649 for sampling NIOSH 6013 for analysis or US EPA M11
		Ammonia	20	mg/m^3			EN ISO 21877 CEN TS 1369 for sampling

							Or NIOSH 6016 for analysis
A15	Cake Barn Ventilation Stack	-	-	-	-	-	-

Note 1 – Monitoring required, unless combustion facility non-operational in given monitoring period, as agreed in writing by the Environment Agency

Note 2 – Monitoring should be undertaken twice a year, once within Q1/Q2 and repeat in Q3/Q4

Note 3 – Reference condition for Spark Ignition engines only are dry air, 273K, at a pressure of 101.3kPa with an oxygen content of 5%.

Note 4- The previous requirement that "Emission limit value shall be confirmed in writing by Environment Agency after completion of Improvement condition 1. Target Value is 1400 mg/m^3." Is removed and replaced by a testing requirement for VOCs and a standard ELV for CO of 1,400 mg/m3. NB: the requirements for IC1 have since been satisfied so the CHP engines are now tested/reported against an ELV of 1400mg/m3 CO and testing requirement for Total VOCs.

Table C3-2b – Emissions to Sewer

Emission point reference and location	Source	Parameter	Limit	Unit
T1 (as per site plan in Appendix A2) (TQ 51531 82319)	Sludge Dewatering Liquors, Digested Sludge Dewatering Liquors, Biogas Condensate, OCU Waste Waters, Boiler Waste Waters	No parameters set	No limit set	-

There are no permitted emissions to land from the activities covered by this permit.

3 – Operating techniques

3a – Technical standards

Description of the schedule 1 activity or directly associated activity	Relevant technical guidance note or Best available techniques as described in BAT conclusions under IED	Document Reference
Anaerobic Digestion plant S5.4A1(b)(i); Storage of waste (DAA)	Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.) BAT Conclusions for Waste Treatment	

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

Yes, please refer to ADMS modelling from the previous application which remains valid.

3b – General requirements

If the TGN or H1 assessment shows that emissions of substances not controlled by emission limits are an important issue, send us your plan for managing them.

Although screened out of the detailed Risk Assessment (Question C2 Q6), due to the nature of the process the installation has the potential to generate fugitive emissions to air and water, which are subject to a number of process controls.

Risk Matrix and Terminology for Accident for Risk Assessment

Likelihood ↓	Consequence		
	Low	Medium	High
Low	Low	Low	Medium
Medium	Low	Medium	High
High	Medium	High	High

Classification	Likelihood	Consequence	Risk
Low	Probability of an event is low and likely only to occur in the long-term (a yearly basis or less frequent).	Impact is low or a minor, short-term nuisance. Minor release to a non-sensitive receptor or pollution of water course. Non-permanent health effects to human health (preventable by appropriate PPE). Minor surface damage to buildings; structures; services; or the environment which can be repaired immediately.	A level of harm is possible although this may not be noticeable to a receptor and would be a short-term event without lasting effects. Level of harm can be reduced using industry best practice and appropriate management techniques.
Medium	It is probable that an event will occur periodically in the medium-term (twice yearly basis).	Impact is noticeable in the short to medium-term. Large release impacting on the receiving media killing flora and fauna and requires remediation. Nuisance causing non-permanent health effects to human health. Damage to buildings; structures; services; or the environment preventing short-term use and/or requiring repair.	A level of harm may arise to a receptor which is noticeable although not long-lasting and may require some remedial actions in order to prevent re-occurrences.
High	An event is very likely to occur in the short-term (monthly or weekly basis) and is almost inevitable over the long-term OR there is evidence at the receptor of harm or pollution.	Impact is significant, wide-ranging and long-lasting effect. Has a chronic or acute impact on human health. Very large release that has a major impact on flora and fauna which may be very difficult to remediate. Significant damage to buildings; structures; services; or the environment which prevents use long-term and may require complete replacement. May cause a long-term impact or contribute towards a global issue due to releases of greenhouse gases.	A level of harm is likely to arise to a receptor that is severe causing significant harm to human health or the environment without appropriate remedial and mitigation measures being implemented. Remedial works to infrastructure and processes is required in the long-term.

Although screened out of the detailed Risk Assessment (Question C2 Q6), due to the nature of the processes, the anaerobic digestion operations and digested sludge cake storage, along with biogas utilisation have the potential to generate fugitive emissions to air and water, which are subject to a number of process controls.

Table C3-3b(i) Fugitive emissions risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
Emissions to air of NOx, SO_2, CO_2 and VOCs	Normal	Emissions to air and dispersion leading to inhalation by local human and animal receptors	High	Low	Medium	Activities are managed and operated in accordance with the site management system (including inspection and maintenance of equipment, including engine management systems), point source emissions to air (CHP Engines, boilers and emergency flare stack) have emission limits. Flare stack height approx. 6 m, shared dual flue stacks for boilers and CHP Engine is approx. 19 m. Site has a siloxane filter fitted on the main biogas pipeline connected to the CHP Engines to remove impurities within the biogas.	Low
Biogas transfer systems, Biogas Storage holder, CHP engines, flares or PRVs failure causing emissions of biogas	Abnormal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors. Odour impact. Global warming potential. Risk of fire and explosion	Low	Medium	Low	The plant is designed to capture and utilise all biogas possible, combusting the biogas in order to maximise recovered value from the biological treatment of sludge. The biogas system utilised is subject to regular preventative maintenance including a LDAR plan to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of pressure and flow	Low

						sensors and with isolation valves to minimise the potential for release if a leak is detected. Personnel on site wear portable biogas detectors in order to alert staff to presence of biogas. An Emergency Flare is utilised for the safe disposal of surplus biogas in the event of plant breakdown, or a surplus of biogas above the level that can be safely stored or utilised. Use of emergency flare is recorded. PRVs are in place on both Biogas Storage holders to be operated in the event of failure of the emergency flare to prevent overpressurisation and catastrophic failure.	
Catastrophic loss of biogas emissions from biogas transfer systems, Biogas Storage holders, CHP engines, flare or PRVs	Abnormal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors. Odour impact. Global warming potential. Risk of significant fire and explosion	Low	High	Medium	The plant is designed to capture and utilise all biogas possible, combusting the biogas in order to maximise recovered value from the biological treatment of sludge. The biogas system utilised is subject to regular preventative maintenance including a LDAR plan to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of pressure and flow sensors and with isolation valves to minimise the potential for release if a leak is detected. An Emergency Flare is utilised for the safe disposal of surplus biogas in the event of plant breakdown, or a surplus of biogas above the	Medium

						level that can be safely stored or utilised. Use of emergency flare is recorded. PRVs are in place on both Biogas Storage holders to be operated in the event of failure of the emergency flare to prevent overpressurisation and catastrophic failure.	
Combustion of biogas within CHP engines and emergency flare. Combustion of biogas or natural gas within boilers	Normal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors. Global warming potential	High	Low	Medium	Combustion plant is regularly maintained and appropriately sized with multiple outlets to manage volumes of biogas. Combustion plant operates within permitted ELVs subject to routine monitoring against permit compliance. CHP Engines and emergency flare are located towards the west of the site, which is on the far side from the nearest residential properties which are 330 m east of the Powerhouse, while the nearest commercial buildings approx. 115 m west of the emergency flare.	Low
Release of steam from THP, vessels and tanks	Abnormal	Emissions to air and dispersion leading to inhalation by local human and animal receptors. Global warming potential	Low	Low	Low	THP is regularly maintained and operated by trained, competent personnel. Regular visual checks made of all equipment to identify potential faults. THP tanks and vessels are fitted with PRVs to safely vent steam to atmosphere and prevent a catastrophic failure. THP is located within the towards the centre of the site with the nearest sensitive receptors,	Low

						approx. 175 m to the north, beyond a number of other site buildings and the railway line.	
Release of bioaerosols and dust	Normal	Emissions to air and dispersion leading to inhalation by local human and animal receptors. Odour impact of bioaerosols. Nuisance impact of dust.	Low	Low	Low	The risk of bioaerosol and dust is largely minimised by storing the digested sludge cake within an enclosed and ventilated cake barn. The nearest residential properties are approx. 270 m North-East from the ventilated cake barn and nearest commercial buildings approx. 100 m north. The cake barn extracts via a flue within the central area of the site, creating a large separation distance between receptors and the cake barn. Digested sludge cake within the cake barn retains a high moisture content and is not prone to windblown dispersion leading to the generation of dust. Internal roads are made from concrete/asphalt and not prone to the generation of dust. A wheelwash is present near the exit of the cake barn.	Low
Release of bioaerosols and dust from spillages	Abnormal	Emissions to air and dispersion leading to inhalation by local human and animal receptors with potential harm to health. Odour impact of bioaerosols. Nuisance impact of dust.	Low	Medium	Low	The risk of bioaerosol and dust is largely minimised by storing the digested sludge cake within an enclosed and ventilated cake barn. The nearest residential properties are approx. 270 m North-East from the ventilated cake barn and nearest commercial buildings approx. 100 m north. The cake barn extracts via a flue within the central area of the site, creating a	Low

						large separation distance between receptors and the cake barn. Digested sludge cake retains a high moisture content and is not prone to windblown dispersion leading to the generation of dust. Internal roads are made from concrete/asphalt and not prone to the generation of dust. A wheelwash is present near the exit of the cake barn. Staff responsible for site housekeeping and cleaning of spillages in a timely manner.	
Spillage of liquids, including chemicals and oils.	Abnormal	Emissions to surface waters close to and downstream of site. Acute effect resulting in loss of flora and fauna. Chronic effect resulting in deterioration of water quality Emissions to ground and ground water.	Low	Medium	Low	The closes surface water body is a small channel on the northern and western boundaries. Rainham Creek and the River Ingrebourne are approx. 40 m to the east of the site and is where the works discharges final effluent. Chemicals and oils all stored within suitably bunded tanks and IBCs, with rainwater removed as required to maintain 110% capacities. Penstock valves available within chemical delivery areas to contain large spillages Handling and use of chemicals and oils is carried out by trained personnel. COSHH data sheets available. Spill kits available on site. There are no point source emissions to water with drainage system pumping back to works inlet.	Low

Spillage from storage and digestion tanks, overtopping of tanks, leakage from same tanks and from buried pipes	Abnormal	Emissions to surface waters close to and downstream of site. Acute effect resulting in loss of flora and fauna. Chronic effect resulting in deterioration of water quality Emissions to ground and ground water.	Medium	Low	Low	The installation lies outside any Groundwater Source Protection Zones (GPZ). Provision of suitable structurally integral tanks constructed from concrete or steel and glass reinforced plastic. All tanks are subject to asset inspection and proactive maintenance programme including regular visual inspection for cracks or weeping. Visual checks during regular day-to-day operations and scheduled preventative maintenance of equipment such as pumps, pipes, joins etc. Biogas condensate discharged back to the works inlet through site drainage system. Spill kits available on site. Staff are trained in their use. There are no point source emissions to water with drainage system pumping back to works inlet.	Low
Generation of solid waste resulting in litter	Normal	Releases of litter to the environment. Visual nuisance and local loss of amenity	Low	Low	Low	Site operations do not give rise to large amounts of solid wastes and litter that would be prone to dispersion by wind. Rags are stored within skips and retain high moisture content. Waste is stored securely for collection by appropriately licensed approved contractors.	Low

						Litter picking activities are completed as required.	

Where the TGN or H1 assessment shows that odours are an important issue, send us your odour management plan.

Due to the nature of the process, the installation has the potential to generate odorous emissions resulting from the permitted activities. Odour management is a key operational objective, as summarised in the risk assessment table below. A copy of the site-specific odour management plan has been appended to this application as Appendix E.

Table C3-3b(ii) Odour risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
H_2S/biogas emissions from uncovered tanks	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	All tanks used for sludge digestion at Riverside STC are enclosed. Biogas will principally be generated in Primary Digester Tanks which are covered with fixed roofs. The nearest receptors are commercial buildings approx. 120 m north of the Primary Digester Tanks with residential properties approx. 230 m south-east. H_2S production is controlled through the digestion process which can be manually overridden if required. Ferric dosing is also used to reduce odour emissions as required.	Low
Loss of containment from Biogas Storage holder and biogas pipework	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors	Low	Medium	Low	Biogas is principally stored within two Biogas Storage holders which are suitably sized to manage biogas generation. The biogas line is mostly above ground at Riverside STC. The biogas system utilised is	Low

		Loss of amenity from odour nuisance				subject to regular preventative maintenance to minimise the potential for leaks occurring. The system is also protected with a comprehensive array of pressure and flow sensors and with isolation valves to minimise the potential for release if a leak is detected. Personnel on site wear portable gas detectors in order to alert staff to presence of biogas. Physical protection measures in place for Biogas Storage, including fencing and the above ground pipework is guarded. PRVs available to safely manage pressures within the Biogas Storage and prevent under or over pressurization.	
Activation of biogas pressure relief valve	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	PRVs are only activated in emergency situations to maintain safety within the biogas system and are re-seated/repaired promptly to minimize biogas emissions. PRVs subject to monitoring via SCADA and visual checks by site personnel. Biogas is principally stored within two Biogas Storage holders which are suitably sized to manage biogas generation and act as buffer storage for biogas. Site has three CHP Engines, three boilers and one flare which are used in order of preference to maximise recovery of energy. Not all plant is permitted to run at the same time.	Low

						CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with flare maintained in good working order should it need to be used. The nearest residential properties are approx. 250 m east from the Biogas Storage holders and nearest commercial buildings approx. 150 m north.	
H_2S/biogas emitted when biogas cannot be combusted in CHP engines, boilers or flare	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	Biogas is principally stored within two Biogas Storage holders which are suitably sized to manage biogas generation and act as buffer storage for biogas. Site has three CHP Engines, three boilers and one flare which are used in order of preference to maximise recovery of energy. Not all plant is permitted to run at the same time. The nearest residential properties are approx. 250 m east from the Biogas Storage holders and nearest commercial buildings approx. 150 m north. CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with flare maintained in good working order should it need to be used.	Low
Storage of treated digested sludge cake	Normal	Emissions to air and dispersion leading to inhalation by local human receptors	High	Low	Medium	Digested sludge cake is stored within an enclosed and ventilated cake barn and is inherently a low odour material.	Low

		Loss of amenity from odour nuisance				The nearest residential properties are approx. 270 m north-east from the cake barn and nearest commercial buildings approx. 100 m north. The cake barn extracts via a flue within the central area of the site, creating a large separation distance between receptors and the cake barn. Should any odorous sludge cake be produced, this will be subject to process checks undertaken to identify root cause of production and removed from site expediently. The THP process further reduces the likelihood of non-conforming or odorous cake being generated.	
Failure of odour control units	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	High	Medium	Odour control units are subject to regular preventative maintenance. Media is replaced in line with the manufacturer's recommendations	Low
Storage of site generated wastes	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	Wastes generated on site are not inherently odorous and is stored securely for collection by appropriately licensed approved contractors.	Low

If the TGN or H1 assessment shows that noise or vibration are important issues, send us your noise or vibration management plan (or both)

The installation has the potential to generate noise as a result of the permitted activities. Potentially noisy activities are subject to a number of process controls and noise management is a key operational objective, as summarised in the risk assessment table below.

Table C3-3b(iii)Noise risk assessment

Activity/Hazard	Normal or Abnormal	Environmental Impact (Pathway-Receptor)	Likelihood	Consequence	Risk	Risk Management	Residual Risk
Operation of CHP engine	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	High	Low	Medium	The CHP Engines are acoustically baffled, self-contained and located within the CHP building. Therefore, noise emissions are already low. The nearest sensitive receptors are 120 m west of the CHP building, commercial/industrial premises. Residential receptors are approx. 320 m north-east of the CHP building. Good inspection regimes and maintenance of plant to ensure that excessive noise levels are not generated. Regular checks of noise mitigation measures fitted to items of plant. Such measures include silencers and baffles fitted to specific areas of plant. Where repair or replacement is required, the plant will, where possible, be taken out of service until repair or replacement of parts has been undertaken.	Low
Operation of fans on air cooled radiators	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	High	Low	Medium	Air cooled radiators do not give rise to high levels of noise and are only used as required. They are located away from sensitive human receptors, approx. 120 m from the nearest	Low

						commercial buildings and 320 m from the, nearest residential properties. Good maintenance of fans to ensure that excessive noise levels are not generated. Where repair or replacement is required, this will be completed promptly.	
Operation of site vehicles	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors. Generation of vibration with ground transmission, causing loss of amenity to local human receptors.	High	Low	Medium	Vehicle movements across the site subject to speed limit and one way system to reduce generation of noise. Shovel loading of digested sludge cake takes place within the enclosed cake barn. Tanker deliveries limited to daytime only.	Low
Vehicle movements – tanker deliveries of waste and bulk collections of digested sludge cake	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors. Generation of vibration with ground transmission, causing loss of amenity to local human receptors.	High	Low	Medium	Vehicle movements across the site subject to speed limit to reduce generation of noise. Imports of sludge take place to an import point located centrally, approx. 180 m from the nearest sensitive receptors near the entrance to the site. Shovel loading of digested sludge cake takes place within the enclosed cake barn. Tanker deliveries limited to daytime only. Bulk collections normally take place during daytime only.	Low

Vehicle movements – tanker deliveries of chemicals and raw materials	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors. Generation of vibration with ground transmission, causing loss of amenity to local human receptors.	High	Low	Medium	Deliveries likely to take place during daytime hours to specific delivery areas. Vehicle movements across the site subject to speed limit to reduce generation of noise and subject to a one-way system to reduce reversing obligations.	Low
Operation of emergency flare	Abnormal	Generation of noise with air transportation, causing loss of amenity to local human receptors.	High	Low	Medium	Use of the emergency flares is minimized by prioritizing use of the CHP Engines and boilers with use of the flare recorded. Emergency flare is located away from sensitive receptors, over 390 m from nearby residential properties and 120 m from commercial property.	Low

Table C3-3b (iv) – Environmental Risk Assessment and Accident Management Plan

A site-specific Accident Management Plan (AMP) is located in Appendix J.

Table C3-3b (v) – Bioaerosol Risk Assessment

The installation has the potential to generate bioaerosols which may pose a risk to nearby sensitive receptors. Please see the site-specific bioaerosol risk assessment presented in Appendix F.

3c – Types and amounts of raw materials

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

Types and amounts of raw materials used by the installation are summarised in the site-specific Residue Management Plan (RMP) which is located in Appendix I.

4 – Monitoring

4a – Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

Point A5 is assumed to be removed via this permit variation given it is not a DAA but the 2 x 5.92MWth standby diesel generators are currently subject to advice under the enhanced pre-application service.

The air emission points A1 (a) and (b), A2 (a) and (b), A3 (a) and (b), and A4 are monitored in accordance with EA guidance and the requirements of MCPD. The site has a number of emission points to air. Points A1 (a) and (b), A2 (a) and (b), A3 (a) and (b) for the three CHP Engines and three boilers which share a dual flue stack, are subject to gas monitoring in accordance with the requirements of the existing permit requirements and EA guidance.

The hours of operation of the flare stack, emission point A4, are monitored and logged. In the unlikely event that the total annual hours of operation exceed 10% of the hours in a year (876 hours), emissions from the flare as per the existing permit would be subject to monitoring in accordance with EA guidance.

Pints A13-A14 are OCUs and will have bi-annual testing.

There is no routine monitoring proposed for points A6 – A12 (PRVs) and A15.

Table C3-4a – Emission Monitoring

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A1 (a) – CHP Engine 1	TQ 51384 82383	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Carbon monoxide – hourly average Volatile Organic Compounds – Hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15267-3 BS EN 15058 BS EN 12619:2013
A1 (b) – Steam Boiler 1	TQ 51384 82383	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A2 (a) – CHP Engine 2	TQ 51389 82379	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Carbon monoxide – hourly average Volatile Organic Compounds – Hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15267-3 BS EN 15058 BS EN 12619:2013
A2 (b) – Steam Boiler 2	TQ 51389 82379	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792
A3 (a) – CHP Engine 3	TQ 51394 82374	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average Carbon monoxide – hourly average Volatile Organic Compounds – Hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15267-3 BS EN 15058 BS EN 12619:2013
A3 (b) – Steam Boiler 3	TQ 51394 82374	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – hourly average	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792
A4 – Emergency Flare	TQ 51337 82341	Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period.	n/a	-
A6 (THP PRV)	TQ 51413 82352	n/a	n/a	-
A7 (Primary Digester Tank PRV)	TQ 51439 82329	n/a	n/a	-

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A8 (Primary Digester Tank PRV)	TQ 51455 82349	n/a	n/a	-
A9 (Primary Digester Tank PRV)	TQ 51470 82367	n/a	n/a	-
A10 (Primary Digester Tank PRV)	TQ 51505 82339	n/a	n/a	-
A11 (Biogas Holder PRV)	TQ 51464 82324	n/a	n/a	-
A12 (Biogas Holder PRV)	TQ 51480 82343	n/a	n/a	-
A13 (OCU1)	TQ 51346 82415	Hydrogen sulphide Once every six months	CEN TS 13649 for sampling NIOSH 6013 for analysis OR US EPA M11	
		Ammonia: Once every six months	EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis	
A14 (OCU3)	TQ 51497 82288	Hydrogen sulphide Once every six months	CEN TS 13649 for sampling NIOSH 6013 for analysis OR US EPA M11	
		Ammonia: Once every six months	EN ISO 21877 OR CEN TS 1369 for sampling NIOSH 6016 for analysis	
A15 (Cake Barn Ventilation Stack)	TQ 51426 82328	n/a	n/a	
S1 (Liquor sampling point)	TQ 51450 82385	n/a	MCERTS or ISO/IEC 17025 where available	

4b - Point source emissions to air only

4b1 Has the sampling location been designed to meet BS EN 15259 clause 6.2 and 6.3?

No.

4b2 Are the sample ports large enough for monitoring equipment and positioned in accordance with section 6 and appendix A of BS EN 15259?

No.

4b3 Is access adjacent to the ports large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the test?

No.

4b4 Are the sample location(s) at least 5 HD from the stack exit

No.

4b5 Are the sample location(s) at least 2 HD upstream from any bend or obstruction?

No.

4b6 Are the sample location(s) at least 5 HD downstream from any bend or obstruction?

No.

4b7 Does the sample plane have a constant cross sectional area?

No.

4b8 If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)

No.

4b9 If you have answered 'No' to any of the questions 4b1 to 4b8 above, provide an assessment to how the standards in BS EN 15259 will be met.

As an existing operational site entering environmental permitting for the first time, sampling locations and sampling ports may not meet all of the requirements for BS EN 15259, but these are being checked onsite. Where a permanent sampling platform is not provided, temporary sampling platform is utilised to provide sufficient space, in accordance with standard industry practice, where sampling cannot be undertaken from the ground.

5 - Environmental impact assessment

5a Have your proposals been the subject of an environmental impact assessment under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment]?

No.

6 - Resource efficiency and climate change

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

Steam for the THP process is generated from three dedicated boilers located on site which makes use of heat generated by the CHP Engines, via a heat exchanger within the CHP house. The incoming warm sludge from the THP process is then used to maintain the optimum temperature within the Primary Digester Tanks.

The CHP Engines are suitably sized to maximise energy utilisation for the parasitic load, while minimising the use of the flare. Heat generated from the CHP Engines is used to supplement the steam-raising process in pre-heating the boiler water supply. Steam can also be supplied, as required, by auxiliary boilers which combust biogas or natural gas, as required.

Maintenance activities and low energy lighting is installed across the plant contribute towards energy efficiency

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

The main site energy source is electricity from the CHP Engines combusting indigenous biogas, supplemented by electricity imports from the public supply. The CHP Engines also provide useable heat for hot water and steam raising to the THP plant, via heat exchange. Auxiliary boilers combusting natural are used to meet additional heat demands for THP and digestion. Use of heat from the CHP Engines reduces the demand on diesel in the boilers. Diesel fuel is used as a back-up fuel for standby purposes in the event of an electricity supply problem.

In the event of a surplus of electricity, the site is able to supply electricity back to the National Grid.

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

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

Describe the specific measures you use for improving your energy efficiency

The production and use of biogas to generate electricity and produce heat (which is used in the THP and digestion processes) on site minimises the use of fossil fuels whilst recovering biological wastes. Location of the heat exchange, boilers, CHP Engines and Primary Digester Tanks within close proximity minimises the transmission losses on site, improving the efficiency of the process.

Regular and proactive maintenance of pumps and insulation of pipework will improve efficiency and minimise the electrical demands and heat losses on site.

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

See response to question 3c above.

The processes take digested sludge which would otherwise require additional disposal and recover energy and nutrients which can be put to beneficial use.

Small quantities of chemical raw materials are required to control and maintain the process. These are all proven materials that are extensively used within the water industry.

The other main raw materials are used in the generation of electricity and heat, and maintenance of combustion plant, which is supplied to the treatment process.

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

The facility is a waste treatment plant, and the primary wastes produced through the processes on site are maintenance wastes. Production of maintenance waste is minimised by ensuring that preventative maintenance is carried out based on a combination of manufacturers' best practice and operational experience.

Form C4 Questions

1 About the permit

1a What waste operations are you applying to vary?, Waste operations which do not form part of an installation

The original CHP permit was a waste level permit. This has now been incorporated within the installation permit as a DAA. This permit application is for a new waste operation for temporary storage of non-hazardous waste as a secondary activity waste operation to the main listed installation.

1b –types of waste accepted and restrictions

The EWC list is included in the responses to form C3.

1c Deposit for recovery purposes

This is not a deposit for recovery application

2 Point source emissions to air, water and land

Please see responses to form C3

3 Operating techniques

3a Technical standards

Please see responses to form C3

3b General requirements

Please see responses to form C3

4 Monitoring

4a Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

Please see responses to form C3

4b Point source emissions to air only

Please see responses to form C3

Form C6 Questions

The relevant questions within the form are those applicable to effluent and / or surface water run-off arising from the operation of an installation

Q1About the effluent – details and type, continued

1a Give a brief description of the effluent discharge you want a permit for, for example, treated domestic sewage effluent

This effluent is a mixture of waste liquors from the operation of the installation for the anaerobic treatment of separated sewage sludge. It primarily comprises of dewatering liquors returned to the work inlet following the dewatering of sludge and dewatering of treated sewage sludge within the installation. Lower volume constituents will include rainfall; biogas condensate; boiler waste waters; contaminated run off and washdown water. The only wastes treated within the installation are sewage related, either being separated from the UWWTD flow in the wider works, or comprise of waste imports, principally of sludge from smaller satellite treatment works.

1b Give this effluent a unique name

Liquor returns

1d Have you obtained all the necessary permissions in addition to this environmental permit to be able to carry out the discharge (see C6 guidance notes for more details)?

Yes. The discharge is into the inlet of a sewage works controlled by the applicant.

Q2 About the effluent – how long will you need to discharge the effluent for?

2c Will the discharge take place all year?

Yes, the discharge will take place all year

Q3 How much do you want to discharge?

3b What is the maximum volume of effluent you will discharge in a day?

8,225 Cubic metres

3c What is the maximum rate of discharge?

95.19 Litres / second

3d What is the maximum volume of non-rainfall dependent effluent you will discharge in a day?

8,225 Cubic metres

3f For each answer in question 3, show how you worked out the figure on a separate sheet

Q3b –The liquor arisings must come from the installation inputs as there is limited additional water inputs. The maximum volume of effluent discharged per day will consist of primary thickening liquors, post-digestion

dewatering liquors and biogas condensate generated from the inputs and outputs to/from the Primary Digester Tanks.

Q3c – Maximum rate of discharge (L/second) is generated from the maximum volume of effluent per day [8,224.69 m^3 x 1000] / 86,400 (24 x 60 x 60) from sources such as thickening and dewatering. This gives a value of 95.193171296 litres, rounded up to 95.19 litres per second.

Q3d – The liquor arisings must come from the installation inputs as there is limited additional water inputs. The maximum volume of effluent discharged per day will consist of primary thickening liquors, post-digestion dewatering liquors and biogas condensate generated from the inputs and outputs to/from the Primary Digester Tanks.

Q4 No questions

Q5 Should your discharge be made to the foul sewer?

5a How far away is the nearest foul sewer from the boundary of the premises?

Not applicable, the site is located within the curtilage of a sewage treatment works and discharges into the works inlet via the site drainage system.

5b2 Discharges from all other premises including trade effluent

Not applicable, the site is located within the curtilage of a sewage treatment works and discharges into the works inlet via the site drainage system.

Q6 How will the effluent be treated?

6a Do you treat your effluent?

No. The Effluent generated by the process of treating sludge within the installation is returned to the inlet of the wider Riverside STW, where it is subject to aerobic treated in a mixture with UWWTD related waste waters.

6b Fill in Table 2 for each stage of the treatments carried out on your effluent in the order in which they are carried out

Order of Treatment	Code Number	Description
First	09	Primary settlement within sewage works
Second	31	Activated sludge process
Third	21	Sand filtration

6c You must provide details on a separate sheet of the final effluent discharge quality that the overall treatment system is designed to achieve

The final effluent discharge from the wider sewage treatment works is specified in Environmental Permit TH/CSSA.0364/009

Q7 What will be in the effluent?

7b Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' added to or present in the effluent as a result of the activities on the site?

At present, no sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken. Only limited chemicals are added to the process within the installation boundary, primarily antifoam (in low doses, as required) and polymer to aid dewatering of sludge. A review of the appropriate MSDS data does not indicate the presence of 'specific substances' within those chemicals.

Sampling and analysis of the liquor returns to fully characterise the waste streams in accordance with BAT 3 will be undertaken at the site, in line with what is technically achievable, as per the commitment to undertake a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

7c Have any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' been detected in samples of the effluent or in the sewerage catchment upstream of the discharge?

At present, no routine sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken either for effluent from the installation or within the wider sewerage catchment. Thames Water commits to undertaking a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

7d Are there any other harmful or specific substances in your effluent not mentioned in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater'?

At present, no sampling or analysis for all substances listed within the referenced risk assessment at the site has been undertaken. A review of the MSDS sheets for chemicals used within the installation does not indicate the presence of any other harmful or specific substances. Thames Water commits to undertaking a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

7e If you have answered 'No' to any of questions 7a to 7d provide details on a separate sheet of how you have established that the effluent is not likely to contain specific substances

Thames Water commits to undertaking a chemical analysis of the installation's effluents as per "Return Liquors BAT 3, 6, 7" within Appendix M.

A review has been undertaken of the relevant MSDS sheets for chemical used routinely within the installation to look for substances identified within the risk assessments listed.

7f What is the maximum temperature of your discharge?

20°C back into the sewage works

7g What is the maximum expected temperature change compared to the incoming water supply?

0°C

Q8 Environmental risk assessments and modelling

8b Discharges to lakes, estuaries, coastal waters or bathing waters

The installation does not discharge to lakes, estuaries, coastal waters or bathing waters

8d Discharges to groundwater

The installation does not discharge to groundwater

8e Discharges to freshwater (non-tidal) rivers from an installation, including discharges via sewer

No modelling has been undertaken on the output from the installation at present. The final effluent discharge from the wider works, which includes the installation arisings has previously been subjected to modelling as part of the environmental permitting discharge application process.

8f Environmental impact assessment

No environmental impact assessment has been carried out on the installation, as it is an existing facility.

Q9 Monitoring arrangements

9a What is the national grid reference of the inlet sampling point? (for example, SJ 12345 67890)

Not applicable to this installation

9b What is the national grid reference of the effluent sample point?

No sampling point installed at present. Effluents will be sampled from the Sample point identified in Table C3-4a (approximately) within the installation.

9d What is the national grid reference of the flow monitoring point?

No flow meter installed

9e Does the flow monitor have an MCERTS certificate?

No. No flow meter installed

9f Do you have a UV disinfection efficacy monitoring point?

No. Not installed as part of this installation.

9h You should clearly mark on the plan the locations of any of the above that apply to this effluent

Please see site emission point plan.

Q10 Where will the effluent discharge to?

10a Where the effluent discharges to

Non-tidal river, stream or canal

10b Is this effluent discharged through more than one outlet?

No

10c If you answered yes to question 10b above make sure you show clearly on your discharge point appendix or appendices and site plan that this one effluent can discharge to more than one discharge point

N / A

Appendix 5 – Discharges to non-tidal river, stream or canal

A5.1 Give the discharge point a unique name For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan)

Outlet 1

A5.2 Give the national grid reference of the discharge point

TQ 51500 81900

A5.3 Give the name of the watercourse, canal or the main watercourse it is a tributary of if you know it

Rainham Creek, via the wider UWWTD sewage treatment works

A5.4 Is the discharge into a:

Non-tidal river

A5.5 Does the discharge reach the watercourse or canal by flowing through a surface water sewer?

No

A5.6 Does the watercourse dry up for part of the year?

No

A5.61 If the watercourse does dry up for part of the year can you indicate a typical period when the surface water runs dry each year – start and finish (in months)

N / A

A5.6.2 If the watercourse does dry up for part of the year, how many metres downstream of the discharge is it before the discharged effluent soaks in?

N / A

A5.7 Is the discharge made to a roadside drain or ditch?

No

Appendix A. Figures

A.1 Site Location Plan

Please see document: B22849AM-JAC-RVE-DR-0001.

A.2 Installation Boundary and Air Emission Points Plan

Please see document: B22849AM-JAC-RVE-DR-0002.

A.3 Site Impermeable and Permeable Surfacing Plan

Please see document: B22849AM-JAC-RVE-DR-0003.

A.4 Site Drainage Plan

Please see document: RVES1ZZ-DPL-001.

A.5 Process Flow Diagram

Please see document B22849AZ-JA-RIVES1ZZ-LSX-DR-P-0001.

A.6 Site Photographs

Please see document TW_STC_EPR_16a_RVE_APPA.6.

Appendix B. CoTC

Please see document TW_STC_EPR_16a_RVE_APPB.

Appendix C. Site Condition Report - H5

Please document TW_STC_EPR_16a_RVE_APPC.

Appendix D. BAT Assessment

Please see the appended BAT Assessment Spreadsheet: TW_STC_EPR_16a_RVE_APPD.

Appendix E. Odour Management Plan

Please see document TW_STC_EPR_16a_RVE_APPE.

Appendix F. Bioaerosol Risk Assessment

Please see document TW_STC_EPR_16a_RVE_APPF.

Appendix G. Containment Assessment

G.1 Containment Options Report (CIRIA 736)

See document: B22849AZ-JA-RIVES1ZZ-100-RP-Z-0001

G.2 Containment Assessment

See document: B22849AZ-JA-RIVES1ZZ-100-CA-P-0001

Appendix H. Leak Detection and Repair (LDAR) Plan

Please see document TW_STC_EPR_16a_RVE_APPH.

Appendix I. Residue Management Plan

I.1 Residue Management Plan

Please see document TW_STC_EPR_16a_RVE_APPI.1.

I.2 MSDS Zip File

Please see separate zip file: TW_STC_EPR_16a_RVE_APPI.2

Appendix J. Accident Prevention and Management Plan

Please see document TW_STC_EPR_16a_RVE_APPJ.

Appendix K. Acceptance of Third-Party Waste Imports

K.1 Acceptance of Third-Party Waste Imports

Please see document TW_STC_EPR_16a_RVE_APPK.1.

K.2 Acceptance of TWUL Inter-Site Sludge and Cake

Please see document TW_STC_EPR_16a_RVE_APPK.2.

Appendix L. Air Quality Assessment

Not applicable to this application.

Appendix M. Liquor Monitoring

Please see document TW_STC_EPR_16a_RVE_APPM.