Sludge Treatment Centre Permitting

Environmental Permit Variation Application - Mogden STC Resubmission

TW_STC_EPR_13a_MGD_ASD | Resubmission

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Thames Water

EPR/WP3533LT/V006

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Contents

Introduction

This substantial variation application relates to a biological treatment permit for the Mogden Sludge Treatment Centre (STC), located at the Mogden Sewage Treatment Works (STW), operated by Thames Water Utilities Ltd (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 ('sludges') 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 thickening of separated sludge from the main aerobic treatment flow and blending with imported waste of a similar nature to indigenous sludge, sludge pre-treatment, anaerobic digestion, through to the transfer of digested sludge cake prior to offsite dewatering plant, including biogas storage and utilisation (by multiple consumptive means), will fall within the scope of this permit variation application.

The previous permits in place at the site for the listed activity operation of combustion plant installation (EPR/WP3533LT/V005) and for the importation of tankered trade waste to the works inlet (a standard rules permit, SR2008 No.19 250kte, permit number: EPR/CP3999LE/A001), will be merged and remain in place as directly associated activities to this listed process. This application is for the purposed of varying the existing permitted activities to include the anaerobic digestion process as an additional installation activity at the site.

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.

1.1 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 sludges and Surplus Activated Sludge (SAS) from the onsite aerobic treatment process and treatment of imported sewage sludges from other sites, arriving by road to a Sludge Import point. The indigenous sewage sludges are generated from the aerobic treatment of both waste waters from the sewer network arriving into site at the Works Inlet, and, from imported waste materials, arriving by road transport into a dedicated waste import points to the works inlet. The storage of biogas and operation of biogas fuelled Combined Heat and Power (CHP) Engines, biomethane upgrading plant and boilers for the generation of electricity, production of biomethane for export (Gas to Grid) and generation of heat at the site along with all other combustion plant at the facility, which is classified as listed activity combustion plant under s1.1A1 of the Environmental Permitting Regulations, is already permitted, and will be classified as a separate listed activities to the new listed activity.

The Mogden STC is located within the Mogden STW, in south-west London, within the London Borough of Hounslow.

The STC treats both indigenous sludges and imported sludges. Indigenous sludge is generated from the incoming flow to the STW which passes through the aerobic treatment process under the UWWTD. Indigenous primary sludges derived from the main flow are transferred to the two Primary Sludge Buffer Tanks and mixed with imported sludges from the Sludge Import Tank via Sludge Screens. The Sludge is then transferred through Sludge Screens to the Primary Sludge Thickening Plant. SAS from elsewhere in the aerobic process is subject to thickening

in SAS Thickening Plant. Liquors from the SAS and Primary Sludge thickening processes are pumped back to the works inlet and UWWTD process for additional treatment, via the Liquor Return Pumping Station 9 and 16, respectively. Thickened SAS and thickened primary sludge are blended within the Thickening Sludge Buffer Tank, before being pumped to the Pasteurisation Process.

Imported sludge from other works is delivered to a sludge import point via tankers into a Sludge Import Tank, is screened and pumped to the Primary Sludge Buffer Tanks. All such imports are subject to appropriate waste pre-acceptance and acceptance checks, prior to acceptance. Indigenous primary sludge and imported sludge combine in the Primary Sludge Buffer Tanks and are pumped to Primary Sludge Thickening Plant via Sludge Screens, as described above.

The STC comprises two offloading points for permitted imported tankered waste to the works inlet of the STW. The waste arrives at the STC via tanker, is discharged and combines with incoming material from the sewer and is pumped to the Works Inlet. This material is passed via screens and subject to the aerobic treatment process under the UWWTD.

All imports will be assessed using the Thames Water standard waste pre-acceptance checks to ensure that they are appropriate for treatment via the UWWTD. Once pre-approved as suitable for treatment via the UWWTD route, the waste carriers are approved. Wastes will be subject to appropriate waste acceptance checks in accordance with Thames Water procedures.

Following the Pasteurisation Process, sludge is transferred to the Pasteurised Sludge Buffer Tanks before it is pumped to one of the 16 Primary Digester Tanks at the site. Primary Digester Tanks are buried by an embankment which surrounds the tanks, with Biogas Storage holders mounted on top of each Primary Digester Tank.

Following treatment over an appropriate number of days within the Primary Digester Tanks, digested sludge is transferred to the Digested Sludge Buffer Tank, from this tank, digested sludge is pumped by Sludge Pumping Station 14 to an Offsite Dewatering Plant (Iver South Sludge Dewatering Centre (SDC)), which receives Mogden's digested sludge for dewatering. Operations at Iver South SDC are already permitted and outside of the scope of this permit variation application. As required, digested sludge is pumped to the Contingency Storage Tank before it is pumped offsite.

Biogas from the Primary Digester Tanks is captured and stored within roof mounted Biogas Storage holders. Individual biogas lines from each Biogas Storage holder join a common line and passes via a biogas compressors before it is sent to the CHP Engines, Gas-to-Grid plant, boilers or Emergency Flares. The biogas lines are fitted with condensate pots which captures entrained moisture for discharge to the site drainage. The Primary Digester Tanks are fitted with pressure release valves (PRVs) as a safety precaution in the event of over pressurising the system. A siloxane filter is fitted upstream of the CHP Engines in order to remove impurities prior to combustion of the biogas in the CHP Engines.

Biogas is combusted within one of the three CHP Engines on site, generating electricity which is normally all used within the site. Heat from the CHP Engines is recovered and used within the heat exchange on the Pasteurisation Process which is backed up by four dual fuelled auxiliary boilers which can combust biogas or diesel. Biogas is also utilised within the Gas-to-Grid plant, upgraded to biomethane and injected into the gas distribution network for offsite use. These combustion assets are regulated under Environmental Permit EPR/WP3533LT/V005 as a s1.1A1 listed combustion plant activity due to their thermal input exceeding 50MW.

In the event there is excess biogas, i.e. more than the CHP Engines, Gas-to-Grid plant, or boilers can utilise, or in the event that the CHP Engines, Gas-to-Grid plant, or boilers are unavailable, there are two ground mounted emergency flares which are utilised under 10% of the year or less than 876 hours per year.

There are existing emergency standby diesel generators and diesel standby pumps that are not changed by this variation application.

2. 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 (UWWTD) by the Environment Agency. It relates to a biological waste treatment permit for the Mogden STC, located at the Mogden STW, operated by Thames Water Utilities Ltd (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. It also permits the acceptance of portable toilet wastes along with cess, septic tank, and similar sewage derived materials, to the Works Inlet for processing through the Urban Waste Water Treatment Directive (UWWTD) treatment route. There are a number of Directly Associated Activities (DAAs), including the operation of a pasteurisation plant for pre-treatment, as well as biogas storage, scrubbing and processing, operation of Emergency Flares, oil storage, and condensate drainage systems. The site's existing listed activity is for combustion plant with an aggregated thermal input of greater than 50MW.

The biogas CHP Engines and associated boilers are covered by an existing S1.1A1 Environmental Permit EPR/WP3533LT/V005. This permit is subject to a substantial variation to add a new listed activity of anaerobic digestion for recovery.

A standard rules permit, EPR/ CP3999LE/A001, SR2008 No.19 250kte, is subject to a minor variation for the consolidation of existing import activities at the head of the works.

Location

The Mogden site is located within the Twickenham area of south-west London, an industrialised urban area consisting of residential, commercial and industrial premises. The site is bounded on all sides by residential or commercial premises but maintains a small vegetation buffer between the site assets and nearby receptors, who are mainly between 50 m and 100 m distance from the nearest asset.

The whole of the STW and STC is within a Flood Zone 1 indicating that there is a low annual probability of river flooding (less than 1:1000 annual probability of flooding). The only exception to this is the Duke of Northumberland's River, an artificial channel that runs from south to north through the middle of the STW towards the River Thames. This channel is considered to be in Flood Zone 3 with a high annual probability of flooding, greater than 1:100, however, this has not been known to flood outside of the channel and into the works. The whole of the site sits outside of a Source Protection Zone but is within the Hounslow Air Quality Management Area (AQMA). The Hounslow AQMA was declared by the London Borough of Hounslow encompassing the entire Borough of Hounslow for nitrogen dioxide (NO_2) - Annual Mean

There are six designated habitat sites within the relevant distances of the site and 24 non-statutory designated Local Wildlife Sites (LWSs) within 2 km of the site. The nearest is a Local Nature Reserve (LNR), Isleworth Ait which is approx. 950 m north-east of the site. Syon Park, a Site of Special Scientific Interest (SSSI) is approx. 1.5 km to the north-east and Ham Lands LNR is approx. 2 km south-east of the site. Richmond Park Special Area of Conservation (SAC) is approx. 3 km to the south-east and Wimbledon Park SAC is approx. 6.6 km away in a south-easterly direction. Parts of the South West London Waterbodies, which is both a Ramsar site and Special Protection Area (SPA) can be found within 5 km and 10 km of the site within a south-westly direction. There are no Ancient Woodlands within 2 km of the site.

A site plan, showing the permitted area of the Mogden 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

Name	Quantity	Volume (m3)	Total Operational Volume (m3)	Material
Primary Sludge Buffer Tanks	2	1,505	3,010	Steel
Sludge Import Tank	1	331	331	Steel
Thickening Sludge Buffer Tank	1	320	320	Steel
Pasteurisation Process (Consists of the following:				
12 x Pasteurisation Tanks (Each stream has 1 pre-heat tank, 1 reactor tank)	12	200	2,400	Steel
Pasteurised Sludge Buffer Tanks	2	150	300	Steel
Primary Digester Tanks	16	4,125	66,000	Concrete
Digested Sludge Buffer Tank	1	520	520	Steel
Contingency Storage Tank	1	1,957	1,957	Steel
Overall Volume			74,838	
Primary Sludge Thickening Plant Polymer Silo	2	15 tonnes		Steel
SAS Thickening Plant Polymer Silo	1	30 tonnes		Steel
Sodium Hypochlorite Silo	1	42,000 litres		Not specified
Sodium Hydroxide Silo	1	42,000 litres		Not specified
Boiler House Diesel Tank	1	40,000 litres		Not specified
Diesel Tank	3	32,000 litres		Not specified
Standby Generator Diesel Tank	1	11,000 litres		Not specified

Waste Activities

The STC comprises of imports of waste for biological treatment and one additional waste activity (imports of non-hazardous waste to the head of the works). Biological treatment processes at the installation are for indigenous sludges separated from the UWWTD area of the site and treatment processes for imported sludge that arrives at Mogden STC by tankers and consists of sludge from other Thames Water sites, which forms a waste activity for the site.

Imports of non-hazardous waste is considered a secondary waste operation to the main listed activity and consist of portable toilet waste along with cess, septic tank and similar sewage derived materials to the head of the works for processing through the UWWTD treatment.

There is also a waste management activity for the operation of a biogas upgrading plant to produce biomethane for injection into the National gas Grid.

Imports

Waste imports to the head of the works consist of two offloading points for permitted imported waste, depending upon the size of the delivery vehicle. All imports are made by road, normally from tankers and tanker vehicles and consists of liquids and associated sludges from domestic and municipal sources that are similar in composition to those materials derived from the sewer network and managed via the UWWTD route. No wastes are imported packaged in other ways than tankers. Access to the offloading point is controlled by the issue of keys by Thames Water to approved contractors only who have undergone appropriate waste pre-acceptance checks on the material they wish to import. These keys enable the delivery tankers to discharge waste into the works, through a data logger which records the volume of waste transferred.

Waste import of non-hazardous wastes to the head of the works (an existing waste operation) is considered a secondary waste operation to the main listed activity. One of the offloading points is mainly used by vehicles smaller than 3.5 tonnes and one is mainly used by vehicles that are larger than 3.5 tonnes (Cess/Domestic Tanker Waste Imports 2 and 1, respectively). Imports to the eastern offloading point is via one data logger and import hose which can accept imports of waste 24/7, normally from smaller vehicles. All transfers of waste are via the site supplied flexible hose pipe (to prevent misconnections) and through a data logger. Imported wastes are discharged through the data logger, which records the volume of waste material discharged. Imports mix with the incoming flows from the sewer network. This cess/waste import area is made of engineered concrete with a gentle slope to gully drainage which feeds directly to the works via a manhole into the incoming sewer. Webcam coverage monitors this area.

Imports to the western offloading point is via one data logger and the site supplied flexible hose pipe (to prevent misconnections), which is monitored by webcam. Imported wastes are discharged through the data logger which discharges into the incoming sewer and are mixed with the incoming UWWTD flows. The waste import area is made of engineered concrete with sleeping policeman forming a small bund at the entrance and directing any liquids or spillages into the drainage system of the wider works.

The incoming flows at Mogden are treated in the aerobic UWWTD process within one of five streams, two via the East side, one via the West side and two via West side extensions. Following treatment, sludge is removed and treated through the sludge digestion assets. Operations prior to the thickening of sludge are not included within the scope of this permit.

Sludge Processes

Primary sludge from the Primary Settlement Tanks (PSTs) is transferred to one of two Primary Sludge Buffer Tanks where it mixes with the imported sludge from the Sludge Import Tank. The two tanks are above ground, covered, connected to an OCU and of steel construction with a reinforced glass lining. They are hydraulically balanced and operate in parallel, although can be isolated and bypassed for maintenance if required. Each tank is fitted with ultrasonic levels and float switches connected to the SCADA system which would inhibit transfer pumps and prevent overfilling of the tanks if a high level is reached. Both tanks have external aeration systems in order to mix the sludge and prevent settling. Primary sludge is then pumped to Sludge Screens which removes rag and inorganic material. This waste material is compacted and sent for offsite disposal. Screened sludge is then transferred to the Primary Sludge Thickening Plant for thickening. A polymer from a bulk powder silo is made up using Potable Water / Final Effluent water, stored in a day tank and dosed into the Primary Sludge Thickening Plant to aid coagulation of the screened sludge with the liquor being returned via Liquor Return Pumping Station 16 and the site drainage to the UWWTD process for further treatment. The thickened sludge is pumped into the Thickening Sludge Buffer Tank where it is mixed with thickened SAS. The Primary Sludge Thickening Plant and Thickening Sludge Buffer Tank are connected to an OCU.

SAS from the aerobic process is pumped to the SAS Buffer Tank, which is outside of the scope of this permit and then pumped to the SAS Thickening Plant. A polymer from a bulk powder silo is made up using Potable Water / Final Effluent water, stored in a day tank and dosed into the SAS Thickening Plant to aid coagulation of the SAS. The SAS Thickening Plant is connected to an OCU. Liquors from the SAS Thickening Plant are returned via Liquor Return Pumping Station 9 and the site drainage to the Works Inlet for further treatment. The thickened SAS is then pumped to the Thickening Sludge Buffer Tank where it is mixed with thickened primary sludge.

The Thickening Sludge Buffer Tank is of steel construction with a reinforced glass lining that is covered and connected to an OCU. Thickened SAS and thickened primary sludge are blended in this tank which has air mixing to prevent settling prior to the pasteurising of the sludge. There are two sludge pumps that operate duty/standby to transfer mixed thickened sludge to the Pasteurisation Process via aboveground sludge pipes.

Imports of sludge from other works is accepted into an inter-site transfer point for biological treatment and is pumped into the Sludge Import Tank. There is a site supplied import hose (to avoid misconnections) connected to the sludge logger which records the volume of sludge transferred and the origin of the sludge. Access to the sludge logger is via a key fob that is issued to drivers and the logger records the volume of sludge transferred and

the originating site. The sludge is screened to remove inorganic material and the screened sludge is pumped to the Primary Sludge Buffer Tanks where it is mixed with indigenous sludge, and is subject to thickening, as above. The Sludge Import Tank and Sludge Screens are odour abated by an OCU. Imported sludge from the Sludge Screens can also be pumped directly to the Thickened Sludge Buffer Tank, as required.

Pasteurisation Process

Thickened sludge is pumped from the Thickening Sludge Buffer Tank and is subject to pre-treatment via a Pasteurisation Process. The Pasteurisation Process has 12 streams consisting of one Pre-Heat Tank and one Reactor Tank per stream. All of the pasteurisation tanks are of steel construction, above ground and situated within an area of made ground which is of concrete engineering and connected to the site drainage system. The Pasteurisation Process operates 24/7, receiving small batches of sludge at a time and the Pasteurisation Process takes approximately 60 minutes. The Pasteurisation Process is a two-step process which commences with a small batch of cold fresh sludge being pumped into the Pre-Heat Tank, where the sludge enters into an inner chamber and is subject to mechanical mixing while being held and heated. At the same time, hot pasteurised sludge from the Reactor Tank is pumped to a heat exchange system in the outer chamber of the Pre-Heat Tank in order to pre-heat the cold fresh sludge. The heated sludge is then pumped into the Reactor Tank for pasteurising at a minimum of 60°C and 60 minutes which increases the pathogen kill. Each Reactor Tank has an external hot-water heating jacket and both a mechanical mixer and air mixing to prevent settling of the sludge. After 60 minutes, the pasteurised sludge is pumped back to the outer envelope of Pre-Heat Tank in order to cool by pre-heating a fresh batch of incoming sludge. There is provision to supply external heat from dual fuelled boilers as required, while pipework interconnects between the two streams. The entire Pasteurisation Process system is connected to an OCU for odour abatement. The SCADA system monitors parameters within the system, including the pressures, levels and temperatures and would inhibit further feeding in the event of a high-level alarm.

Pasteurised sludge from the outer envelope of the pre-heat tank is pumped to one of the two Pasteurised Sludge Buffer Tanks (PSBT) via subsurface pipes. Both of the PSBTs are partially subsurface, covered tanks which have air mixing. They are fitted with level controls that are connected to the site SCADA system and would inhibit the feeding of the Pasteurisation Process in the event of a high-level alarm to prevent overtopping. The tanks are connected to an OCU to manage malodourous air. Sludge transfer pumps transfer the pasteurised sludge to one of the site's Primary Digester Tanks and anti-foam from an Intermediate Bulk Container (IBC) is dosed in at the transfer pumps as required to reduce foaming in the Primary Digester Tanks. SAS from the SAS Thickening Plant can bypass the Pasteurisation Process, as required, and is pumped to the PSBTs.

Digestion process

There are 20 Primary Digester Tanks at Mogden STC however only 16 of the tanks are in regular operation, with tanks no.1-4 decommissioned. The Primary Digester Tanks are all subsurface, due to being surrounded by a man-made embankment that extends from the ground level of the site around. All of the Primary Digester Tanks are of concrete construction with a roof mounted Biogas Storage holder. All tanks are fitted with ultrasonic levels measuring both the sludge depth and the Biogas Storage holder height, PRVs for safety and are subject to periodic emptying and cleaning. Small batches of sludge from the PSBTs enter midway into each Primary Digester Tank sequentially, controlled by the process controller. Sludge is drawn off from the bottom with separate re-circulation mixer/chopper pumps and after approximately 12 days residence time, digested sludge is drawn from the bottom of the tanks and pumped via a subsurface pipe to the Digested Sludge Buffer Tank by one of three dedicated pumps. The Primary Digester Tanks are primarily heated by the incoming pasteurised sludge but an external heat source can be supplied via heat exchange from recovered heat from the CHP Engines or from auxiliary boilers.

The Digested Sludge Buffer Tank is located outside of Sludge Pumping Station no.14 and receives the digested sludge. This tank is an aboveground, steel tank that is reinforced with a glass lining and is connected to an OCU to treat malodourous air. Mixer/chopper pumps operate to prevent the sludge settling and level monitors connected to the site SCADA system prevent overfilling of this tank by inhibiting the feed pumps from the Primary Digester Tanks. There are no dewatering operations for digested sludge at Mogden STC, instead this sludge is transferred off site for dewatering. There are four sets of duty/standby pumps located within Sludge Pumping Station no. 14 which draws digested sludge from the base of the Digested Sludge Buffer Tank and pumps it via two independent sludge mains to Offsite Dewatering Plant at Iver South Sludge Dewatering Works. This site is an

existing permitted site (EPR/DP3291SW/A001) operated by TWUL and all operations at Iver South are outside of the scope of this permit variation application.

A Contingency Storage Tank is available to store sludge in the event of abnormal operations. This tank is an above ground, open tank, of steel construction that is reinforced with a glass lining with a shallow conical bottom. The Contingency Storage Tank receives digested sludge from the Primary Digester Tanks as required, for example due to planned maintenance of Sludge Pumping Station 14. Digested sludge is returned from the Contingency Storage Tank to the sludge line between the Primary Digester Tanks and the Digested Sludge Buffer Tank.

Biogas

Biogas from the Primary Digester Tanks is captured in roof mounted Biogas Storage holders on top of each of the Primary Digester Tanks. The Biogas Storage holder rises and falls depending upon the levels of biogas in each holder, before being drawn off and into a common biogas line, where the biogas is passed through activated carbon scrubbers to remove impurities. This common biogas line is fed to biogas compressors which either pressurise the biogas and feed the CHP Engines, Gas-to-Grid plant and boilers or diverts unpressurised biogas to the Emergency Flares. The level of the Biogas Storage holders are monitored and controlled between two set points for safety. The whole of the Primary Digester Tank area is ATEX rated for safety, is protected by a security fence and there is lightning protection.

The aboveground biogas transfer pipeline is equipped with condensate pots that capture entrained moisture from the generated biogas and allow it to be drained to the site drainage system for treatment through the UWWTD system. This improves the quality of the biogas and reduces impurities that could reduce the efficiency of the CHP Engines. The biogas transfer pipeline passes subsurface within the digester area towards the boiler house and power house along an accessible walkway which allows for routine maintenance. A slam shut valve is present on the main biogas line and would automatically isolate the Biogas Storage holder in the event of an emergency situation.

The biogas is primarily used as a fuel within the three CHP Engines that are present on site to generate electricity which is normally used within the site. Biogas can also be consumed within the Gas-to-Grid plant or combusted in one of the four dual fuelled boilers to generate heat for the pasteurisation or digestion processes. If none of the CHP Engines, Gas-to-Grid plant or the boilers are available, biogas can be diverted to the Emergency Flare.

There is a currently permitted waste activity for a Gas-to-Grid plant at the site, which separates biomethane from the site generated biogas, following biogas drying to remove water and separation of CO_2. Following checks on biomethane quality, including calorific value enhancement using propane (if required), the biomethane is odourised and injected into the national gas grid for use offsite. The grid injection point is equipped with a remote slam shut valve and the Gas-to-Grid plant has a dedicated Emergency Flare for use in the event of the loss of grid outlet. If the grid outlet is not available, biogas is utilised within the wider site combustion infrastructure. This plant remains as currently permitted as a DAA to the overall processes on site.

The three CHP Engines are all MWM TCG 2020 V12 engines with a thermal input of 4.68 MWth. They generate electricity and generate heat which is passed via a heat exchange to supplement the Pasteurisation Process and Primary Digester Tank heat demand, via lagged and insulated pipework. These are 'existing' combustion plants and are permitted by the existing Combustion Plant Environmental Permit (EPR/WP3533LT/V005). In the event of additional heating being required, biogas may be used in the onsite auxiliary boilers. There are four dual fuelled composition boilers which can operate on biogas or diesel oil. The four boilers are Strebel SRE 240 hot water boilers units with a thermal input of 1.62 MWth each. Emissions to air from the CHP Engines is via a 26-metre common stack and emissions to air from the boilers are via individual stacks of approximately 6m.

A PpTek siloxane removal system is located at the power house, upstream of the CHP Engines on the biogas line and operate in series to remove impurities from the biogas prior to combustion in the CHP Engines.

In the event of excess biogas, there are two ground mounted Emergency Flares which can combust biogas. The Emergency Flares are utilised under 10% of the year, less than 876 hours per year and its use is recorded via

SCADA. One Emergency Flare is associated with the Biogas Storage and one Emergency Flare is used by the Gas -to-Grid plant.

Emergency Standby Generators

The STW has existing emergency standby diesel generators and diesel standby pumps which are already permitted by the existing permit. These remain as per the existing details and are not changed by this permit variation.

BAT Considerations

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

2.1 BAT 3; 6; 7: Return Liquors

The site does not have a Liquor Treatment Plant. Liquor treatment for waste waters arising within the permitted area is part of the 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

There is one open topped tank within the permit boundary at Mogden STC, the Contingency Storage Tank.

Thames Water is committed to meeting the requirement 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 Mogden 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 digester operations are monitored automatically from the control centre at the site 24-7. Checks include digester health, temperature and operation. As described, tanks are equipped with appropriate high-level alarms and automatic cut off valves to minimise releases. The Pasteurisation Process and Primary Digester Tanks are also fitted with dual pressure relief valves which operate in 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 pasteurisation digestion site such as Mogden 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 (pasteurisation) typically, 5,000 - 10,000mg/litre range (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.

- 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. Mogden fits into the second row of the table.

- Dry solids feed: see table below, Mogden 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

Due to 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.

Odour

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

Bioaerosols

Digested sludge cake is not stored on site. See Appendix F for the site specific bioaerosol risk assessment.

Other Items

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

A leak detection and repair (LDAR) plan has been prepared for the site and this is presented as Appendix H.

An air dispersion model has previously been provided for the site. Combustion and biogas upgrading processes on the site are currently permitted and there are no changes to these units as part of this application. As such, the previous modelling remains valid and all emission limits are unchanged.

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 listings under Schedule 1 are:

Section 1.1 Combustion activities

Part A(1) (a) Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more (existing listing)

and

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; (new listing)

The site includes the following Directly Associated Activities (DAA):

- ***Biogas storage and scrubbing;***
- ***Biogas processing for siloxane removal;***
- ***Emergency*** Flares***;***
- ***Oil storage;***

- ***Surface water drainage*** *and transfer back to the head of the sewage treatment works via site drainage;*
- ***Condensate drainage*** *and transfer back to the head of the sewage treatment works via site drainage;*
- Imports of waste, including sludge from other sewage treatment works for treatment;
- Dewatering liquor drainage and transfer back to the head of the sewage treatment works via site drainage;
- Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;
- Pre-treatment of sewage sludge by pasteurisation;
- Storage of digestate prior to dewatering;
- Transfer/export of waste digested sewage sludge/digestate for off-site dewatering;
- Storage and handling of wastes, including waste oils; and
- Storage of raw materials.

The waste activities at the site are:

- Imports of waste to the works inlet for treatment through the UWWTD route;
- Upgrading of biogas to biomethane for injection into the National Grid.

Directly associated activities at the installation which are in bold are currently permitted under permit EPR/WP3533LT/V005.

As part of the current listed activity at the site there is combustion plant, permitted under Schedule 1, S1.1 A1 of the Environmental Permitting (England and Wales) Regulations 2016 (as amended). This comprises:

- 3x 4.68 MWth CHP Engines;
- 4x 1.62 MWth boilers;
- 7x larger emergency standby diesel generators including 3x MTU engines with net rated thermal input of 5.01 MW each (which are existing MCP) and 4x MTU engines with net rated thermal input of 3.73 MW each (which are existing MCP);
- 4x storm pumps mechanical drive engines fired on diesel which is standby plant with a net rated thermal input of 1.2 MW each (which are existing MCP); and
- Other combustion equipment with net rated thermal input less than 1 MW each, aggregated net rated thermal input approx. 0.8 MW.

Total thermal input of site is approximately 56 MWth, of which approximately 20.5 MW is CHP plant combustion plant and boiler assets.

3. Form C2 Questions

1 About the permit

1a Discussions before your application

There have been no specific pre-application meetings with National Permitting about this application, although discussion have been had with local officers. 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/WP3533LT/V005 determined 15/05/2023

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

Mogden Sludge Treatment Centre

Mogden Sewage Treatment Works

Mogden Lane

Isleworth

Middlesex

TW7 7LP

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
Mogden STC	*Section 1.1 Part A(1)(a)*	Operation of combustion plant at the site, including CHP Engines, boilers, emergency generators and Emergency Flares		See application for EPR/WP3533LT/V005

Mogden STC	*Section 5.4 Part A(1) (b); i*	Biological treatment by means of Anaerobic digestion		This document
Mogden STC			Imports of non-hazardous waste	See application for EPR/CP3999LE

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/WP3533LT/V005 – Mogden STW Combustion Plant

EPR/CP3999LE/A001 – Mogden Sewage Treatment Works

2d Treating batteries

The installation is not 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	3rd & 4th 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 Environmental Permitting (England and Wales) Regulations 2016.

3b Technical ability

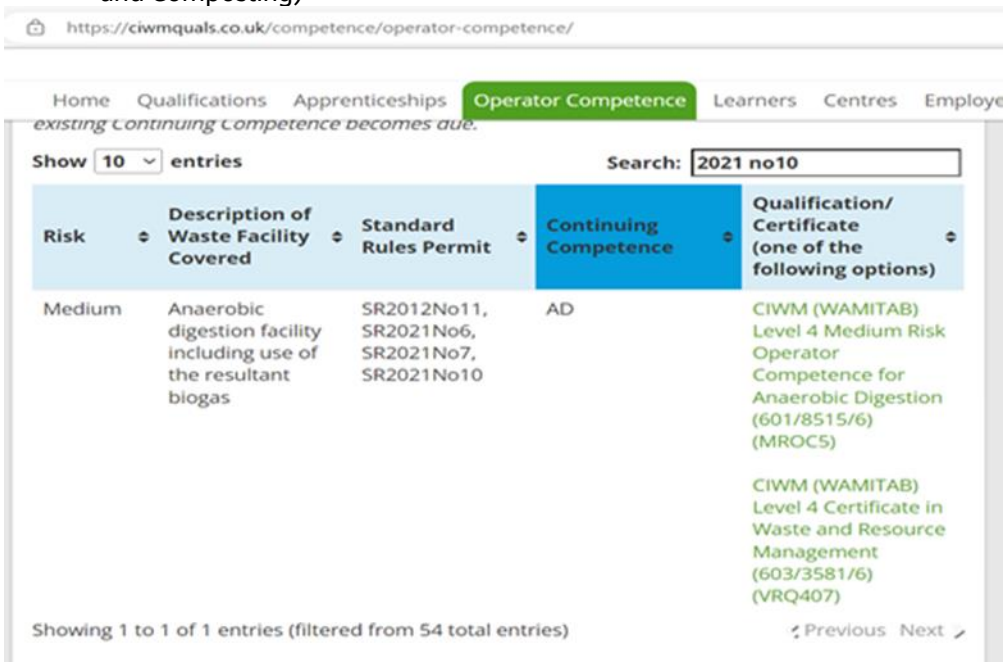
Thames Water uses WAMITAB qualified staff at their waste facilities. The relevant person for the site has been named below and full details have been provided separately on a spreadsheet.

Mr David Chowings

Please see Appendix B for evidence of competency

Following discussions with 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, Mogden 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 for:

- A.1 Site Location Plan
- A.2 Installation Boundary and Air Emission Points Plan
- A.3 Site Impermeable and Permeable Surfaces 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 document. '

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
Richmond Park	SAC	SE	3,000m
Wimbledon Park	SAC	SE	6,600m
South West London Waterbodies	Ramsar	SW WSW	5,300m 5,600m 9,600m
South West London Waterbodies	SPA	SW	5,300m 5,600m

		WSW	9,600m
Syon Park	SSSI	NE	1,500m
Isleworth Ait	LNR	ENE	9,50m
Ham Lands	LNR	SES	2,000m
n/a	Ancient Woodland		
List of Local Wildlife Sites			
Crane Corridor Duke of Northumberland's River at Isleworth Duke of Northumberland's River at Woodlands Duke of Northumberland's River north of Kneller Road Duke of Northumberland's River south of Kneller Road Hounslow Loop Railsides Hounslow, Feltham and Whitton junctions Inwood Park Jersey Gardens Lampton Park Marble Hill Park and Orleans House Gardens Mogden Sewage Works Moor Mead Recreation Ground Osterley Park Piccadilly Line Railsides in Hounslow River Crane at St Margarets River Crane at St Margaret's (Richmond side) River Thames and tidal tributaries Royal Botanic Gardens, Kew Royal Mid-Surrey Golf Course Syon Park Tide Meadow at Syon Park Twickenham Junction Rough Twickenham Road Meadow			All sites <2,000m

Data taken from MAGIC.gov.uk website, accessed December 2020. For habitat sites, the relevant distance for consideration are: International designations (SAC, MPA, SPA and Ramsar – 10 km); National designations (SSSI – 2 km); Nature reserves (2 km)

There are four designated habitats within the 2 km and 10 km zones from the boundaries of the site; Richmond Park (SAC), Wimbledon Park (SAC), South West London Waterbodies (SPA and Ramsar), and Syon Park (SSSI). There are no National Nature Reserves within 2 km of the site. There are two Local Nature Reserves within 2 km of the site boundaries, Isleworth Ait and Ham Lands. There are 24 Local Wildlife Sites (LWSs) within 2 km of the site. There is no Ancient Woodland within 5 km of the Mogden STW.

The site does not sit inside a Source Protection Zone (SPZ). The majority of the STW site and all of the STC sits within a Flood Zone 1 (>1:1000 annual probability of river flooding). The channel of the Duke of Northumberland's River that runs through the site is a Flood Zone 3, with a high annual probability of flooding (<1:100 annual probability of river flooding).

The site is completely within an AQMA. Hounslow AQMA No.1 (Hounslow Borough Council); An area encompassing the entire borough, which is the whole site; Nitrogen dioxide NO2 - Annual Mean.

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. The site is located in industrial urban south-west London, close to Twickenham rugby stadium. There is a small buffer of vegetation between the site assets and residential or commercial properties, which are found on all sides of the site, normally between approx. 50 m and 100 m from site assets. A supermarket is located opposite the site entrance. Ecological receptors: There are six designated habitat sites within the relevant distances of the site. Isleworth Ait LNR is the closest at approx. 950 m, Syon Park (SSSI) is approx. 1.5 km away and Ham Lands LNR is approx. 2 km from the site. Richmond Park SAC is approx. 3 km away and Wimbledon Park SAC is approx. 6.6 km away. The South West London Waterbodies, which is both a Ramsar and SPA is approx. 5.3 km away.	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. All of the wastes are handled within a closed system under normal conditions, limited the potential pathways to the environment. 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, along with UWWTD derived material delivered by sewer. All of the wastes are handled within a closed system under normal conditions, limited the potential pathways to the environment. The site will not be handling inherently dusty or powdery wastes and all wastes maintain a relatively high moisture content. Digested sludge cake is not produced on the site so there is no bioaerosol risk from this source. Roads will be maintained to avoid the production of dust. Please see Appendix F for the site specific bioaerosol risk assessment.	X
Assessment of point source emissions to air	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 site is located within an AQMA. Air emissions have previously been assessed by the Environment Agency and deemed satisfactory. Use of the emergency flares is limited to emergency situations and during planned maintenance activities to either the CHP	X

Emissions deposited from air to land	The impact of emissions from air on human health will depend on the distance and wind direction.	Engines, Gas to Grid plant or the boilers. Multiple outlets at Mogden reduces the likelihood of this situation occurring. 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).	
Assessment of point source and fugitive emissions to water	The Duke of Northumberland's River is an artificial channel which runs south-north through the middle of the Mogden STW site to the River Thames. The River Crane can be found approx. 700 m to the east of the STW and the River Thames is located approx. 1 km to the east. The majority of the STW and all of the STC is in Flood Zone 1 indicating a low risk of flooding. There is an increased risk of flooding associated with the Duke of Northumberland's River channel. Surface water drainage within the site drains to the inlet of the adjacent sewage treatment works for full treatment prior to discharge.	The aqueous discharges generated by process are limited (comprising biogas condensate, pasteurisation 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. Digested sludge is transferred off-site via sludge transfer pipes to separate dewatering operations and no digested sludge cake is generated at Mogden.	**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.	There is a history of substantiated odour complaints associated with the STW and proactive odour monitoring and management across the whole STW and STC. The site has an odour management plan in place that is subject to regular review. The odour management plan contains specific routine operational tasks for controlling and minimising odour emissions. Management of odours from the STW includes chemical dosing at the sewer inlets to control odour and H_2S, physical containment and covering assets to prevent fugitive emissions and operational procedures and odour abatement. There are also 12 odour monitoring stations at Mogden STW that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA to the Process Controller. The sewage treatment works has an odour management plan which is appended as Appendix E.	**X**
Energy	Global atmosphere (direct and indirect emissions)	Use of biogas on site within the CHP Engines and export of this renewable electricity generated at Mogden to the National Grid can offset consumption of fossil fuels within the energy mix, lowering the carbon intensity of power. Use of the biogas within	**X**

		the site boilers minimises the need to import non-renewable gas from the National Grid. Use of biogas in the Gas to Grid plant for upgrading to biomethane and injection into the local natural gas network minimises consumption of fossil fuels in the natural gas network. Good maintenance procedures will help the plant run efficiently and reduce site energy consumption. Use of LED lighting reduces site electricity consumption. Insulated hot water pipes minimises heat losses during transmission.	
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 superficial deposits).	All waste streams are taken 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. The site is located in industrial urban south-west London, close to Twickenham rugby stadium. There is a small buffer of vegetation between the site assets and residential or commercial properties, which are found on all sides of the site, normally between approx. 50 m and 100 m from site assets. A supermarket is located opposite the site entrance. Ecological receptors: There are six designated habitat sites within the relevant distances of the site. Isleworth Ait LNR is the closest at approx. 950 m, Syon Park (SSSI) is approx. 1.5 km away and Ham Lands LNR is approx. 2 km from the site. Richmond Park SAC is approx. 3 km away and Wimbledon Park SAC is approx. 6.6 km away. The South West London Waterbodies, which is both a Ramsar and SPA is approx. 5.3 km away.	Site design has been chosen to minimise the impact of noise on offsite receptors through building orientation, finishes and location of openings. All waste processing operations are located within an enclosed building. 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 (Bullhead and European eel) and migratory routes (for European eel) within the specified screening distance (up to 500m) of the site. There are no protected habitats recorded within the specified 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. 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. additional CHP Engines or other technology that is appropriately sized to utilise additional biogas above the capacity of the current Gas to Grid plant. 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 OCUs to be utilised as appropriate. OCUs 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. Digested sludge is transferred offsite for dewatering. Land spreading activities could be restricted during very wet, winter months. Although the offsite dewatering plant 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.	X

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

4. Form C3 Questions

1 – What activities are you applying to vary?

Table C3-1a – 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
Mogden STW Combustion Plant AR1	Section 1.1 A1 (a) Burning any fuel in an appliance with a rated thermal input of 50 megawatts or more	Combustion plant fired on biogas generated on site, including the following equipment: • 3 x Combined Heat and Power (CHP) engines, net rated thermal input of 4.68 MW each, fired on biogas. Existing MCP. • 4 x pasteurisation boilers, net with net rated thermal input of 1.62 MW each, fired on biogas generated on site or diesel oil. Existing MCP.		R1 Use principally as a fuel or other means to generate energy	N / A
Mogden STW Combustion Plant AR2		Emergency standby diesel generators (emergency plant), including the following equipment: • 3 x MTU engines, net rated thermal input 5.01 MW each. Existing MCP. • 4 x MTU engines, net rated thermal input 3.73 MW each. Existing MCP.			
Mogden STW Combustion Plant AR3		4 x storm pumps mechanical drive engines fired on diesel (standby plant), net rated thermal input 1.2 MW each. Existing MCP.			
Mogden STW Combustion Plant AR4		Combustion equipment with net rated thermal input less than 1 MW each, aggregated net rated thermal input approx. 0.8 MW.			
Mogden Sewage Treatment Centre AR5	S5.4 A1 (b) (i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes	From receipt of permitted waste through to digestion and recovery of by-products (digestate and biogas).	5,500 wet tonnes per day	R3: Recycling reclamation of organic substances which are not used as solvents.	Maximum waste throughput 8,100,000 wet tonnes per annum including indigenous

	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 16 Primary Digester Tanks followed by combustion of biogas produced from the process		(Throughput based on 66,000 m3/12 = 5,500 m3 per day)	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)	UWWTD derived sludge from within the wider Sewage Treatment Works. As per volume calculations in Note 1 below.
Directly Associated Activities [existing listings in bold]					
AR6	**Biogas storage and scrubbing**	**Storage of biogas within sixteen floating roof primary digesters and the pressurisation of the biogas using compressors and gas boosters.** **The operation of gas scrubbing plant from the receipt of biogas through its scrubbing using activated carbon to its delivery at the gas compressors.**		**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).**	
AR7	**Biogas processing for siloxane removal**	**Siloxane removal system.** **Operation of a siloxane removal system equipped with a condensing regeneration stage venting through emission point A11e.**			
AR8	**Emergency Flare**	**Operations of an emergency flare (emission point A25, used to burn excess biogas when CHP Engines and boilers of activity AR1 are not in operation or operate at reduced capacity.** **Operations of an emergency flare/waste gas burner (emission point A27) used to burn excess biomethane when the biogas upgrading plant of activity AR20 is not in operation.**		**D10: Incineration on land.**	

AR9	**Oil Storage**	**Storage of oil from receipt onto site, storage in oil storage tanks and transfer through oil pipelines. From receipt of raw materials to dispatch for use.**			
AR10	**Surface water drainage** and transfer back to the head of the sewage treatment works via site drainage	**Operation of systems for the collection and discharge of uncontaminated surface water.**			
AR11	**Condensate drainage** and transfer back to the head of the sewage treatment works via site drainage	**Discharge of condensate to a sealed drainage system.**			
AR12	Imports of waste, including sludge from other sewage treatment works for treatment;				
AR13	Dewatering liquor drainage and transfer back to the head of the sewage treatment works via site drainage;				
AR14	Blending of indigenous sludges and imported wastes/waste sludge prior to treatment;				
AR15	Pre-treatment of sewage sludge by pasteurisation;				
AR16	Storage of digestate prior to dewatering;				
AR17	Transfer/export of waste digested sewage sludge/digestate for off-site dewatering				
AR18	Storage and handling of wastes, including waste oils; and				
AR19	Storage of raw materials.				

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**
AR20	Upgrading of biogas to biomethane (including the removal of moisture and other substances such as carbon dioxide, hydrogen sulphide and Volatile organic compounds) for injection into the National Grid. From the receipt of biogas produced at the on-site anaerobic digestion process to injection into the National Grid. This includes return of off-	R3: Recycling/reclamation of organic substances which are not used as solvents	n/a	n/a

	specification biogas for combustion to the on-site CHP Engines auxiliary boiler(s) and/or emergency flare.			
AR21	Imports of wastes to the works inlet for treatment through the UWWTD route and screening of imports;	D13: Blending or mixing prior to submission to any of the operations numbered D1 to D12	n/a	Maximum waste throughput 40,000 wet tonnes per annum
For all Waste Operations		**Total capacity**	**74,838 wet tonnes**	
		Total STC treatment capacity (tank volume)	74,838 wet tonnes	
For waste imports to the head of the works		Annual throughput (tonnes each year)	Imports: 40,000 wet tonnes	
Note 1: Treatment Calculation based on: **Co-settled Sludge: 82.40 tds/day: worse case 0.90% dry solids =9,156 m^3/day = 3,341,822 m^3/year** **Unthickend SAS: 82.40 tds/day: worse case 0.70% dry solids = 11,772 m^3/day = 4,296,629 m^3/year** **Imports - Liquids: 41.20 tds/day: worse case 3.50% dry solids = 1,177 m^3/day = 429,663 m^3/year** **Total combined import calculation: 8,068,114 m^3/year, rounded to 8,100,000 m^3/year**				

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 wastewater
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 at the head of the works import point

Waste Code	Description of Waste
16 10 02	aqueous liquid wastes other than those mentioned in 16 10 01 [note 1]
19 09 02	sludges from water clarification
Note 1 – comprising but not limited to: Thickening and dewatering liquors, centrate and filtrate derived from TWUL processes Waste from a portable toilet	

Emissions to air, water and land

Table C3-2a – Emissions to Air

Air emissions points currently permitted under permit EPR/WP3533LT/V005 are in bold.

Emission point reference and location	Source	Parameter	Limit – these limits do not apply during start up or shut down	Unit	Reference period	Monitoring frequency	Monitoring standards or method
A5	**Boiler fired on biogas or diesel oil**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**150 [Note 3]**	**mg/m^3**	**-**	**Annually**	**BS EN 14792 (Permanent sampling access not required)**
A6	**Boiler fired on biogas or diesel oil**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**150 [Note 3]**	**mg/m^3**	**-**	**Annually**	**BS EN 14792 (Permanent sampling access not required)**
A7	**Boiler fired on biogas or diesel oil**	**Oxides of Nitrogen (NO and NO_2**	**150 [Note 3]**	**mg/m^3**	**-**	**Annually**	**BS EN 14792 (Permanent sampling**

		expressed as NO_2)					access not required)
A8	Boiler fired on biogas or diesel oil	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	150 [Note 3]	mg/m^3	-	Annually	BS EN 14792 (Permanent sampling access not required)
A11a	Combustion exhaust gases from CHP Engine 5, fired on biogas, via multi-flue to 26 metres stack	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	500 [Note 2]	mg/m^3	-	Annually	BS EN 14792 Permanent sampling platform to meet the requirements of TGN M1
		Carbon Monoxide	1,400 [Note 2]	mg/m^3	-	Annually	BS EN 15058 Permanent sampling platform to meet the requirements of TGN M1
A11b	Combustion exhaust gases from CHP Engine 6, fired on biogas, via multi-flue to 26 metres stack	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	500 [Note 2]	mg/m^3	Average over sampling period	Annually	BS EN 14792 Permanent sampling platform to meet the requirements of TGN M1
		Carbon Monoxide	1,400 [Note 2]	mg/m^3	Average over sampling period	Annually	BS EN 15058 Permanent sampling platform to meet the

							requirements of TGN M1
A11c	Combustion exhaust gases from CHP Engine 7, fired on biogas, via multi-flue to 26 metres stack	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	500 [Note 2]	mg/m^3	Average over sampling period	Annually	BS EN 14792 Permanent sampling platform to meet the requirements of TGN M1
		Carbon Monoxide	1,400 [Note 2]	mg/m^3	Average over sampling period	Annually	BS EN 15058 Permanent sampling platform to meet the requirements of TGN M1
A11e	Siloxane and VOC removal exhaust flue to 26 metres stack	VOCs and Siloxanes	No limit set	-	-	-	-
A14	Emergency Flare stack [note 5]	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	150	mg/m^3	Average over sampling period	Annually [Note 1]	BS EN 14792 (Permanent sampling access not required)
		Carbon Monoxide	50	mg/m^3	Average over sampling period	Annually [Note 1]	BS EN 15058 (Permanent sampling access not required)
A15a, b A16a, b	7 x MTU diesel engines (Standby Emergency generators)	Oxides of Nitrogen (NO and NO_2	No limit set	-	-		-

A17a, b A18a, b A19a, b A20a, b A21a, b		**expressed as NO_2)**					
		Carbon Monoxide	**No limit set**	**-**	**-**		**-**
A22	**4 x standby diesel storm pumps**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**No limit set**	**-**	**-**		**-**
		Carbon Monoxide	**No limit set**	**-**	**-**		**-**
A23	**Pumphouse Standby Generator**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**No limit set**	**-**	**-**		**-**
		Carbon Monoxide	**No limit set**	**-**	**-**		**-**
A24	**Deluge Standby Generator**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**No limit set**	**-**	**-**		**-**
		Carbon Monoxide	**No limit set**	**-**	**-**		**-**
A25	**Flare stack (to replace A14) [Note 4]**	**Oxides of Nitrogen (NO and NO_2 expressed as NO_2)**	**150**	**mg/m3**	**Average over sampling period**	**Annually**	**BS EN 14792**

		Carbon Monoxide	**50**	**mg/m3**	**Average over sampling period**	**Annually**	**BS EN 15058**
		TVOCs	**10**	**mg/m3**	**Average over sampling period**	**Annually**	**BS EN 15058**
A26	**Biogas Upgrader Unit Exhaust**	**Total VOCs including methane**	**No limit set**		**Leak detection and repair (LDAR) programme**	**In accordance with written management system**	**BS EN15446**
A27	**Reject biomethane waste gas burner**	**Oxides of Nitrogen (NO and NO2 expressed as NO2)**	**150**	**mg/m3**	**Average over sampling period**	**Annually [Note 1]**	**BS EN 14792**
		Carbon Monoxide	**50**	**mg/m3**	**Average over sampling period**	**Annually [Note 1]**	**BS EN 15058**
		Total volatile organic compounds	**10**	**mg/m3**	**Average over sampling period**	**Annually [Note 1]**	**BS EN 12619:2013**
A28	**GEU Process vent**	**No parameter set**	**No limit set**	**-**	**-**	**-**	**-**
A29	**Carbon filter pressure relief valve stack**	**No parameter set**	**No limit set**	**-**	**-**	**-**	**-**
A30	Pasteurisation Process PRV	-	-	-	-	-	-
A31 – A46	Primary Digester Tank pressure relief valves (for Tanks no. 5-20)	-	-	-	-	-	-

A47	OCU 12	Hydrogen sulphide	No limit set	-	Average over sampling period		Once every 6 months
		Ammonia	20	mg/m^3			Once every 6 months
A48	Transfer PS OCU	Hydrogen sulphide	No limit set	-	Average over sampling period		Once every 6 months
		Ammonia	20	mg/m^3			Once every 6 months
A49	GBT Building OCU	Hydrogen sulphide	No limit set	-	Average over sampling period		Once every 6 months
		Ammonia	20	mg/m^3			Once every 6 months
A50	Sludge Thickening Plant OCU	Hydrogen sulphide	No limit set	-	Average over sampling period		Once every 6 months
		Ammonia	20	mg/m^3			Once every 6 months

Note 1: Monitoring required if total flare use (A14 and A25) is more than 10% of the year. Monitoring required if waste gas burner use is more than 10% of the year.

Note 2: Emission limits for the biogas CHP Engines are referred to the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 5% dry.

Note 3: Emission limit apply to the combustion of biogas.

Note 4: Emergency Flare is designed to meet the emissions limits as described in LFTGN05 V2 2010

Note 5: Emergency Flare Stack at A14 is to be replaced by A25 following commissioning

Table C3-2b – Emissions to Sewer

Emission point reference and location	Source	Parameter	Limit	Unit
T1(as per site plan in Appendix A.2) (NGR: TQ 15218 74914)	Primary Sludge Thickening Liquors, OCU Waste Water, Boiler Waste Water, Biogas Condensate, Surface Water Run Off	No parameters set	No limit set	-
T2a (as per site plan in Appendix A.2) (NGR: TQ 15161 74918)	SAS Thickening Liquors, OCU Waste Water, Surface Water Run Off	No parameters set	No limit set	-
T3 (as per site plan in Appendix A.2) (NGR: TQ 15261 75408)	Head of Works Imports 1	No parameters set	No limit set	-
T4 (as per site plan in Appendix A.2) (NGR: TQ 15455 75410)	Head of Works Imports 2	No parameters set	No limit set	-
T5 (as per site plan in Appendix A.2) (NGR: TQ 15140 74901)	Offsite Dewatering Plant	No parameters set	No limit set	-
Note: Existing emissions to sewer are replaced by new transfer points				

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

Table C3-2c – Process Monitoring Requirements

Emission point reference or source or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Diffuse emissions from all sources identified in the Leak Detection and Repair (LDAR) programme	VOCs including methane	Every 6 months or otherwise agreed in accordance with the LDAR programme	BS EN 15446 In accordance with the LDAR programme	Monitoring points as specified in a DSEAR risk assessment and LDAR programme. Limit as agreed with the Environment Agency as a percentage of the overall gas production.

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.)	

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 and Site Condition Reports 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**

	Consequence		
Likelihood ↓	**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, Gas to Grid upgrade flue, and Emergency Flare stacks) have emission limits. Emergency Flare stack height approx. 4 m, CHP Engines share a 26 m stack and boilers each have a 5 m stack. Gas to Grid upgrade flue approx. 6m and Emergency Flare approx. 8m. Site has a siloxane filter fitted on the main biogas pipeline connected upstream of the CHP Engines to remove impurities within the biogas and discharges emissions via the shared 26 m stack. Biogas pipeline has condensate traps to remove impurities. Previous modelling, which remains unchanged, did not find unacceptable impacts.	Low
Biogas transfer systems, Biogas Storage holder,	Abnormal	Emissions to air and dispersion leading to: inhalation by local human	Low	Medium	Low	The plant is designed to capture and utilise all biogas possible, either combusting the biogas or upgrading it for grid injection, in order to	Low

CHP Engines, Emergency Flares or PRVs failure causing emissions of biogas		and animal receptors. Odour impact. Global warming potential. Risk of fire and explosion.				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 methane monitors, pressure and flow sensors and with automatic slam shut 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. Two Emergency Flares are utilised for the safe disposal of surplus biogas in the event of plant breakdown, unavailability of grid upgrade, or a surplus of biogas above the level that can be safely stored or utilised, which is pre-set within the SCADA system. Use of emergency flare is recorded via SCADA. Dual duty/standby PRVs are in place to be operated in the event of failure of the Emergency Flares to prevent over-pressurisation and catastrophic failure. Activation of any PRV causes an alarm on the SCADA system.	
Catastrophic loss of biogas emissions from biogas transfer systems, Biogas	Abnormal	Emissions to air and dispersion leading to: inhalation by local human and animal receptors. Odour impact. Global	Low	High	Medium	The plant is designed to capture and utilise all biogas possible, either combusting the biogas or upgrading it for grid injection, in order to maximise recovered value from the biological treatment of sludge.	Medium

Storage holder, CHP Engines, Emergency Flares or PRVs		warming potential. Risk of significant fire and explosion.				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 methane monitors, pressure and flow sensors and with automatic slam shut isolation valves to minimise the potential for release if a leak is detected. Two Emergency Flares are 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. Dual duty/standby PRVs are in place to be operated in the event of failure of the Emergency Flares to prevent over-pressurisation and catastrophic failure. Activation of any PRV causes an alarm on the SCADA system.	
Combustion of biogas within CHP Engines and Emergency Flares. Combustion of biogas or diesel 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 to manage volumes of biogas with multiple outlets providing contingency. Combustion plant operates within permitted ELVs subject to routine monitoring against permit compliance. The nearest sensitive receptors to each combustion asset are: CHP stack 70 m, Emergency Flare 180 m and boilers 215 m. The stack height and prevailing wind conditions will minimise the impact on the	Low

						nearby receptors for which previous modelling, which remains unchanged, did not find unacceptable impacts.	
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	There is a very low risk of bioaerosol and dust as digested sludge cake is not produced at Mogden STC. All digested sludge is dewatered at an offsite facility and all digested sludge is stored within an enclosed, odour abated tank under normal conditions with a relatively high moisture content. Internal site roads are made from concrete/asphalt and not prone to the generation of dust.	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	Low	Low	There is a very low risk from bioaerosols and dust as digested sludge cake is not produced at Mogden STC. The site is very large and spillages would only impact upon receptors if they occurred close to the site boundary which is unlikely to occur as sludge digestion is approx. 100 m from the site boundary. Digested sludge may be stored in a Contingency Storage Tank under abnormal conditions however this tank is located over 200 m from the nearest sensitive receptor and within a topographical low point of the site. The impact on sensitive receptors is likely to be low.	Low

						Internal site roads are made from concrete/asphalt and not prone to the generation of dust. 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	High	Medium	The closes surface water body is the Duke of Northumberland's River which runs through the middle of the site. The site lies outside any groundwater Source Protection Zones (SPZ) All combustion plant and associated fuel tanks are situated on concrete hardstanding. Chemicals and oils all stored within bunded tanks and IBCs with the diesel tank for the boilers is located within very close proximity to the Duke of Northumberland's River channel. Tanks and bunds are subject to regular inspection with defects addressed, e.g. rainwater removed as required to maintain 110% capacities. Handling and use of chemicals and oils is carried out by trained personnel. COSHH data sheets available. Spill kits available on site. Staff are trained in their use. There are no point source emissions to water from the STC processes 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.	Low	Low	Low	The installation lies outside any Groundwater Source Protection Zones (SPZ). Provision of suitable structurally integral tanks constructed from pre-cast concrete, or steel with glass reinforced plastic. All tanks are subject to asset inspection and proactive maintenance programme including regular visual inspection for cracks or weeping where possible on above ground assets. All tanks used for normal operations are covered; only the emergency storage tank is uncovered. Tanks are fitted with levels and monitors. 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	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 normal operations at Mogden STC are enclosed. Biogas will principally be generated in Primary Digester tanks and captured for storage within the roof-mounted Biogas Storage holders. All of the tanks used under normal operating conditions are enclosed. The nearest residential properties are approx. 80 m south-east from the covered Primary Digester Tanks at the site boundary and nearest commercial buildings approx. 140 m south-east. H_2S production is controlled through the digestion process which can be manually overridden if required. Chemical dosing at the	Low

						inlet is used to minimise hydrogen sulphide levels in biogas and minimise odour. There is routine odour monitoring by twelve odour monitoring stations located across the site that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA system which alert to the presence of H_2S.	
Loss of containment from Biogas Storage holder and biogas pipework	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Medium	Low	Biogas is principally stored within the Biogas Storage holder on each Primary Digester Tank which are suitably sized to manage biogas generation. 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 methane monitors, pressure and flow sensors and with automatic slam shut 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. Physical protection measures in place for Biogas Storage holders, including lightning protection, fencing and pipework is guarded. PRVs available to safely manage pressures within the Primary Digester Tanks/Biogas	Low

						Storage holder and prevent under or over-pressurisation. Chemical dosing at the inlet is used to control hydrogen sulphide levels in biogas and minimise odour. There is routine odour monitoring by twelve odour monitoring stations located across the site that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA system which alert to the presence of H_2S.	
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. Alarms on SCADA in the event of a PRV activation. PRVs subject to monitoring via SCADA and visual checks by site personnel. Biogas is principally stored within Biogas Storage holder on each Primary Digester Tank which are suitably sized to manage biogas generation. Site has multiple outlets to use biogas - three CHP Engines, Gas to Grid plant, four boilers and two Emergency Flares which are used in order of preference to maximise recovery of energy. CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with Emergency Flares maintained in	Low

						good working order should they need to be used. Chemical dosing at the inlet is used to control hydrogen sulphide levels in biogas and minimise odour. The nearest residential properties are approx. 80 m south-east from the covered Primary Digester Tanks at the site boundary and nearest commercial buildings approx. 140 m south-east. There is routine odour monitoring by twelve odour monitoring stations located across the site that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA system which alert to the presence of H_2S.	
H_2S/biogas emitted when biogas cannot be upgraded for gas grid injection or combusted in CHP Engines, boilers or Emergency Flares	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 the roof mounted Biogas Storage holder on each Primary Digester Tank which are suitably sized to manage biogas generation and act as buffer storage for biogas. Site has multiple outlets to use biogas including the biogas upgrading plant for Gas to Grid and multiple combustion sources- three CHP Engines, four boilers and two Emergency Flares which are used in order of preference to maximise recovery of energy. The nearest residential properties are approx. 80 m south-east from the biogas holders, at the site boundary and nearest commercial buildings approx. 140 m south-east.	Low

						Biogas upgrading plant, CHP Engines and boilers are subject to regular maintenance to maintain maximum use of outlets, with Emergency Flares maintained in good working order should they need to be used. Chemical dosing at the inlet of incoming sewages used to control hydrogen sulphide levels in biogas and minimise odour. There is routine odour monitoring by twelve odour monitoring stations located across the site that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA system which alert to the presence of H_2S.	
Storage of treated digested sludge cake	Normal	Emissions to air and dispersion leading to inhalation by local human receptors Loss of amenity from odour nuisance	Low	Low	Low	There is a low risk of odour as digested sludge cake is not produced at Mogden STC. All digested sludge is dewatered at an offsite facility and all digested sludge is stored within an enclosed, odour abated tank under normal conditions to minimise odour emissions impacts. Digested sludge is stored within a tank in a central part of the site away from sensitive receptors and is inherently low odour material.	Low
Failure of odour control units	Abnormal	Emissions to air and dispersion leading to inhalation by local human receptors	Low	High	Medium	OCUs are subject to regular preventative maintenance. Site staff have a schedule to ensure routine maintenance for key mechanical items. In addition, a dedicated maintenance team provide additional support for more specialised equipment. Odour critical plan is	Low

		Loss of amenity from odour nuisance				designated as critical plant to ensure effective performance is maintained. Condition of the media in the OCU is monitored by performance checks and by additional testing as required. Media is replaced in line with the manufacturer's recommendations. A bi-monthly service contract is carried out by a specialist contractor. There is routine odour monitoring by twelve odour monitoring stations located across the site that continuously monitor atmospheric levels of hydrogen sulphide, feeding the results back through SCADA system which alert to the presence of H_2S.	
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 are 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 Engines	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	High	Low	Medium	Combustion assets are all contained within the Powerhouse building. This provides a level of containment of noise and units are acoustically baffled so that noise emissions are already low. Nearest sensitive receptors are residential properties which are approx. 70 m from the Powerhouse. 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 approx. 70 m from nearest sensitive human receptors. Good maintenance of fans to ensure that excessive noise levels are not generated. Where repair or replacement is required, this will be completed promptly.	Low

Biogas upgrade plant	Normal	Generation of noise with air transportation, causing loss of amenity to local human receptors	Low	Low	Low	The biogas upgrade plant has been designed and specified as a low noise plant and is subject to a manufacturer led preventative maintenance programme, including a LDAR plan.	Low
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 to reduce generation of noise. There are limited movements of heavy plant due to the absence of a cake pad.	Low
Vehicle movements - tanker deliveries of sludge	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	Medium	High	Imports can be made 24/7 and take place to two import points on the north of site however access is via the main entrance on the south of the site. Both import points can be found within close proximity of sensitive receptors and there are residential properties approx. 60 m north of each location. Vegetation and an earth bund provide screening for noise emissions. Vehicle movements across the site subject to speed limit to reduce generation of noise. There are no shovel loader operations or bulk collections of digested sludge cake due to the absence of a cake pad.	Medium

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 delivery areas within the central area of the site. Vehicle movements across the site subject to speed limit to reduce generation of noise.	Low
Operation of emergency flares	Abnormal	Generation of noise with air transportation, causing loss of amenity to local human receptors.	High	Low	Medium	Use of the Emergency Flares are minimized by prioritizing use of the CHP Engines and boilers with use of the Emergency Flares recorded via SCADA. The Emergency Flare is located over 130 m from nearest residential property. The waste gas burner from the Gas-to-Grid plant is approx. 65m from the nearest receptor.	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. A site-specific bioaerosol risk assessment (SSBRA) is 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) in Appendix I.

4 - Monitoring

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

Emission points A1 – A4, A9-A10, A12, A13 have been removed by previous variations.

The air emission points A5-A8 (boilers), A11a-A11c (CHP Engines), and A14/A25/A27 (ground flares) are monitored in accordance with EA guidance.

The site has a number of emission points to air. Points A5 – A8 and A11a-c and A11e (3x boilers and a multi-flue stack for the CHP Engines and siloxane and VOC removal) are subject to monitoring in accordance with the requirements of existing permit requirements and EA guidance.

Hours of operation of the Emergency Flares, emission point A14 and A25, 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 Emergency Flares as per the existing permit would be subject to monitoring in accordance with EA guidance. The existing Emergency Flare stack is subject to decommissioning and removal, to be replaced by A25.

Emissions to air from the biomethane upgrading plant, A26 and A27 are subject to monitoring in accordance with the requirements of existing permit requirements and EA guidance. Emission points A28 and A29 have no routine monitoring proposed, as per the existing permit requirements.

There is no routine monitoring proposed for points A15a, b – A21a, b (7x standby emergency generators), A22 (standby diesel storm pumps), A23 (pumphouse standby generator) and A24 (deluge standby generator).

Points A47-A50, OCUs, will be subject to bi-annual testing.

There is no routine monitoring proposed for points A30-A46 for PRVs.

Table C3-4a – Emission Monitoring

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A5 (boiler)	TQ 15375 74908	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792
A6 (boiler)	TQ 15375 74906	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually		BS EN 14792
A7 (boiler)	TQ 15375 74903	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually		BS EN 14792

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A8 (boiler)	TQ 15375 74899	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually		BS EN 14792
A11a (CHP Engine No. 5)	TQ 15513 74869	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually Carbon Monoxide – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15058
A11b (CHP Engine No. 6)	TQ 15513 74869	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually Carbon Monoxide – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15058
A11c (CHP Engine No. 7)	TQ 15513 74869	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) – Annually Carbon Monoxide – Annually	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15058
A11e (Siloxane and VOC exhaust flue)	TQ 15513 74869	n/a	-	-
A14 (Flare Stack)	TQ 15311 74737	Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period. Oxides of Nitrogen (NO and NO_2 expressed as NO_2) Carbon Monoxide	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15058
A15a, b A16 a, b A17a, b A18 a, b A19a, b A20 a, b A21 a, b (Standby Emergency Generators)	TQ 15601 74909 TQ 15611 74911 TQ 15622 74914 TQ 15633 74916 TQ 15644 74919 TQ 15656 74923 TQ 15667 74926	N/a	-	-
A22 (Standby Pumps)	TQ 15431 75373	N/a	-	-

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
A23 (Standby Emergency Generator)	TQ 15416 75390	N/a	-	-
A24 (Standby Emergency Generator)	TQ 15469 74845	N/a	-	-
A25 (Flare Stack)	TQ 15320 74738	Annual monitoring is only required when flare operates in excess of 10% of the time, taken on an annual assessment period. Oxides of Nitrogen (NO and NO_2 expressed as NO_2) Carbon Monoxide TVOCs	In accordance with Environment Agency guidance note M2 "Monitoring of stack emissions to air".	BS EN 14792 BS EN 15058 BS EN 15058
A26 (biogas upgrader exhaust flue)	TQ 15701 74937	Total VOCs	In accordance with written management system	BS EN15446
A27 (reject biomethane waste gas burner)	TQ 15676 74926	Oxides of Nitrogen (NO and NO_2 expressed as NO_2) Carbon Monoxide TVOCs	-	BS EN 14792 BS EN 15058 BS EN 12619:2013
A28 (GEU Process vent)	TQ 15729 74936	N/a	-	-
A29 (Carbon filter PRV stack)	TQ 15693 74931	N/a	-	-
A30 (Pasteurisation PRV)	TQ 15329 74913	N/a	-	-
A31-A46 (Primary Digester Tanks PRV)	TQ 15143 74793 TQ 15168 74793 TQ 15192 74794 TQ 15217 74795 TQ 15240 74796 TQ 15264 74797 TQ 15288 74797 TQ 15312 74798 TQ 15144 74768 TQ 15169 74769 TQ 15193 74770	n/a	-	-

Monitoring point	NGR	Monitoring frequency	Methodology (standard)	Assessment procedures
	TQ 15217 74770 TQ 15241 74771 TQ 15265 74772 TQ 15289 74773 TQ 15313 74773			
A47 (OCU 12)	TQ 15274 74870	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	
A48(Transfer PS OCU)	TQ 15204 74901	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	
A49 (GBT Building OCU)	TQ 15153 74873	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	
A50 (Sludge Thickening Plant OCU)	TQ 15337 74898	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	
S1 (Liquor sampling point)	TQ 15225 74908	n/a	MCERTS or ISO/IEC 17025 where available	
S2 (Liquor sampling point)	TQ 15145 74905	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, a 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

The Primary Digester Tanks are heated by the incoming pasteurised sludge and are all suitably insulated. The CHP Engines are suitably sized to maximise energy utilisation for the parasitic load, while minimising the use of the flares.

Heat generated from the CHP Engines is used to supplement the pasteurisation process which are backed up by auxiliary boilers which can also supply the Primary Digester Tanks, 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 National Grid. Diesel fuel is used by the boilers as a back-up fuel and for stand-by generator purposes in the event of a failure of the electricity supply.

The site CHP Engines combusts indigenous biogas with the electricity 100% exported from the site to the National Grid. The CHP Engines also provides useable heat to be used within the pasteurisation process via heat exchangers and to the Primary Digester Tanks, on a separate heat exchange system.

The biogas upgrading plant is designed to treat biogas to concentrate the biomethane for injection to the national gas grid, for use off site, following calorific value adjustment using propane as required.

The boilers use biogas or imported diesel, when required, to meet additional demands from the pasteurisation process or from the Primary Digester Tanks. Use of heat from the CHP Engines reduces the demand on biogas and diesel. in the boilers.

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 for export and produce heat (which is used into the pasteurisation process) on site minimises the use of fossil fuels onsite, whilst recovering biological wastes. Location of the heat exchange, boilers, CHP Engines and pasteurisation all within close proximity minimises transmission losses on site, improving the efficiency of the process. Biogas upgrading for export increases the availability of non-fossil fuels within the power infrastructure for the UK, helping meet government targets for the transition away from fossil fuels. The export of generated electricity from the site to the National Grid helps to lower the overall carbon intensity of grid electricity as it is considered to be a renewable energy source.

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.

5. 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 permit variation application is to vary an existing waste permit and include for physical treatment 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.

6. 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 thickening of sludge within the installation. Lower volume constituents will include rainfall; biogas condensate; siloxane filtrate; 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?

22,578 cubic metres

3c What is the maximum rate of discharge?

261.32 litres / second

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

22,578.22 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, [22,578.22m^3 x 1000] / 86,400 seconds (24 x 60 x 60) from sources such as the thickening and dewatering.. This gives a value of 261.32199074litres, rounded up to 261.32litres 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 Mogden 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/CNTD.0085/010.

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 points 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 15410 74720.

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

Duke of Northumberland's River

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

See document: B22849AM-JAC-MGN-DR-0001

A.2 Installation Boundary and Air Emission Points Plan

See document: B22849AM-JAC_MGN_DR-0002

A.3 Site Impermeable and Permeable Surfaces Plan

See document: B22849AM-JAC-MG-DR-0003

A.4 Site Drainage Plan

See documents: TW_STC_EPR_13_MGNS1ZZ-DPL-001

A.5 Process Flow Diagram

See document: B22849AZ-MOGDS1ZZ-LSX-DR-P-0001

A.6 Site Photographs

See document: TW_STC_EPR_13_MGN_APPA.6

Appendix B. CoTC

See document: TW_STC_EPR_13_ MGN_APPB

Appendix C. Site Condition Report – H5

See document: TW_STC_EPR_13_MGN_APPC

Appendix D. BAT Assessment

See document: TW_STC_EPR_13_MGN_APPD

Appendix E. Odour Management Plan

Includes: Odour Management Plan and Odour Risk Assessment. See document: TW_STC_EPR_13_ MGN_APPE

Appendix F. Bioaerosol Risk Assessment

See document: TW_STC_EPR_13_MGN_APPF

Appendix G. Containment Assessment

G.1 Containment Options Report (CIRIA 736)

See document: B22849AZ-JA- MOGDS1ZZ-100-RP-Z-0001

G.2 Containment Assessment

See document: B22849AZ-JA- MOGDS1ZZ-100-CA-P-0001

Appendix H. Leak Detection and Repair (LDAR) Plan

See document: TW_STC_EPR_13_MGN_APPH

Appendix I. Residue Management Plan

I.1 Residue Management Plan

See document: TW_STC_EPR_13_MGN_APPI.1

I.2 MSDS Zip File

See zip folder: TW_STC_EPR_13_ MGN_APPI.2

Appendix J. Accident Prevention and Management Plan

See document: TW_STC_EPR_13_MGN_APPJ

Appendix K. Acceptance of Third-Party Waste Imports

K.1 Acceptance of Third-Party Waste Imports

See document: TW_STC_EPR_13_ MGN_APPK.1

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

See document: TW_STC_EPR_13_MGN_APPK.2

Appendix L. Air Quality Assessment

Not Required

Appendix M. Liquor Monitoring Proposal

See document: TW_STC_EPR_13_MGN_APPM