BAT No.	Topic	Brief Description	BAT	Applicable BAT- AEL	Compliant now?	Derogation needed?	Provide brief comments on how compliance with BAT is (or will be) achieved Where "N/A" or "other" is given, please explain why
General BAT conclusions							
1	Overall performance	EMS *Applicability* The scope (e.g. level of detail) and nature of the EMS (e.g. standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and amount of wastes processed).	In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS) that incorporates all of the following features:				
			i) commitment of the management, including senior management;		Yes		The EMS has received sign-off from Senior Management and the Thames Water Environmental Governance Board. In addition Thames Water operate several steering groups attended by Senior Managers where procedures can be highlighted and issues raised.
			ii) definition, by the management, of an environmental policy that includes the continuous improvement of the environmental performance of the installation;		Yes		Thames Water's EMS includes a commitment to continuous improvement.
			iii) planning and establishing the necessary procedures, objectives and targets, in conjunction with financial planning and investment;		Yes		Procedures are in place to identify and control environmental issues arising from company activities. This includes an Asset Planning System and Project Stage Gate Process for supporting investment decisions. Thames Water are regulated by OFWAT and financial investment is governed through the Price Review process and agreement of performance commitments.
			iv) implementation of procedures paying particular attention to: (a) structure and responsibility, (b) recruitment, training, awareness and competence (c) communication, (d) employee involvement, (e) documentation, (f) effective process control, (g) maintenance programmes, (h) emergency preparedness and response, (i) safeguarding compliance with environmental legislation;		Yes		Thames Water operates a SharePoint-based EMS with procedures linked from across the organisation. Procedures cover items (a) to (i) and include documents such as Site Operating Manuals and Asset Standards for design and operation of plant, EMS Standards, planned and preventative maintenance programmes and corporate incident response procedures.
			v) checking performance and taking corrective action, paying particular attention to: (a) monitoring and measurement (see also the JRC Reference Report on Monitoring of emissions to air and water from IED installations – ROM), (b) corrective and preventive action, (c) maintenance of records, (d) independent (where practicable) internal or external auditing in order to determine whether or not the EMS conforms to planned arrangements and has been properly implemented and maintained;		Yes		Thames Water's EMS includes procedures to allow for checking of performance and preventative and corrective actions. Monitoring checks are completed as necessary and records are maintained, including use of SCADA and SAP systems for electronic records. Periodic inspections of sites are carried out internally to monitor compliance with EMS procedures. Electronic systems are in place to assign ownership, and track the progress of, any corrective actions resulting from internal or external inspections.
			vi) review, by senior management, of the EMS and its continuing suitability, adequacy and effectiveness;		Yes		The EMS has received sign-off from Senior Management and the Thames Water Environmental Governance Board. In addition Thames Water operate several steering groups attended by Senior Managers where procedures can be highlighted and issues raised.
			vii) following the development of cleaner technologies;		Yes		Thames Water has an Asset Management System that is accredited to ISO55001. Included in the associated policy is a commitment to work to providing and delivering high-performing, sustainable and efficient asset base to achieve our commitments, including net zero operational carbon by 2030 which requires us to look at reducing our use of fossil fuels and look at low carbon alternatives.
			viii) consideration for the environmental impacts from the eventual decommissioning of the plant at the stage of designing a new plant, and throughout its operating life;		Other (explain)		Thames Water has an Asset Management System that is accredited to ISO55001. Our Asset Standards consider the assets from design through to operation and some include decommissioning, these include consideration of environmental impacts and regulatory requirements. We are currently developing an overarching decommissioning asset standard which will include consideration of environmental impacts.
			ix) application of sectoral benchmarking on a regular basis;		Yes		Thames Water are an active members of the WaterUK Management System Forum (and other Water UK Network groups) and meet industry colleagues on an ad-hoc basis to compare approaches.
			x) waste stream management (see BAT 2);		Yes		This is requirement is broadly met - see BAT 2
			xi) an inventory of waste water and waste gas streams (see BAT 3);		Yes		A site-specific inventory of waste water and waste gas streams will be included as part of the Residues Management Plan which is submitted alongside the permit application.
			xii) residues management plan (see description in Section 6.5);		Yes		A site-specific Residues Management Plan which covers the management of raw materials, waste water and biogas used or generated as part of the permitted activities is included and submitted alongside the permit application.
			xiii) accident management plan (see description in Section 6.5);		Yes		Thames Water operates a SharePoint-based Accident Management Plan and Environmental Risk Assessment. Information includes; Incident management arrangements, EMS essential standards, H&S procedures, Thames Water wide contact details, Site specific information (Site Operating Manual), permit, site plans, vulnerable receptors).
2	Overall performance	Improvement of overall environmental performance	In order to improve the overall environmental performance of the plant, BAT is to use all of the techniques given below.				

			a) Set up and implement waste characterisation and pre-acceptance procedures		Other (explain)		Thames Water has a Biorecycling Management System that is certified to ISO14001 and accredited under the Biosolids Assurance Scheme (BAS). The scheme covers the sludge recycling process including inputs into sites, the treatment process right through to the recycling of biosolids as fertiliser to land. Details of waste characterisation and pre-acceptance procedures can be found in the relevant sections of: Acceptance of TWUL Inter-Site Sludge, Cake and Sludge Liquors; and Environmental Essential Standard 12, Acceptance of Third-Party Waste Imports
			b) Set up and implement waste acceptance procedures		Other (explain)		Thames Water has a Bio-recycling Management System that is certified to ISO14001 and accreditation under the Biosolids Assurance Scheme (BAS). Details of the waste acceptance procedures can be found in the relevant sections of: Acceptance of TWUL Inter-Site Sludge, Cake and Sludge Liquors; and Environmental Essential Standard 12, Acceptance of Third-Party Waste Imports
			c) Set up and implement a waste tracking system and inventory		Yes		Beddington STC operates on a continuous batch process treating combined indigenous and imported sludge. Once accepted it is not possible to track individual loads of sludge or separate from the indigenous UWWTD flow within the bulk sludge. However it can be estimated that following acceptance on average sludge will progress through the treatment process according to the residence times of each process unit. Residence times are known by the operational teams who are able to estimate progress of sludge through the treatment process, based on the known acceptance information provided by the data loggers and site SCADA information.
			d) Set up and implement an output quality management system		Yes		Outputs are subject to the requirements of the Sludge Use in Agriculture Regulations 1989 (SUiAR), and in accordance with the Biosolids Assurance Scheme (BAS). Digested sludge cake output is subject to regular testing and corrective action plans to manage non-compliance.
			e) Ensure waste segregation		Yes		Waste is only accepted by the site for biological treatment following waste pre-acceptance and waste acceptance procedures. Waste is delivered to dedicated import areas. Digested sludge cake within the cake barns is segregated between indigenous and imported sludge by using different areas within the cake barns.
			f) Ensure waste compatibility prior to mixing or blending of waste		Yes		Thames Water accept a limited number of waste types. Waste is only accepted by the site for biological treatment following waste pre-acceptance and waste acceptance procedures. This ensures compatibility prior to mixing or blending activities.
			g) Sort incoming solid waste		N/A (explain)		Item g does not apply to this site. Solid waste is not received by the site
3	Overall performance	Inventory *Applicability* The scope (e.g. level of detail) and nature of the inventory will generally be related to the nature, scale and complexity of the installation, and the range of environmental impacts it may have (determined also by the type and amount of wastes processed).	In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of waste water and waste gas streams, as part of the environmental management system (see BAT 1), that incorporates all of the following features:		Yes		As far as is reasonably practicable
			(i) information about the characteristics of the waste to be treated and the waste treatment processes, including: (a) simplified process flow sheets that show the origin of the emissions; (b) descriptions of process-integrated techniques and waste water/waste gas treatment at source including their performances;		Yes		All sites have block flow diagrams for their operations available within the EMS, and plant performance is monitored through the site SCADA system. Output quality is monitored at various points (cake quality; biogas quality). Plant performance measures are checked regularly for digester health and H_2S levels, amongst other key operational parameters.
			(ii) information about the characteristics of the waste water streams, such as: (a) average values and variability of flow, pH, temperature, and conductivity; (b) average concentration and load values of relevant substances and their variability (e.g. COD/TOC, nitrogen species, phosphorus, metals, priority substances/micropollutants); (c) data on bioeliminability (e.g. BOD, BOD to COD ratio, Zahn-Wellens test, biological inhibition potential (e.g. inhibition of activated sludge)) (see BAT 52);		Yes		Waste waters generated from waste treatment are subject to monitoring and sampling - see Appendix M, Liquor Monitoring Proposal.
			(iii) information about the characteristics of the waste gas streams, such as: (a) average values and variability of flow and temperature; (b) average concentration and load values of relevant substances and their variability (e.g. organic compounds, POPs such as PCBs); (c) flammability, lower and higher explosive limits, reactivity; (d) presence of other substances that may affect the waste gas treatment system or plant safety (e.g. oxygen, nitrogen, water vapour, dust).		Yes		Biogas quality is measured continuously for certain parameters through the biogas management system and, if required, appropriate clean up equipment installed to control levels, e.g. siloxane filters. Overall biogas quality is monitored live on line via electronic means by a dedicated specialist team.. Systems such as SCADA and Cockpit are used to monitor site processes; provide trending and then inform any required corrective action.

4	Overall performance	Techniques for storage of waste	In order to reduce the environmental risk associated with the storage of waste, BAT is to use all of the techniques given below.		Yes		Thames Water is compliant as far as practicable.
			a) Optimised storage location		N/A (explain)		Item A is generally applicable directly to new plants. However, compliance is pre-defined due to the locational constraints of existing sites and infrastructure within the existing works for storage.
			b) Adequate storage capacity		Yes		Item B is controlled through the retention times within the biological treatment system, including the use of any holding tanks installed with known capacities. Should capacity be an operational issue, waste imports will be diverted to other Thames Water sites.
			c) Safe storage operation		Yes		Only the first consideration in Item (c) applies to the site and is controlled through the provision of site transfer pipework for tanker offloading and loading. There is labelling for different waste inputs at the waste import points. There is a design standard for these waste import assets, and the discharge of waste is controlled by activation fobs which allows access to the correct discharge point.
			d) Separate area for storage and handling of packaged hazardous waste		N/A (explain)		Item (d) does not apply to the wastes handled at the site as no packaged waste is accepted.
5	Overall performance	Techniques for handling and transfer of waste	In order to reduce the environmental risk associated with the handling and transfer of waste, BAT is to set up and implement handling and transfer procedures.		Yes		Thames Water is fully compliant with the requirements of this BAT. All staff are appropriately trained in site procedures, with a TCM in place and all waste management procedures are covered by the EMS. Spill kits are available on site and staff trained to use them. Waste transfers are carried out only using vacuum transfer lines at dedicated disposal points.
6	Monitoring	Waste water - Monitor key parameters	For relevant emissions to water as identified by the inventory of waste water streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, BOD) at key locations (e.g. at the inlet and/or outlet of the pretreatment, at the inlet to the final treatment, at the point where the emission leaves the installation).		Yes		Returns of liquors to the works inlet are not currently sampled. See Appendix M for the Liquor Monitoring Proposal.
7	Monitoring	Waste water - Monitoring frequencies and standards	BAT is to monitor emissions to water with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	See 'Water emissions tables' tab	Yes		There are no direct emissions to water from the permitted operations. Thames Water are proposing a monitoring regime at sampling locations on key waste water outputs that are transferred from the permitted activities back to the inlet, via the site drainage system. See Appendix M for the Liquor Monitoring Proposal.
8	Monitoring	Channelled air emissions - Monitoring frequencies and standards	BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards. If EN standards are not available, BAT is to use ISO, national or other international standards that ensure the provision of data of an equivalent scientific quality.	See 'Air emissions tables' tab	Yes		Thames Water comply with this requirement for the following substances, as applicable to their processes: H_2S; NH_3; Odour. See Appendix E for the site Odour Management Plan
9	Monitoring	Diffuse emissions - Monitor organic compounds	BAT is to monitor diffuse emissions of organic compounds to air from the regeneration of spent solvents, the decontamination of equipment containing POPs with solvents, and the physico-chemical treatment of solvents for the recovery of their calorific value, at least once per year using one or a combination of the techniques given below.		N/A (explain)		These activities are not applicable to this site.
			a) Measurement		N/A (explain)		These activities are not applicable to this site.
			b) Emissions factors		N/A (explain)		These activities are not applicable to this site.
			c) Mass balance		N/A (explain)		These activities are not applicable to this site.
10	Monitoring	Odour - Monitor emissions *Applicability* The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.	BAT is to periodically monitor odour emissions. (The monitoring frequency is determined in the odour management plan (see BAT 12).)		Yes		Thames Water carries out odour monitoring in accordance with BAT 10 requirements. Monitoring of OCUs is carried out monthly and quarterly for various parameters including hydrogen sulphide. Our contractors undertake hydrogen sulphide monitoring typically using Draeger or Gastec analysis tubes widely used in the waste water industry. Where applicable, OCUs may also have online hydrogen sulphide monitoring.
11	Monitoring	Moniror annual consumption and generation of waste outputs	BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and waste water, with a frequency of at least once per year.		Yes		Thames Water meets this BAT requirement through annual monitoring of key process parameters (biogas production; energy consumption and export; raw material use; waste produced). Pre and Post AD process returns back to the sewage works are monitored in order to ensure control and optimisation of the works. For returns from the digestion process to the treatment works – drainage, waste process water, condensate, dirty washwater. These are not routinely monitored see response to BAT 6.
12	Emissions to air	Odour Management Plan *Applicability* The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to set up, implement and regularly review an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements: — a protocol containing actions and timelines; — a protocol for conducting odour monitoring as set out in BAT 10; — a protocol for response to identified odour incidents, e.g. complaints; —an odour prevention and reduction programme designed to identify the source(s); to characterise the contributions of the sources; and to implement prevention and/or reduction measures.		Yes		The site has an odour management plan which is subject to regular monitoring and periodic updating. See Appendix E for the site Odour Management Plan
13	Emissions to air	Odour reduction techniques	In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of the techniques given below.		Yes		Thames Water complies with this BAT requirement

			a) Minimising residence times		Yes		Waste storage time is minimised prior to digestion. Waste treatment takes place within tanks and vessels on a continuous basis for appropriate durations of time. Digested sludge is stored in containers post-digestion prior to dewatering operations. Digested sludge cake is stored in one of two cake barns for minimal times before transfer offsite.
			b) Using chemical treatment		Yes		H_2S levels are controlled through chemical dosing outside of the installation boundary. Odour control assets are designed in accordance with Asset Standards, the current Asset Standard requires construction to WIMES 8.05.
			c) Optimising aerobic treatment		N/A (explain)		Aerobic treatment is not utilised within the installation
14	Emissions to air	Diffuse emission reduction techniques	In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below. Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant.		Other (explain)		Thames Water operates a number of existing facilities, entering IED for the first time. As such, existing plant and equipment may not be fully compliant with the requirements of this item. Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the potential need to cover open topped tanks. Thames is not able to commit to covering tanks by the stated deadline of December 2024, delivery timescales will be subject to the outcome of PR24 and subsequent price review discussions.
			a) Minimising the number of potential diffuse emission sources		Yes		Use of gravity transfer over pumping and appropriate design of piping layout is carried out as far as practicable within the organisations design codes. Site has a vehicle speed limit.
			b) Selection and use of high- integrity equipment		Other (explain)		Applicability of item b) is restricted due to existing operability requirements of the plant.
			c) Corrosion prevention		Yes		Construction materials specified are based on the operational requirements, e.g. stainless steel used in biogas pipework to prevent corrosion and used in the process.
			d) Containment, collection and treatment of diffuse emissions		Yes		Storage of waste and materials that may generate diffuse emissions takes place within enclosed tanks and buildings under normal operations. Treating wastes takes place within the Primary Digestion Tanks which are contained/enclosed. There is limited handling of waste and materials, with the exception of digested sludge cake, which takes place within one of two semi-enclosed cake barns. Emissions are directed to odour control units as appropriate to treat emissions. Digested sludge in the Sludge Buffer Tank, Emergency Sludge Storage Tank and Overflow Tanks is not enclosed.
			e) Dampening		N/A (explain)		Item e) is not relevant to Thames Water's operations
			f) Maintenance		Other (explain)		Routine maintenance is the responsibility of site staff who complete day-to-day activities with the support of approved contractors. Maintenance activities and regular checks are recorded electronically. Access to potentially leaky equipment may be restricted in the case of pre-existing assets, including some sludge pipelines, that are subsurface.
			g) Cleaning of waste treatment and storage areas		Yes		Cleaning and regular maintenance of all plant and equipment will be completed on the time scale specified by the equipment manufacturer. Spillages are cleaned up as required making use of available spill kits.
			h) Leak detection and repair (LDAR) programme		Yes		A leak detection and repair (LDAR) plan has been prepared for the site and is included within the main application document.
15	Emissions to air	Flare use minisation techniques	BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using both of the techniques given below.		Yes		Use of the flare is minimised as far as possible in order to obtain best value from the biogas generation at the site. Flare use currently can exceed 10% of annual hours, this is to maintain safety within the pressurised gas system and monitoring would be undertaken.
			a) correct plant design		Yes		The site is equipped with sufficient biogas storage capacity across multiple biogas holders. The site is equipped with multiple outlets for biogas use, with high-integrity relief valves only used in emergency situations and not to control biogas volumes. Biogas is used within the CHP engines with flaring only used for safety reasons. There are two flares which can both be used with a new flare scheduled to be installed at the site, to replace one of the existing flares.
			b) Plant management		Yes		All plant is maintained to optimise biogas for economic use. Multiple outlets are available to make use of biogas and imports of waste can be reduced in order to reduce biogas generation during planned maintenance of key plant. Multiple outlets are available to use sludge including the transfer offsite to another sludge treatment centre.
16	Emissions to air	Flare emissions minisation techniques	In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use both of the techniques given below.		Yes		Thames Water complies with this BAT requirement.
			a) Correct design of flaring devices		Yes		Thames Water specify ground mounted flares for use when flaring is unavoidable.
			b) Monitoring and recording as part of flare management		Yes		Thames Water monitors the hours of operation of the flare, in line with the standard requirements of environmental permits issued by the Environment Agency, that is only carrying out emissions monitoring should the flare operate over 10% of annual hours. Where flaring takes place for more than 10% of annual hours, monitoring would be undertaken.
17	Noise and vibrations	Noise management plan *Applicability* The applicability is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated.	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to set up, implement and regularly review a noise and vibration management plan, as part of the environmental management system (see BAT 1), that includes all of the following elements:		N/A (explain)		Thames Water does not routinely prepare noise and vibration plans for sites due to a lack of noise and / or vibration issues at nearby sensitive receptors. There is no history of substantiated noise or vibration complaints against the wider site. In accordance with the applicability criteria for this BAT item, Thames Water is therefore compliant.
			i) a protocol containing appropriate actions and timelines;		N/A (explain)		Although not applicable to this site, Thames Water's EMS contains protocols including for appropriate actions and timelines in the event of feedback from stakeholders.
			ii) a protocol for conducting noise and vibration monitoring;		N/A (explain)		Although not applicable to this site, Thames Water's EMS contains protocols for conducting noise and vibration monitoring.
			iii) a protocol for response to identified noise and vibration events, e.g.		N/A (explain)		Thames Water's EMS contains protocols for managing feedback from stakeholders.

			iv) a noise and vibration reduction programme designed to identify the source(s), to measure/estimate noise and vibration exposure, to characterise the contributions of the sources and to implement prevention and/or reduction measures.		N/A (explain)		Although not applicable to this site, a noise and vibration reduction programme would be implemented as a result of substantiated claims.
18	Noise and vibrations	Noise and vibration reduction techniques	In order to prevent or, where that is not practicable, to reduce noise and vibration emissions, BAT is to use one or a combination of the techniques given below.		Yes		Thames Water meets the requirements of this BAT requirement as far as practicable, considering their existing infrastructure and constraints on site layout.
			a) Appropriate location of equipment and buildings		Yes		For existing plant appropriate locations and building openings/exits is restricted to plant design but where possible plant and openings are located away from sensitive receptors. Where this is not possible, doors are kept closed to minimise noise and vibration emissions.
			b) Operational measures		Yes		While the avoidance of night operations is not possible as works must operate 24 hours per day, where possible noise is minimised during these periods. Plant and equipment is maintained at the time scale specified by the equipment manufacturer to minimise noise and vibration emissions. Activities at the site are completed by competent and trained staff.
			c) Low-noise equipment		Yes		Item c) is met through design standards for the organisation for new plant and equipment.
			d) Noise and vibration control equipment		Yes		Item d) is met through design standards for the organisation for new plant and equipment.
			e) noise attenuation		Yes		Item e) is implemented on new plant and equipment on a risk assessed basis.
19	Emissions to water	Water management techniques	In order to optimise water consumption, to reduce the volume of waste water generated and to prevent or, where that is not practicable, to reduce emissions to soil and water, BAT is to use an appropriate combination of the techniques given below.		Other (explain)		Thames Water is currently not in full compliance with this BAT requirement. Thames Water is committed to meeting the requirements of BAT. A full BAT risk assessment is required to determine the detailed design for Beddington 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) water management		N/A (explain)		Item a) is not carried out at sites, because Thames Water is also responsible for the treatment of any waste water generated. Where possible, final effluent from the UWWTD works is utilised for cleaning operations in place of potable water and roof guttering is diverted to surface water drainage on new builds.
			b) water recirculation		N/A (explain)		Item b) is not carried out at sites, because Thames Water is also responsible for the treatment of any waste water generated to the adjacent sewage treatment works. Where possible, final effluent from the UWWTD works is utilised for cleaning operations in place of potable water and roof guttering is diverted to surface water drainage on new builds.
			c) impermeable surface		Other (explain)		Item c) is not met for all operational areas. Sludge thickening operations take place on impermeable surfaces, digested sludge dewatering operations take place on impermeable surfaces and all cake storage takes place on engineered, impermeable surfaces in a semi-enclosed cake barn. However, areas surrounding the Primary and Secondary Digester Tanks are not fully impermeable and may not be impermeable to the materials stored within the tanks.
			d) Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels		Other (explain)		Item d) is not complied with for all tanks. While tanks are equipped with high level alarms and digesters are monitored for foaming, tanks are not routinely equipped with secondary containment. Isolation valves and inhibitors are installed at appropriate points within the installation to allow for tanks or vessels to be isolated and taken out of service. Drainage from within the installation is captured within the site drainage system which is returned to the works inlet. Drainage from the digested sludge dewatering is pumped via a Liquor Buffer Tank. A Containment Assessment for the site, based on spillage modelling is presented in the main application document as Appendix G. The Containment Options Report provides a potential solution.
			e) Roofing of waste storage and treatment areas		Yes		Item e) is met for tanks up to and including the secondary digesters. The Sludge Buffer Tank, Emergency Sludge Storage Tank, Liquor Buffer Tank and Overflow Tanks are not covered.
			f) Segregation of water streams		Yes		The site has a drainage system, which returns water to the head of the works for full treatment via the UWWTD route
			g) Adequate drainage infrastructure		Yes		The site has a drainage system, which returns water to the head of the works for full treatment via the UWWTD route
			h) Design and maintenance provisions to allow detection and repair of leaks		Yes		Tanks and vessels are generally above ground structures and subject to routine visual inspection. Primary Digester Tanks have a planned schedule of emptying and cleaning during which they are inspected for integrity and any necessary repairs carried out. Where visual checks identify issues with tanks or vessels these are actioned for addressing.
			i) Appropriate buffer storage capacity		Yes		Item i) is accounted for in the overall process design, based on a combination of the population equivalence for the overall works and a specified level of storm event. In the event of a capacity issue during normal operational periods, excess sludge is transferred to another appropriate digester site for treatment and imports of waste would be stopped at this site. A containment solution for the site, based on spillage modelling is presented in the main application document as an appendix and includes provision of additional bunding as a potential solution that provides buffer storage capacity in the event of tank failure.
20	Emissions to water	Water emission reduction techniques	In order to reduce emissions to water, BAT is to treat waste water using an appropriate combination of the techniques given below.	See 'Water emissions tables' tab	Other (explain)		Liquors from the installation are returned to the inlet of the adjacent sewage treatment works, controlled by the installation operator for treatment in UWWTD process.
			a) equalisation		N/A (explain)		n/a as there are no direct emissions to water
			b) neutralisation		N/A (explain)		n / a as pH is similar to UWWTD materials

			c) Physical separation, e.g. screens, sieves, grit separators, grease separators, oil- water separation or primary settlement tanks		Other (explain)		Liquors enter at the inlet, which then goes through degritting, grease separators and into primary settlement tanks
			d) adsorption		N/A (explain)		n / a - not appropriate to liquor components
			e) distillation/rectification		N/A (explain)		n / a - not appropriate to liquor components
			f) precipitation		N/A (explain)		n / a - not appropriate to liquor components
			g) chemical oxidation		N/A (explain)		n / a - not appropriate to liquor components
			h) chemical reduction		N/A (explain)		n / a - not appropriate to liquor components
			i) evaporation		N/A (explain)		n / a - not appropriate to liquor components
			j) ion exchange		N/A (explain)		n / a - not appropriate to liquor components
			k) stripping		N/A (explain)		n / a - not appropriate to liquor components
			l) activated sludge process		Other (explain)		The wider sewage works uses this technology to treat the compounds within the liquor.
			m) membrane bioreactor		N/A (explain)		n/a as there are no direct emissions to water
			n) Nitrification/denitrification when the treatment includes a biological treatment		Other (explain)		ammonia is removed through the sewage treatment process at the adjacent works
			o) coagulation and flocculation		N/A (explain)		n / a - this is carried out to remove gross sludge within the installation boundary
			p) sedimantation		N/A (explain)		n / a - not appropriate to liquor components
			q) Filtration (e.g. sand filtration, microfiltration, ultrafiltration)		Other (explain)		Sand filtration is used for final polishing of effluent from the works
			r) floatation		N/A (explain)		n / a - not appropriate to liquor components
21	Emissions from accidents and incidents	Prevention and limitation techniques	In order to prevent or limit the environmental consequences of accidents and incidents, BAT is to use all of the techniques given below, as part of the accident management plan (see BAT 1).		Yes		Thames Water has considered accidents and incidents and developed site specific accident management plans. DSEAR assessments have been undertaken on sites and appropriate zoning designated.
			a) protection measures		Yes		The site employs physical site security to prevent unauthorised access to the site. Physical protection methods including fencing, bollards and kerbing are in place around some assets. Fire detection and automatic safety features are fitted to biogas systems.
			b) Management of incidental/accidental emissions		Yes		Site has Accident Management Plan which includes spill prevention steps for trained staff to clean up spillages using suitable spill response kits. Site drainage system is suitably sized to handle firefighting waters. Safety features are connected to site SCADA system which is monitored 24/7 with additional visual checks completed by site staff.
			c) Incident/accident registration and assessment system		Yes		All accidents and incidents are logged within the company wide management system. Sensitive receptor risk assessments have been undertaken for all sites.
22	Material efficiency	Material efficiency *Applicability* Some applicability limitations derive from the risk of contamination posed by the presence of impurities (e.g. heavy metals, POPs, salts, pathogens) in the waste that substitutes other materials. Another limitation is the compatibility of the waste substituting other materials with the waste input (see BAT 2).	In order to use materials efficiently, BAT is to substitute materials with waste.		Yes		Thames Water comply with this BAT requirement as far as they are able. However, the installation has a low level of raw material consumption in the process and there is limited opportunity to substitute waste products for materials in the process. The process also has specific requirements for specific applications, e.g. use of polymer to aid digested sludge cake production, use of lubricating oils in the biogas combustion plant. In addition, substitution of materials with waste is currently seen as non-compliant with SUiAR, as it is deemed codigestion.
23	Energy efficiency	Energy efficiency techniques	In order to use energy efficiently, BAT is to use both of the techniques given below.		Yes		Thames Water comply with this BAT requirement.
			a) energy efficient plant		Yes		Thames Water have an ISO 50001 accredited Energy Management System. All CHP engines are accredited under the Combined Heat and Power Quality Assurance Scheme. Included within the EMS is an energy efficiency plan for the business in order to optimise energy consumption and to plan for improvements, e.g. increased insulation to reduce heat losses in transmission from CHP engines to digesters. Use of the flare is monitored and minimised as far as possible (it currently operates at greater than 10% of annual hours) and energy efficient plant and equipment specified during asset replacement schemes. Imports of waste are planned to optimise biogas generation and can be diverted to other sites to meet shortfalls or plan for decreases in storage/generation capacity from planned maintenance.
			b) energy balance record		Yes		Thames Water monitor energy consumption used by the installation in processing the waste and export from their sites from generation within CHP engines, in order to maximise the value of biogas generated within the sites. Monitoring is completed for all fuel sources.
24	Reuse of packaging	Reuse of packaging *Applicability* Some applicability restrictions derive from the risk of contamination of the waste posed by the reused packaging.	In order to reduce the quantity of waste sent for disposal, BAT is to maximise the reuse of packaging, as part of the residues management plan (see BAT 1).		Yes		Thames Water complies with this BAT requirement. There is limited packaging used on site with all wastes are delivered by tankers, which is inherently a reuse activity. Where possible, bulk deliveries are made by tanker eliminating the need for packaging or containers from chemicals used on site, are rinsed and returned to the supplier for reuse. Other containers are sent offsite for recovery or recycling as appropriate.
General BAT conclusions for the biological treatment of waste							
33	Overall performance		In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input.		Yes		Thames Water comply with this BAT requirement for all imported wastes. However it is unable to select waste inputs in the UWWTD system. With imported trade wastes (cess and septic tank wastes), standardised procedures ensure compatibility.
34	Emissions to air		In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H2S and NH3, BAT is to use one or a combination of the techniques given below.	See 'Air emissions tables' tab	Yes		Thames Water comply with this BAT requirement but does not use equipment of the type described by items a; c, d or e due to the nature of the process on site. Odour control units used to reduce channelled emissions to air are appropriately sized for the application.
			a) adsorption - see table 6.1		N/A (explain)		Not applicable to this site

			b) biofilter - see table 6.1		Yes		There is one odour control units installed at Beddington STC to control specific odour sources which is biofilter based. This has been designed and appropriately sized for the sources to be treated. H2S is monitored in some processes and action levels set, no overall site monitoring is undertaken.
			c) fabric filter - see table 6.1		N/A (explain)		Not applicable to this site
			d) thermal oxidation - see table 6.1		N/A (explain)		Not applicable to this site
			e) wet scrubbing - see table 6.1		N/A (explain)		Technique not applicable at this site
35	Emissions to water and usage		In order to reduce the generation of waste water and to reduce water usage, BAT is to use all of the techniques given below.		Yes		Thames Water comply with this BAT requirement as far as practicable, based on existing infrastructure. Items a and c do not apply to the processes on site
			a) segragation of water streams		N/A (explain)		Not applicable to this site - generally applicable to new sites
			b) water recirculation		Yes		Site recirculates water in place of potable water where possible. Final effluent are used for cleaning of plant and equipment. Use of clean, potable water is minimised as far as possible where quality management is required, e.g. with make up of polymer or within welfare facilities.
			c) minimisation of the generation of leachate		N/A (explain)		Not applicable to this site as leachate is not generated.
BAT conclusions for the aerobic treatment of waste							
36	Overall environmental performance	control key waste and process parameters	In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.		N/A (explain)		Thames Water does not undertake aerobic treatment processes within these installation boundaries. Digested sludge cake, stored in the semi-enclosed cake barns prior to removal from site is monitored for compliance with the requirements of BAS / SUiAR but does not undergo significant aerobic degradation.
37	Odour and diffuse emissions to air	reduce diffuse emissions to air of dust, odour and bioaerosols	In order to reduce diffuse emissions to air of dust, odour and bioaerosols from open-air treatment steps, BAT is to use one or both of the techniques given below.		N/A (explain)		Thames Water does not undertake aerobic treatment processes within the installation boundaries. Digested sludge cake at the site does not undergo significant aerobic degradation prior to removal from site.
			a) use of semipermeable membrane covers		N/A (explain)		Item a) does not apply to the processes on the site, as it specifically relates to composting windrows.
			b) adaptation of operations to the meteorological conditions		N/A (explain)		The first step in item b) does not apply as processes are not carried out outdoors. Stored material in the cake barn is not subject to turning or screening / shredding. The second item does not apply, as the digested sludge cake is stored within a semi-enclosed cake barn which has a sufficient freeboard between the top of the sludge cake and the top of the wall to minimise the impact from wind. Digested sludge cake also has a sufficient moisture content that it does not readily form windblown dust.
BAT conclusions for the anaerobic treatment of waste							
38	Emissions to air	Monitor and control key waste and process parameters	In order to reduce emissions to air and to improve the overall environmental performance, BAT is to monitor and/or control the key waste and process parameters.		Yes		Thames Water comply with this BAT requirement. Digester operation is monitored continuously (24hours) using the SCADA system and automatic monitoring, as well as periodic visual inspection. Plant performance measures are checked regularly for digester health and H_2S levels, amongst other key operational parameters. Additional confirmatory testing is carried out through checks on the produced sludge cake to comply with BAS, including pathogen count. This demonstrates if the process is working in the designed manner.
BAT conclusions for the mechanical biological treatment (MBT) of waste							
39	Emissions to air	Segregation and recirculation of waste gas streams	In order to reduce emissions to air, BAT is to use both of the techniques given below.		N/A (explain)		Thames Water comply with this BAT requirement as far as is applicable to their operations.
			a) segragation of the waste gas streams		N/A (explain)		Item a does not apply to the processes carried out on site.
			b) recirculation of waste gas		N/A (explain)		Waste gas (biogas) is used on site. Condensate from the biogas process is captured at low points within the biogas handling system. This is then released into the site wide drainage system for transfer back to the head of the works and treatment within the UWWTD treatment process.
BAT conclusions for the physico-chemical treatment of solid and/or pasty waste							
40	Monitor waste input	Monitoring of content of wastes during pre-acceptance and acceptance	In order to improve the overall environmental performance, BAT is to monitor the waste input as part of the waste pre-acceptance and acceptance procedures (see BAT 2).		N/A (explain)		Not applicable to this site
41	Emissions to air	Abatement systems and BAT-AELS	In order to reduce emissions of dust, organic compounds and NH3 to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below.	See 'Air emissions tables' tab	N/A (explain)		Not applicable to this site
			a) adsorption - see section 6.1		N/A (explain)		Not applicable to this site
			b) biofilter - see section 6.1		N/A (explain)		Not applicable to this site
			c) fabric filter - see section 6.1		N/A (explain)		Not applicable to this site
			d) wet scrubbing - see section 6.1		N/A (explain)		Not applicable to this site