



Acceptance of TWUL Inter-Site Sludge and Cake



Contents

Key Messages	3
Roles and Responsibilities	3
1 Purpose	4
2 Scope.....	4
3 Duty of Care	5
3.1 Waste Classification and Duty of Care Records.....	5
4 Inter-Site Raw Liquid Sludge / Cake Import Areas	7
5 Inter-Site Digested Cake Import Areas	7
6 Waste Pre-acceptance	8
7 Waste Acceptance	9
8 Non-conformity.....	12
8.1 Contingency.....	12
8.1.1 Inter-Site Liquid Sludge:.....	12
8.1.2 Cake - compliance.....	12
9 Assurance	13



Key messages

Thames Water’s 25 Sludge Treatment Centres (STCs) operate under IED EPR Permits which set out specific conditions on how the permitted activities must be carried out, including restrictions on the types of waste which can be handled and accepted.

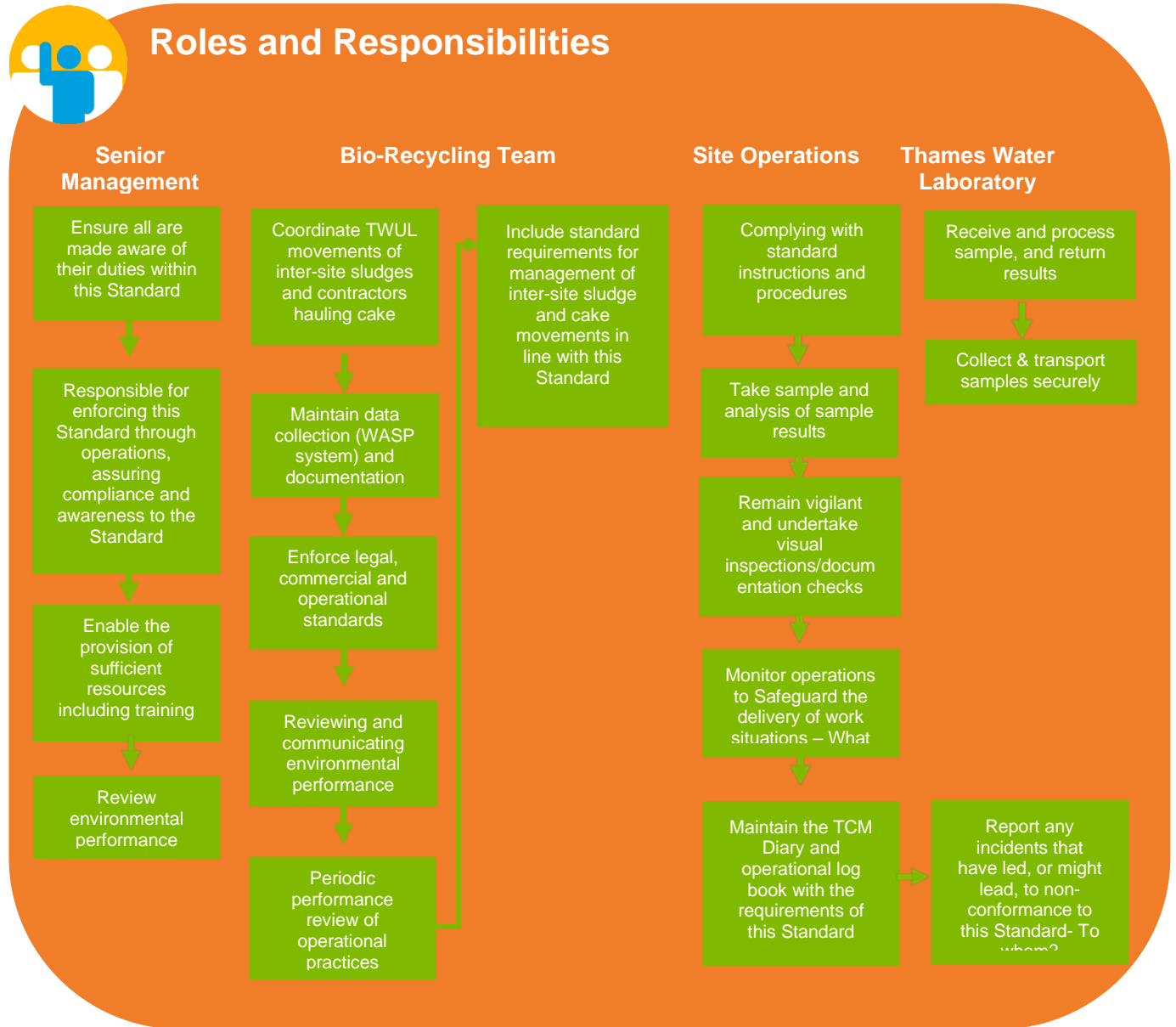
This Standard defines the working practice to be adopted at each of the 25 STCs to ensure the correct acceptance of inter-site sludge and cake imports, based on two levels of waste verification.

- Waste Pre-acceptance (Section 5); and
- Waste Acceptance (Section 6).

This Standard also includes instruction on the reasonable steps to be taken to ensure that duty of care is fulfilled.



Roles and Responsibilities



1 Purpose



Thames Water is the operator of 25 Sludge Treatment Centres (STCs), each of which has an IED EPR Permit that allows imports of inter-site sludge and inter-site sludge cake waste.

The IED EPR Permits allow Thames Water (TWUL) to accept non-hazardous sludges for treatment and / or storage at each of the 25 STCs at waste reception points design for the purpose. These activities must comply with the requirements of each of the respective IED EPR Permits. Note: the import of inter-site sludge to head of works waste reception area is exempt under Controlled Waste Regulations 2012 Regulation 3, 2(a) and this activity is outside the scope of the permit

Each STC IED EPR permit sets out specific conditions on how permitted waste operation must be carried out. This includes restrictions to the types of waste that can be handled. A breach of permit could include accepting or managing a waste which the permit does not accept.

This document sets out TWUL current working practices used to ensure compliant acceptance of waste at our sludge treatment centres based on two levels of waste verification, namely:

- Waste Pre-acceptance (Section 5); and
- Waste Acceptance (Section 6).

The Standard also covers the acceptance of sludge cake transfer between STC's, for the purposes of its storage and / or further treatment (see section 5) prior to transfer offsite for recycling to land under BAS.

The permitted wastes suitable for acceptance at the Inter-Site Liquid Sludge Reception Point(s), and the cake pad(s), at each of the 25 STCs are listed in each of the respective IED EPR permits, which are available on the Thames Water SharePoint EMS Portal via the 'My Sites and EMS' pages for each of the permitted STCs. (see also Table 1 below)



The requirements of this Standard must be communicated to all relevant employees and subcontractors, who must include the relevant control measures in method statements and risk assessments. Relevant Toolbox talks should be undertaken to communicate requirements on an on-going basis. This must include any developments to this Standard.

2 Scope



The scope of this Standard covers all persons, techniques, assets and operations associated to, and/or included within each of the IED EPR Permits for the 25 STCs that relate to the acceptance of inter-site sludge and sludge cake.

The boundary of the site of asset is defined as detailed in f the 25 Sludge treatment permits. Health and Safety Standards and Asset Maintenance Standards also apply across all 25 STCs.

3 Duty of Care



Thames Water has a legal duty, under Section 34 of the Environmental Protection Act 1990, often referred to as The Duty of Care, to ensure that any liquid or solid waste is disposed or recovered in the correct manner, without harming human health or the environment.

Responsibility for the compliant storage, treatment and recovery (or disposal) of waste sludge from UWWT and permitted Sludge Treatment centres lies with TWUL as the waste producer, permit holder and 'waste holder'.

TWUL must take all reasonable steps to ensure the Duty of Care is fulfilled including ensuring:

- waste sludge has been adequately described.
- waste sludge is securely contained to avoid its escape into the environment.
- ensuring that Thames Water is a registered waste carrier authorised to carry waste; and that
- that necessary waste transfer note documentation is kept

Waste must be managed in a way to ensure that its handling:

- Complies with relevant legislation and site-specific permit requirements.
- Does not cause harm to the environment and/or human health;
- Does not cause a nuisance; and
- Does not adversely affect public amenities or ecological receptors.

3.1 Waste Classification and Duty of Care Records

Thames Water transports our own 'inter-site' liquid waste. All movements of inter-site liquid sludge waste must be recorded and inter-site liquid sludges are discharged via a 'WASP' loggers in the waste reception areas. When logging on for a deposit using the unique issued fob, the TWUL fleet tanker driver must select the appropriate sludge type before discharging the waste. The data from each transaction is then stored in the WASP system. This system uses TWUL waste descriptors which are aligned to the 'List of Waste Codes' (EWC's) listed in Environment Agency Guidance RPS 231 'Waste codes for sewage sludge materials: see Table 1.

Table 1: Application of RPS 231 Sewage Sludge EWC codes to TWUL descriptors and sludge characteristics

Description	TWUL Internal descriptor	List of Waste (EWC code)	Typical Dry Solids (DS) content
Raw Sludge (liquor and very thin sludge)	LIQ; SLQ	19 08 05	<1.5% DS
Raw Sludge (thickened / dewatered)	RAW; ACT	19 02 06	1.5% -10% DS
	RCK (Raw Cake)	19 02 06	>18% DS
Digested Sludge Cake	DCK; DIG	19 06 06	> 18% - 40% DS
Treated Sludge – Lime stabilization	TLP	19 02 06	>18% - 40% DS
Raw Sludge Mechanically treated no polymer	N/A	19 12 12	>18% DS

The waste import logger will track the information submitted in real time. For each import of inter-site liquid sludge waste, the following details must be recorded:

- Time, date and place of transfer;
- Volume of transaction;
- Vehicle registration number.
- Source of waste;
- Description of the waste;

The WASP system will store inter-site liquid sludge import data for the lifetime of TWUL Sludge Treatment Centre permits. Transactions recorded on WASP are reviewed by the Bio-Recycling Team for compliance checks and as and when for reporting purposes, for example Environment Agency Quarterly Waste Returns at permitted sites.

Inter-site Cake

For inter-site transfers of cake, cake transfer will utilise TWUL contracted tipper lorries. On board weighing devices are used to determine the quantity of waste delivered by each individual load. This data supports Annual Waste Transfer Notes retained for Duty of Care and informs TWUL reporting such as again Environment Agency Quarterly Waste Returns at permitted sites.

4 Inter-Site Raw Liquid Sludge / Cake Import Areas



Each STC utilises one or more of the following waste reception areas to receive inter-site sludge and inter-site cake (see individual site 'Layout Plans' :

1. 'Cess' / Liquid Waste Import Waste Reception Area discharging liquid sludge to STW Head of Works and the UWWT process.
2. Liquid Waste Sludge Import Point - receiving waste directly to the permitted Sludge Treatment process
3. Raw Cake Import Reception building - receiving waste directly to the permitted Sludge Treatment process or to an on-site storage area prior to treatment as required

Thames Waters waste reception areas are constructed and maintained in accordance with the requirements set out in TWUL Asset Standards. TWUL operates a maintenance programme for these assets and all ancillaries, which is managed by the Site Operations Team.

5 Inter-Site Digested Cake Import Areas



The Inter-Site Cake Import areas, are designated areas on the site cake pad(s) which have been allocated for the storage of cake for import. The precise area will be at the discretion of the Site Operations Team, based on the storage requirements for indigenous cake at the site at the time of the proposed transfer.

Inter-site cake will be stored separately on the pad in clearly marked bays to indicate its status and regularly monitored until such time as it is utilised

6 Waste Pre-acceptance



Inter-site Sludge

Thames Water's 25 STCs only currently receive inter-site sludge produced at other TWUL sites. All movements of inter-site liquid sludge are undertaken by TWUL's own fleet of tankers under the management of the Bio-Recycling Team

All TWUL inter-site sludges are biological sludges that derive from TWUL UWWT streams. Only indigenous and non-indigenous sludge described in Table 1 are accepted to the permitted biological treatment process. We do not currently accept waste any waste that would result in co-digestion.

Thames Water therefore has control of the sludge stream as 'waste holder' from point of production, through to acceptance and treatment at each of the 25 STCs. TWUL is the waste producer and 'Waste Holder' throughout.

The principal types of Thames Water UWWTD inter-site liquid sludges processed at the 25 STCs locations and listed in Table 1 are:

- Primary Sludge (RAW): Sludge from primary settling tanks, generally 75% organic content or higher;
- Chemical-Precipitation Primary Sludge (RAW): Sludge from primary settling tanks that has been dosed with iron salts to aid phosphorous removal, generally 70% organic in content or higher;
- Waste or Surplus Activated Sludge (ACT): Excess sludge from the activated sludge process, comprising mainly of the residual bacteria from the process, generally 75% organic content or higher; and
- Humus Sludge (RAW): Sludge settled following trickling filters, generally 75% organic content or higher
- Sludge Liquors (SLQ): Liquid with less than 1% solid matter from sludge treatment.

Inter-site liquid sludges received are typically in the range of 1% to 8% dry solids, with the majority being between 3.5% and 6% dry solids (see specific examples in Table 1).

Thames Water's Bio-Recycling Team also operates under a management system that is certified to the ISO9001:2015 & ISO14001:2015 standards and the Biosolids Assurance Scheme (BAS). Within the Quality and Environmental Management System, procedures are in place to cover all aspects of the operation including:

- the completion of BAS Source Material Risk Assessments;
- product sampling to ensure compliance with regulations; and,
- routine process testing*, (see Table 2)

*process testing on commissioning of new plant to ensure that the treatment process meets all the requirements of the Hazard Analysis and Critical Control Point (HACCP) standard and will produce a product suitable to be sent to land.

The Thames Water Bio-Recycling Team's documented procedure entitled 'TWUL Procedure to Ensure Satisfactory Sludge Compliance' describes the methods employed to ensure sludge compliance.

The above processes provide TWUL with 'cradle to grave' knowledge, control and assurance of our Sludge imports their characteristics and suitability as inter-site sludges from TWUL UWWT for treatment at the TWUL permitted Sludge Treatment Centres.

TWUL's knowledge of each sludge stream is supported by data sets collected by TWUL, examples being in 2000 and 2009 whereby analysis was undertaken of c. 400 samples of inter-site sludges for % Dry Solids, Ammonia, pH, Total Nitrogen, Total Phosphates, Organic & Volatile Matter and Metals with a further c 1,300 samples being analysed for Dry Solids and Organic and Volatile Matter.

Operationally, sludges are only accepted from sites where the effluent stream and resultant sludge stream is healthy as indicated by TWUL monitoring of the UWWT processes at each STW. Should this not be the case sludges from those streams would be handled separately, and an assessment undertaken to determine the appropriate course of treatment.

Inter-site - Sludge Cake

Movement of inter-site digested sludge cake occurs as part of routine management of stock levels of BAS compliant stock across Thames Water Sludge Treatment Centres. Treated sludge cake is moved between sites in accordance with the Duty of Care (see section 3) by a third-party contractor/s authorised by the Environment Agency to transport waste. Annual Waste Transfer Notes are supported by records of Individual transactions.

Dry Solids data is used to inform the safe and complaint movement of all sludge cake between sites.

7 Waste Acceptance



Inter-site Liquid sludge

The unbroken custody chain set out in above (Section 6 - Waste Pre-Acceptance) ensures the provenance and characteristics of the waste to be accepted at TWUL Sludge treatment centres as being that of sludge derived from TWUL owned and operated UWWTD processes. TWUL does not therefore require further visual inspection of liquid inter-site sludge at point of acceptance, or confirmatory samples.

Each load of liquid inter-site sludge received in a Liquid Sludge Import Area (see Section 4) is however monitored for the following parameters at point of discharge (Table 2).

Table 2: Waste Acceptance Monitoring – Liquid sludge

Parameter	Unit	Frequency	Method
Volume	Litres or m3	Each transaction	Import Logger / WASP
Suspended Solids	%	Each transaction	Import Logger / WASP

Thames Water understands that the characteristics of and mixing of such inter-site liquid sludges will influence the anaerobic digestion process at an STC and, therefore, all digestion processes on site are routinely monitored and sampled as listed in Table 3 .

Table 3 - Waste Treatment Process Monitoring

Parameter	Unit	Frequency	Method
Digester Feed Volume	(m ³ /day)	Daily	SCADA
Digester feed dry solids	(%Dry Solids)	Daily / weekly (site dependant)	Manual Sample
Biogas Production	Nm ³ /day	Daily	SCADA
Volatile matter of digester feed	% VS	Once per week (Min)	Manual Sample
Volatile matter of digestate from each digester	% VS	Once per week (Min)	Manual Sample
Biogas Yield - biogas produced per mass of sludge feed	Nm ³ /tds	Daily	Calculated – Biogas produced/Digester feed Vol x % Dry Solids
Hydraulic retention time	Hrs	Daily	Calculated – Tank Vol /Feed
Temperature of each digester	deg C	Daily	SCADA
Digester outlet dry solids	% Dry Solids	Daily / weekly (site dependant)	

This monitoring includes both data recorded using the SCADA system, Local HMI's (Human Machine Interfaces). The effective treatment of waste imports then being verified by separate sampling and monitoring of digested cake (see table 4).

Inter-site - digested cake

In addition to Dry Solids, inter-site digested sludge cake is routinely checked for the following parameters, either at the place of production or at the receiving STC. This is to confirm that has met characteristics required by Thames Water and is suitable for acceptance for storage at a Sludge Treatment Centre.

Table 4 Thames Water Sludge Analysis Trigger / Alarm Levels

Parameter	Maximum Permissible Level (mg/kg/DS)	Frequency
Zn	1800	Every 4-6 weeks
Cu	1500	Every 4-6 weeks
Ni	500	Every 4-6 weeks
Cd	30	Every 4-6 weeks
Pb	1200	Every 4-6 weeks
Cr	1800	Every 4-6 weeks
Hg	20	Every 4-6 weeks
Mo	40	Every 4-6 weeks
As	140	Every 4-6 weeks
Se	30	Every 4-6 weeks
F	1000	Every 4-6 weeks
DS%	17 – 40%	Every 4-6 weeks
LOI	50 - 90%	Every 4-6 weeks
Total N	1 - 10%	Every 4-6 weeks
Ammonical N	0.05 - 5%	Every 4-6 weeks
Total P	1 - 8 %	Every 4-6 weeks

8 Non-conformity



An incident or non-conformity can include, but is not limited to:

- Breach of recording systems (e.g. Non adherence to data recording procedures and use of the WASP system);
- Significant digestion process impact (e.g. due to imported inter-site liquid sludge being different in composition to that which was recorded on the inter-site liquid sludge transfer request electronic forms);
- Unsafe behaviour (e.g. Incorrect PPE, not abiding to site rules);
- Damage to equipment; and
- Pollution incident.

The event of an incident shall trigger contingency measures. In the event of an Incident, the system Safeguard will be updated to reflect results of the investigation and if further action is required.

8.1 Contingency

The inter-site liquid sludge incident escalation processes are described within this section.

8.1.1 Inter-Site Liquid Sludge:

A potential non-conforming import of inter-site liquid sludge can potentially be retrospectively identified in the event that it has a significant effect on the digestion process at a STC. If concerns are raised over the importation of inter-site liquid sludge, the following risks shall be understood:

- Potential downstream risks.
- DoC compliance – the extent to which all relevant details of the waste have been recorded on the WASP system;
- Permit compliance;

A suitably trained operator shall provide support to retrospectively assess a suspected potentially non-conforming import of inter-site liquid sludge. The Bio-Recycling Team are to be contacted through the existing Safeguard system.

Incidents

If on inspection, either via webcam feed or direct visual inspection an incident has occurred, the site Site Manager and/or Bio Recycling Manager are informed and an investigation is undertaken

8.1.2 Cake - compliance

Where cake is delivered to site, it is checked for compliance with our internal requirements either at the site of origin, or on delivery see Table 4.

When it is subject to checking at the storage location, it is stored separately on the pad, separately from all indigenous cake, until the results of the analytical testing are known.

9

Assurance



This Standard will be subject to an audit regime to ensure the process conforms to Thames Water's requirements and is effectively implemented and maintained.

Any identified actions arising are to be tracked to conclusion, with the learning points captured and cascaded. The findings of the assurance activities must be discussed inside of the Daily Huddle and site performance meetings.

Assurance findings will be reviewed by Senior Management and featured on performance dashboards monthly for review and learning.