



Severn Trent Water Limited Minworth Sludge Treatment Facility

Permit number
EPR/BP3631SW

Severn Trent Water Limited

Minworth Sludge Digestion and Combined Heat and Power Plant Minworth
Sewage Treatment Works
Kingsbury Road
Sutton Coldfield
Birmingham
B76 9DP

Raw Materials, Water and Waste Residue Management Plan

Document Reference: Residue Management plan						
Revision	Purpose	Originated	Checked	Reviewed	Authorised	Date
1.0	Document creation	Simon Whitehouse	Joanne Chapman	First Issue	Joanne Chapman	04/07/2022
2.0	Permit Application	Andrew Perry				29/08/2024

Contents

Executive Summary.....	- 2 -
Environmental Management System and Technical Competence.....	- 3 -
Process Responsibility.....	- 3 -
Raw Materials and Water Management.....	- 4 -
Residue Management	- 18 -
Energy Review	- 22 -
Summary and recommendations.....	- 22 -

Executive Summary

In accordance with the consolidated IED Environmental Permit for Minworth and associated written management systems, this is the site management plan covering use of raw materials, water and residues. Severn Trent Water Limited is required to review and record at least every 4 years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use and to carry out a waste production review.

The prime function of the sludge treatment facility at Minworth Sewage Treatment Plant is to capture the energy potential from the treatment of sewage sludges. The plant is run 24/7 due to the continuous supply of sewage received at the treatment works either from the surrounding catchment, or via tanker discharge.

Environmental Management System and Technical Competence

The Severn Trent Water Environmental Management System (EMS) is certified to ISO14001:2015 standard. All permitted IED installations are within the certification scope.

Severn Trent Water is committed to continual environmental improvements, including materials management, water resources and waste management. This commitment is delivered through better control of processes, capital investments, and environmental training.

Under the EMS, a risk assessment has been carried out to evaluate environmental aspects and impacts of the Company's operations. Energy production activities, including use of materials and water as well as waste production have been evaluated. These activities have been considered as having both positive and negative impact. All negative impacts were considered to have a medium impact with appropriate mitigating measures in place without further recommendations (refer to EMS Aspects & Impact Register [see Guidance tab](#)).

The permitted activities are undertaken by technically competent persons, within the scope of Severn Trent Water's Competence Management System. This is certified to the EU Skills CMS Standard and UKAS accreditation.

Process Responsibility

The Operational Manager for the site has overall responsibility for reviewing the processes on the site that use raw materials, raw water and create residue wastes. This document is reviewed 4-yearly, but in reality the review process is ongoing as part of the regular performance monitoring for the site.

There are many drivers for reducing use of raw materials, and creation of wastes within our processes, including environmental, financial, and resourcing, so it is in our best interests to undertake these reviews regularly, and to include representatives across the full chain of specialist teams involved in the decisions. For example, from initial procurement processes, and contractor management, through to operations, alarms, and the regular maintenance of the installation. These all work together to ensure that the processes utilise the minimum amount of raw materials/water (such as overdosing of chemicals), and that wastes are minimised (such as worn parts or broken machinery).

Raw Materials and Water Management

There are a limited number of raw materials used in the process. All materials used at the installation are subject to storage and handling procedures. There are no dusty or potentially wind conveyed materials used on the installation.

The use of raw materials is carefully monitored and benchmarked for cost reasons, and in many cases the correct quantity has to be precisely used for proper processing to take place, so there are controls in place through monitoring and optimisation of the process.

Regular maintenance of the installation ensures that there are minimal energy losses from worn parts, thereby maintaining its inherent efficiency.

Biogas

The principal fuel used in the installation is biogas resulting from the anaerobic digestion of sludge from imported and indigenous UWWTD sources. Biogas is captured and stored in two gas holders within the facility boundary. The biogas is exported to the gas grid via the G2G facilities, and also combusted in CHP engines to generate heat and power for use in the installation and the wider waste water treatment works (WWTW); the CHP engines are also able to be fuelled on natural gas.

The heat produced by the CHP engines allow the digestion process to be optimised in order to maximise biogas production. Overall, this allows a greater efficiency in converting sludge to biogas. Key to maximising the energy production of the site is the consistent and predictable production of biogas from the digestion process and the minimisation of the use of electrical power in doing so.

The generation and use of power and heat from a renewable biogas source represents a positive impact with respect to global warming potential.

Fuel Oil

Ultra Low Sulphur light fuel oil is also used in the installation as a standby fuel for the boiler plant only. The boilers operate if there is a temperature deficit to provide supplementary heat to the digestion plant; this only happens occasionally in practice.

Lubrication oil

Lubrication oil used on site in the CHP engines, with the volume dictated by the operational requirements. Severn Trent Water monitors the use of oil to increase its efficiency and reduce quantities required. The monitoring is carried out through

a monthly oil analysis programme, which assesses the condition of the oil. The oil is changed if the quality is below pre-defined standards. This minimises consumption of oil as it will only be replaced when necessary. Once determined to be below standard, the oil is changed and the replaced oil is sent for recycling off-site.

CHP engine oil is monitored for contaminants, which indicate oil performance and general engine condition.

In addition, oil is used in the transformers; this is sampled every two years and only changed if the sample shows any deterioration. Transformer oil does not contain PCBs.

Water

Water used on the installation is mains water, for three purposes:

- General use;
- Make up of polymer; and the
- Heating loop and boiler system.

Water within the heating loop and boiler systems are treated with dosing chemicals under the management of a specialist subcontractor. It is in closed loop system which only requires minimal top up and inhibitor chemicals addition. This is to decrease water hardness that can cause scale build up within the heat exchangers. The system is inspected for leaks, particularly where excess water has to be added to top up the system.

Water is also used within the polymer make up system, which is an automatic system that only uses the necessary volumes of water per cycle.

Mains water is provided by Severn Trent Water, and water usage is metered at site. A review has been undertaken of water use within the site, to see if lower grade water, specifically final effluent from the works can be used to replace any potable water. Savings have been identified and implemented, for example, where water is used for washing down purposes within the site, for example if a spillage of sludge occurs, this water is final effluent from the works.

Waste Water Streams

Waste water transfers from the operational areas of the site back to the works inlet for treatment prior to final discharge take place via the sites drainage system. Where such transfers leave the permitted area for the digestion process, these are marked on the site plan.

Waste water arises from a number of sources within the works. These include:

- Surface water drainage (predominately rainfall related);
- Dewatering of Surplus Activated Sludge in belt thickeners
- Dewatering of digested sewage sludge by centrifuges;
- Biogas condensate from moisture traps on biogas lines;
- Boiler blowdown; and
- Washing / cleaning of surfaces.

The drainage system at the works includes both process waters and surface water drainage within the same system, in order to reduce the risk of spillages being diverted directly to the adjacent water body. Instead, all water in the drainage system is captured and returned to the works inlet for processing within the UWWTD stream at the site. Where drainage leaves the permit boundary, it may include waste waters from within areas of the site which sit outside of the permit boundary, due to the design and configuration of the drainage system within the works. These are all collected in the same system and prevented from directly discharging to any watercourse.

To reduce the risk from smaller, accidental spills we have separate controls in place. Tankers offload within impermeable areas and standard spill procedures are in place. Chemicals are stored within impermeable areas and within bunds. Containment assessments are being undertaken to show where further improvements are required on site.

Drainage plans are available on site to show any leading to the treatment works, and any which may lead to controlled waters. The drainage plan is planned to be updated in 2024, the original drainage plan shows drains returning to the inlet of the treatment works, there are a small number that need confirming, and so a CCTV survey will be undertaken.

Drainage leaves the permit boundary at Transfer points, labelled as T on the site layout plan.

Emission point reference and location	Source
T1 SP1618391957	Sludge Import
T2 SP1639392092	Digester transfer point
T3 SP 1674192006	Biosolids transfer point

The following substances may be present at elevated concentrations in the drainage leaving the permitted area:

- BOD;
- COD
- Suspended Solids

- Ammonia
- pH

We have always undertaken periodical sampling of ammonia on the centrate returns with regard to loading impacting the operation of the treatment works. More recently, we are shadow sampling twice monthly for Ammonia, Soluble BOD, Total BOD, Orthophosphates and Suspended Solids in return liquors to the inlet. Direct regular sampling of these returns is a fairly recent addition to our processes so our understanding of the variance in these returns is developing. COD, BOD, Total Nitrogen, TOC, Ammoniacal Nitrogen, total Phosphorous, suspended solids and pH are directly available at our UKAS accredited contract laboratory and we will begin sampling for these determinands from the 1st of July. Not all processes have flow meters on the return lines, assumptions will be made from the throughput of the asset. Temperature would be a field-based measurement, currently this is not measured. STW will aim to sample for PFOS and PFOA on a six-monthly basis to build up a data set, but due to the two weeks analysis turn around, these are not of use to the live operational process.

The data obtained from the return sampling will be used to optimise the process and STW will carry out root cause investigations with the process support teams to understand what changed on site and ensure that we can reduce the risk to the inlet. If any abnormalities are identified in the sample data following root cause investigations, the Process Team will collaborate with wider site-based teams and the Catchment team to ascertain the root cause.

As part of the new IED permit and in line with BAT 3, we commit to carrying out further chemical analysis of the waste water, testing for all pollutants expected to be present in the discharge. We are currently in discussion with UKAS accredited laboratories to see what analysis is possible on our leachate returns, and what 'minimum reporting value' is appropriate. This review will be undertaken in line with EA guidance, for example Surface Water Pollution Risk Assessment for your environmental permit, and Monitoring Discharges to Water. **The sampling will be undertaken by our suitably trained internal teams that already undertake compliance sampling for EA discharge permits to MCERTS standards. Analysis will be contracted to UKAS accredited laboratories.**

The returns sample points at Minworth are listed below. These are described fully in the Returns Sampling Operational Procedure, and are located at:

RETURNS SAMPLE POINTS	NGR
LTP Returns	SP 1650291977
SAS Belts	SP 1622591926
MAFF Wash Water	SP16885 91896
Digested Centrate	SP16832 91870
Pre THP Centrifuge Returns	SP 16506 91832

The site drainage system was designed to take all potentially contaminated waste waters back to the works inlet, and as such, features a large number of points where elements of the drainage system leave the proposed environmental permit boundary.

There is no separation between 'clean' sources of returned water, such as surface water run off, from process related waste waters. Therefore the most appropriate sample points have been identified as per the emission point plan. The drainage system is equipped with a number of oil interceptors to capture any spilled petrochemicals to prevent them entering the works inlet.

The centrate from the dewatering plant on site is the biggest source of waste water within the permitted area.

Water Usage

Water usage is metered at the site. The water usage for 2023 was 198,445m³

Biogas

Biogas production is not subject to direct measurement, due to the difficulty of measuring volumes with or without moisture content. Instead biogas production is monitored by CHP engine output over time. Flare use is monitored and recorded and an allowance made for gas based on flare capacity.

Waste Gases

Waste gases are generated in a limited number of locations within the site, primarily the air emission points associated with the biogas handling, storage and utilisation system.

Biogas comprises a mixture of approximately 40% carbon dioxide and 60% methane; with low levels of other volatile organic compounds and Hydrogen Sulphide and entrained moisture. Moisture is removed using moisture traps within the biogas handling system, so both the exact composition and volume of biogas handled at the site vary dependent upon the precise location where sampling occurs.

This contains four main potential sources:

- Pressure relief valves;
- Boiler emissions;
- CHP stacks; and
- Flare stack.
- Gas to Grid Plants

There are potentially low volumes of waste gases not captured from open topped secondary digesters at the site and from cake storage.

The Gas to Grid plants emit CO₂ and VOC's which are routed through the OCU, most of the CO₂ is removed as part of the process with around 2% left in the Bio Methane, the rest is vented via the OCU.

Gas to Grid plant 1 has its own flare, the flare comes on to burn off the gas when the plant process does not work effectively and when the gas is prepared and put into specification to inject to the grid.

Gas to Grid plant 2 (medium pressure) can emit small amounts of Bio methane when the pressure absorbers change over and blow down as part of the process.

Pressure relief valves, if operated, will release raw biogas.

CHP stacks, boilers and flare stacks combust biogas, so will release primarily CO₂, and NO_x with low volumes of SO₂ volatile organic compounds (VOCs) and CO.

The CHP is subject to routine maintenance and annual air emission monitoring. The flare stack is not monitored unless its operational hours exceed 10% of the year.

There are also low volume emissions from the odour control units on site, although the full composition of these is not analysed. As part of the new IED permit, we commit to carrying out a review of our abatement plants, to determine whether measures have been effective, and to further characterising emissions from the odour control units in line with BAT 3 and 8 to demonstrate that H₂S, NH₃, TVOC and HCl are not present in the waste gas stream. If H₂S, NH₃, TVOC or HCl are found to be present, or any improvements to equipment required, a monitoring and improvement plan will be put in place in agreement with the EA.

These release points are shown on the site plan.

Emission point reference and location	Source	Parameter	Quantity
A6 NGR- SP 16438 91827	CHP 8	NO _x	500mg/m ³
A7 NGR- SP 16434 91831	CHP7		
		SO _x	162mg/m ³
		CO	No limit set
		VOC	No limit set

A9 NGR- SP 16431 91799	Natural Gas Boiler	NOx CO	250mg/m3 No limit
A13	AIR VIRTUAL STACK	---	---
A14A NGR- SP 16482 91753	MULTIFLUE STACK JENBACHER ENGINES CHP10	NOx SOx VOC CO	500mg/m3 No limit No limit No limit
A14B NGR- SP 16482 91753	MULTIFLUE STACK JENBACHER ENGINES CHP11	NOx SOx VOC CO	500mg/m3 No limit No limit No limit
A14C NGR- SP 16482 91753	MULTIFLUE STACK JENBACHER ENGINES CHP12	NOxSOx CO VOC	500mg/m3 No limit No limit No limit
A14D NGR- SP 16482 91753	MULTIFLUE STACK JENBACHER ENGINE 13	NOx SOx CO	500mg/m3 162mg/m3 1400mg/m3
A14E NGR- SP 16482 91753	MULTIFLUE STACK JENBACHER ENGINE 14	NOx SOx CO	500mg/m3 162mg/m3 1400mg/m3
A14F NGR- SP 16482 91753	MULTIFLUE STACK COMPOSITE BOILERS	Biogas NOx SOx CO Natural gas NOx CO	250mg/m3 170mg/m3 No limit 200mg/m3 No limit
A14G NGR- SP 16482 91753	MULTIFLUE STACK COMPOSITE BOILERS	NOx SOx CO	250mg/m3 170mg/m3 No limit set
A14H NGR- SP 16482 91753	MULTIFLUE STACK COMPOSITE BOILERS	NOx SOx CO	250mg/m3 170mg/m3 No limit set
A15 NGR- SP 16422 91880	FIRST UNIT OF TWIN BIOGAS FLARE	NOx, CO, VOC	150mg/m3 50mg/m3 10mg/m3
A16 NGR- SP 16415 91890	SECOND UNIT OF TWIN BIOGAS FLARE	NOx	150mg/m3
A17 NGR- SP 16506 91720	PPTEK SILOXANE FILTER EXHAUST STACK	---	---
A20 NGR- SP 16300 91943	SLUDGE RECEPTION WELL OCU	---	---
A21 NGR- SP 16300 91954	BALANCE TANK 1 OCU	---	---

A22 NGR- SP 16296 91986	BALANCE TANK 2 OCU	---	---
A23 NGR- SP 16296 91985	BALANCE TANK 3 OCU	---	---
A24 NGR- SP 16274 91977	SLUDGE THICKENING CENTRIFUGE OCU	----	---
A25 NGR- SP 16303 91935	NO 2 SLUDGE FACILITY OCU	---	---
A26 NGR- SP 16299 91940	IMPORTED TANK SLUDGE FACILITY	---	---
A27 NGR- SP 16292 91937	RECEPTION TANKS 1,2,3 OCU	---	---
A28 NGR- SP 16308 91940	TANKER TRADE FOOD WELL AND TANKS OCU	---	---
A29 NGR- SP 16306 91947	ACETIC ACID OCU (NOT IN USE)	---	---
A31-A47 NGR;s- SP 16394 92042 SP 16366 92030 SP 16341 92013 SP 16317 91996 SP 16410 92016 SP 16381 92001 SP 16357 91986 SP 16329 91970 SP 16426 91993 SP 16398 91977 SP 16377 91961 SP 16346 91945 SP 16442 91965 SP 16414 91947 SP 16391 91934 SP 16363 91918	PRESSURE RELEASE VALVES LOCATED ON THE ROOF OF EACH DIGESTER	---	---
A49-64 NGR's SP 16395 92042 SP 16367 92030 SP 16342 92013 SP 16318 91996 SP 16411 92016 SP 16382 92001 SP 16356 91986 SP 16328 91970 SP 16425 91993	DIGESTER VENT TUBES	Biogas	---

SP 16397 91977 SP 16378 91961 SP 16345 91945 SP 16442 91964 SP 16414 91946 SP 16391 91933 SP 16363 91917			
Gas to grid plant NGR- SP 16335 91805	BIOFILTER EXHAUST STACK	---	---
A66 NGR- SP 16307 91810	Gas to Grid 1 FLARE	NOx,CO,SOx,VOC	---
A67 SP 16420 91862 A68 SP 16327 91799	ACTIVATED CARBON FILTER PURGE VENTS	---	---
A69-72 NGR's- A69-70 SP 16316 91775 A71-72 SP 16346 91825	GAS COMPRESSORS	Methane, H2S CO	---
A73 NGR- SP 16512 91777	ODOUR CONTROL PACKAGE PLANT EMISSION STACK	Hydrogen sulphide	---
A74 NGR- SP 16446 91901	PRESSURE RELEASE VALVE FOR EXISTING BIOGAS HOLDER	---	---
A75 NGR- SP 16480 91923	PRESSURE RELEASE VALVE FOR EXISTING BIOGAS HOLDER	---	---
A76 NGR-SP 16390 91854	BIOGAS UPGRADE PLANT EXHAUST FOR ODOUR CONTROL SYSTEM- G2G 1	---	---
A77 NGR- SP 16382 91845	BIOGAS UPGRADE PLANT EXHAUST STACK- G2G 2	---	---

Inventory

Biogas production is monitored at the site, based upon the electrical output of the CHP engine in kWh, based around a standard consumption of biogas per kWh, from the manufacturers specification for the CHP engine. The site also provides bio methane gas to the national grid network via a medium pressure pipeline connection from its 2 gas to grid plants. An allowance can then be added for flare use, which is minimal at sites. This will give a volume of produced biogas following the removal of gross moisture within the handling system.

As the production is dependent upon sewage inputs and flows, the volume produced in any month varies. In 2023, the site produced approximately

16469 MWh of biogas.

Other Raw Materials

Element	Odour Abatement Equipment
Raw sludge imports NGR- A25-SP 16303 91935	2 x P8000 CIF's and 2 x P8000 Peacemakers
Raw sludge balancing tanks A20-NGR-SP 16300 91943 A21- NGR- SP 16300 91954 A22- NGR- SP 16296 91986 A23- NGR- SP 16296 91985	3 x Double GRP3000 Peacemakers on tanks and 1 x GRP 3000 Peacemaker on deep sludge well
Raw primary sludge belt thickener A24- NGR- SP 16274 91977	3 x P8000 CIF UNITS & 2 x P8000 Peacemakers Terminodour unit
Reception/ blending tanks A27- NGR- SP 16292 91937	3 x GRP3000 Peacemakers
Imported sludge A26-NGR- SP 16299 91940	2 x SINGLE GRP3000 Peacemaker
Food waste imports (not in operation) A28-NGR- SP 16308 91940	1 x GRP 3000 Peacemaker
THP feed (raw dewatering buffer tanks, imported cake bin and THP feed silos) A73-NGR- SP 16510 91782	Bio-trickling filter and carbon filter
Biogas plant A76- NGR-SP 16390 91854	ERG Biofilter and carbon dry scrubber
Gas to grid plant A65- NGR- SP 16390 91854	ERG Biofilter and carbon dry scrubber
A17 NGR- SP 16506 91720	PPTEK Siloxane Filter Exhaust Stack

These units are monitored for performance and are subject to an annual maintenance check by a specialist contractor. Media in the biofilters is replaced as needed and it is not stored on site.

Peacemakers and CIFs

The Peacemakers and CIF units (catalytic iron filters) are manufactured by Air-Water Treatments Ltd (AWT). The CIFs are a roughing filter which sits upstream of the peacemaker unit.

Peacemakers are a form of dry chemical scrubbers. These are package units consisting of two stages. The first stage consists of pellets impregnated with stabilised chlorine dioxide which oxidise hydrogen sulphide, mercaptans and other odorous compounds. The second polishing stage serves to remove ammonia and other compounds not oxidised by chlorine dioxide.

Terminodour

The Terminodour unit is manufactured by CSO Group. This technology involves the production of negative and positive ions using a reactive plasma generator. Coronar discharge tubes are used to create an electronic field when an electronic current is passed through them. An alternating current is used to produce negative and positive ions in the same 5:4 ratio as found in the atmosphere but at concentrations up to 20 times greater. The polarised air is introduced into the foul air stream where organic odours are oxidised to simpler forms.

THP Feed Bio-trickling Filter

The raw dewatering buffer tanks, imported cake bin and THP feed silos are connected to an enclosed bio-trickling filter and an enclosed carbon filter for sulphur dioxide and odour removal. The bio-trickling filter contains a lava rock media that supports biomass for odour removal. Lava rock has the advantage that it is not consumed in the biological process. A carbon filter has been included as a polishing stage.

This odour abatement system could be extended to treat air from the dewatering centrifuges if required in the future.

ERG Biofilter and Carbon Dry Scrubber

The biogas and gas to grid plants are connected to ERG biofilters. The biofilters are filled with woodchip and enhanced using calcified seaweed. This media supports biomass for odour removal and is kept humid using a spray system. A carbon filter has been included as a polishing stage.

The following documents are used for the design and operation of the OCU's, which are available upon request:

- ME30 Odour Control Equipment and Building Ventilation (version 4.01) - Design manual ME30 for Odour control is adhered to for all Tier One supply chain partners.
- STW design manual – Sewage Treatment Odour Control (version 1.1)

Air-Water Treatments undertake annual health checks on the Biofilters and Peacemakers and report findings back to STW. A copy of the most recent report can be supplied on request.

Table 1: Raw Material List

COSHH sheets that relate to each material are stored in severn trent's Waterpedia database.

[Waterpedia - COSHH Library \(sharepoint.com\)](http://Waterpedia - COSHH Library (sharepoint.com))

Description of raw material and composition	Maximum storage amount	Annual throughput (tonnes per annum or as stated)	Description of the use of the raw material	Alternatives
Anti foam KemfoamX 2599 KemfoamX 2500	40 x 1,000 litre IBC's	1,000 litres per day	Added to primary digesters to reduce foaming, as required.	Standard product used for this purpose within the industry.
Ultra Low Sulphur Fuel Oil	1 x 28,000 litre tank	As needed	Back-up fuel for use within boilers and or back-up generators.	No viable alternative. Used as a backup only.
Lubricating oil	1 x 1,000 litre IBC 1 x 5,000 litre tank 1 x 10,000 litre tank	As needed	Equipment lubricant.	Standard product used for this purpose within the industry.
Waste Oil	1 x 1,000 litre tank 1 x 5,000 litre tank 1 x 10,000 litre tank	As needed	Waste oil collected from the CHP facility.	None available.
Polymer Superfloc C-6598 (powder) Flopam EM 640 HIB (liquid)	3 x 20 tonne tanks 1 x 25 tonne tank 5 x 1,000kg	3 tonne a day 1-4 tonne a day	Digested sludge thickening.	Standard product used for this purpose within the industry.
Ferric sulphate	As needed	1,500 litres per day	Removal of phosphate from sludge.	Standard product used for this purpose within the industry.
Propane*	12,000 litres	As needed	Additive to biogas to ensure suitability of CV.	No viable alternative.
Odorant*	50 litres (used at a rate of 12mg/m³)	100 kg	Additive to biomethane to provide required standard for injection into National Gas Grid.	No viable alternative.

Raw Material	Composition	Fate
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Biogas	Methane (57.2%) Carbon dioxide (41.6%) Other (1.2%)	Electrical and heat energy Air emissions of carbon monoxide, carbon dioxide, sulphur dioxide and nitrogen oxides
Ultra Low Sulphur Light Fuel Oil	Ultra Low Sulphur Light Fuel Oil (100%)	Air emissions of carbon monoxide, carbon dioxide, sulphur dioxide and nitrogen oxides. Local watercourses if uncontained.
Lubrication oil	Oil (100%)	Waste – Recycled
Waste oil	Oil (100%)	Waste – Recycled
Polymer Superfloc C-6598 Flopam EM 640 HIB	Polyacrylamide copolymer	Absorption into sewage sludge or centrifuged cake. Leftover polymer returned to head of works via centrate liquors.
Anti-Foam KemfoamX 2599 KemfoamX 2500	Polyalkoxylate Mixture of fatty acid ester and surfactants	Absorption into sewage sludge. Waste product to be recycled.
Ferric sulphate	Iron(III) sulphate	Absorption into sewage sludge. Waste product to be recycled.
Propane	Propane (100%) – C ₃ H ₈	Addition to generated biogas to raise the energy content, prior to transfer to the network.
Odorant		Addition to generated biogas, prior to transfer to the network (re-ourisation for safety purposes).

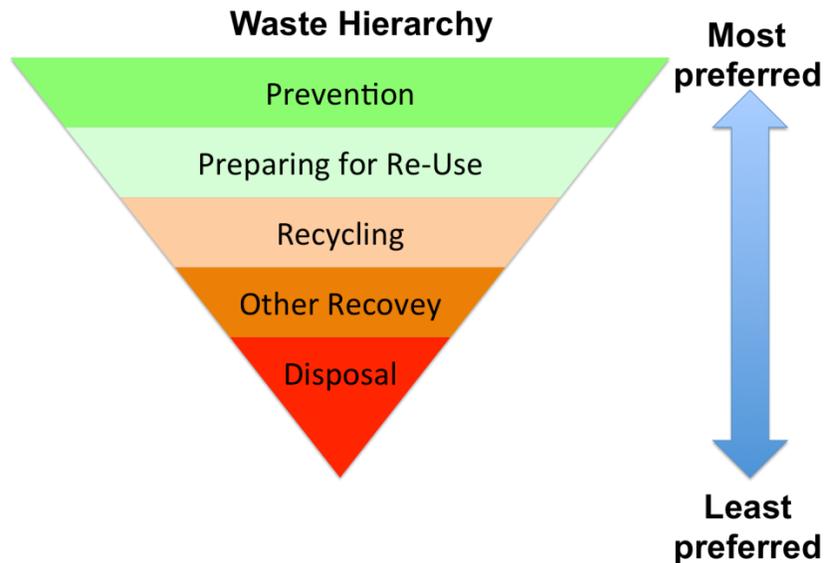
Residue Management

This document records the measures we take to:

- Minimize the generation of residues arising from the treatment of waste
- Optimise the waste hierarchy
- Ensure the proper disposal of residues.

A residue is defined as the solid waste generated by the permitted waste treatment activity. With that definition, this document does not focus on the general wastes created from activities outside the scope of the permit, for example office buildings even if they are collocated on the same site, or on gaseous emissions from the processes. Nor does it include the solid sewage cake produced by dewatering digested sewage sludge, which is removed from site, following checks to determine its quality and adherence to appropriate requirements, and spread to land in accordance with the Sludge Use in Agriculture Regulations 1989 and the Biosolids Assurance Scheme (BAS).

The Waste Hierarchy demonstrates the most preferred options for waste management, and Severn Trent Water commits to achieving waste targets by utilizing its approach.



There are only a limited number of residue streams that require off-site disposal, treatment or recycling because this sludge treatment facility is collocated with Severn Trent Water's sewage treatment works (see Table 2).

The residues are stored within designated areas as described within the Waste Management Standard Operating Procedures.

Oil filters and some contaminated maintenance wastes are considered hazardous and are therefore segregated from non-hazardous wastes for disposal in line with legislation.

Where waste is required to be sent offsite, it is sent to a suitably permitted facility for disposal / treatment by approved third party waste management contractors.

All waste contractors used will be registered with the Environment Agency / Natural Resources Wales and have a current Waste Carriers Licence. Our waste contractors will supply us with a Waste Transfer Note (WTN) and/or Waste Consignment Note (WCN) - dependant on what type of waste is being removed from site. All waste documentation for the installation is retained for the appropriate length of time at the site (two years for WTN and three years for WCN).

The residues produced by the permitted processes including management in line with the waste hierarchy and areas for potential improvement and future review are detailed in Table 2 below:

Table 2: Residue List

Residue Type	Current Measures	In line with Waste Hierarchy	Potential Improvements
Waste lube oil	The quality of the oil is monitored so as to minimise its replacement. Any waste oil is recycled. Waste oil is stored in a tank within a bunded area inside the installation boundary. Off site recovery at appropriately licensed facility	Recycled	No improvement opportunities foreseen. Current route considered to be BAT
Waste transformer oil	The quality of the oil is monitored so as to minimise its replacement. Any waste oil is recovered. Off site recovery at appropriately licensed facility (by specialist contractor)	Recovery	No improvement opportunities foreseen. Current route considered to be BAT

Waste coolant	<p>Glycol coolant is monitored and replaced as required to protect the CHP engine. Any waste coolant is recovered.</p> <p>Off site recovery at appropriately licensed facility (by specialist contractor)</p>	Recovery	No improvement opportunities foreseen. Current route considered to be BAT
Biogas condensate	<p>Condensate is removed from the biogas lines using moisture traps</p> <p>Released to site drainage and returned to works inlet for processing within the UWWTD stream</p>	Disposal following treatment	No improvement opportunities foreseen. Current route considered to be BAT
General engineering waste (e.g. oily rags, oil filters, air filters)	<p>Stored within appropriate segregated containers in the waste storage area.</p> <p>Disposed of (as hazardous waste) by specialist contractor</p>	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Contaminated PPE	<p>Stored within appropriate segregated containers in the waste storage area.</p> <p>Disposed of (as hazardous waste) by specialist contractor</p>	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Spill kit materials	<p>Minimisation of spillages through regular maintenance, pollution prevention infrastructure, and staff training on Standard Operational Procedures.</p> <p>Spill kits used for hazardous materials (oil or fuel) will be managed as hazardous waste.</p> <p>Spillages of liquids will be contained and treated on site where possible.</p>	Disposal	No improvement opportunities foreseen. Current route considered to be BAT
Fluorescent tubes	<p>Stored within appropriate segregated containers in the waste storage area.</p> <p>Removed from site (as hazardous waste) by</p>	Recycling	No improvement opportunities foreseen. Current route considered to be BAT

	specialist contractor for offsite recycling		
Scrap Metal	Stored within appropriate segregated skip. Off site recovery at appropriately licensed facility	Recycled	No improvement opportunities foreseen. Current route considered to be BAT
Empty chemical containers	Use of chemical is minimised in the processes by performance monitoring, which results in decreasing the amount of waste containers produced. Returned to producer for reuse where possible, or removed from site by specialist sub-contractor.	Reuse	Bulk chemicals currently delivered by tanker to reduce use of individual containers No improvement opportunities foreseen. Current route considered to be BAT
Grit and screenings from digester cleansing	As much grit and screenings as possible are screened out during earlier processes (outside the scope of this permit) to minimise that entering anaerobic digestion process. Grit and screenings removed from digesters are screened to segregate the waste streams. Grit can be recycled. As screenings originate from non-segregated sources, there are currently no alternatives to landfill.	Grit: Recycled Screenings: Landfill	No improvement opportunities foreseen. Current route considered to be BAT Screenings fate reviewed on a periodic basis to identify alternative routes for this waste stream

Energy Review

Site Energy Management Plan reviews are carried out at all of our permitted sites at frequent intervals.

Sites with CHP engines and Gas to Grid facilities have a KPI target for generation of electricity from biogas, and excess electricity is exported from the site where possible.

Flare use is monitored to ensure that the use of flaring to control biogas volume is minimised and where appropriate, additional CHP resource is deployed to a site where excess flaring occurs. Where possible, other green energy sources are deployed at works. The onsite generation and use of power and heat from a renewable biogas source represents a positive impact with respect to global warming potential and reduces imports of energy from the grid.

All capital projects consider whole life costs, including energy usage for schemes, and design concepts such as gravity transfers are implemented where possible over pumping. Where possible, low energy lighting is specified and all pumps and motors are appropriately sized for their location. Pumps which may be impacted by rags and solid material are checked and cleaned in accordance with the sites preventative maintenance program, which is developed from a combination of manufacturers recommendations and operational experience of issues with specific pumps within the site network.

Insulating materials are applied to transfer pipelines for hot water and digesters to reduce heat losses which reduces energy consumption.

Summary and recommendations

Raw Materials and Water Usage Review

Currently, there are no additional techniques or raw material alternatives known, which could be implemented on site to reduce environmental impact or improve the efficiency of raw materials or water usage.

Where raw, potable, water can be replaced with lower grade water on site, for example for washing down small spillages, this has already been implemented.

A number of monitoring programmes are being put in place for understanding our waste composition better (wastewater returns). With the outcomes of those activities there may be further improvements available to us.

Residue Production Review

Due to the small number and type of residue streams, there was very little scope for further reduction of those generated on site. All current waste disposal/recovery routes are considered to be BAT and utilise application of the Waste Hierarchy.