Leigh WwTW

Environmental Permit Application

United Utilities
Water for the North West

Leigh WwTW Sludge Treatment Facility

Application Support Document

October 2023

Contents

1. Introduction

The purpose of this Application Support Document (ASD) is to provide supplementary information to support an environmental permit (EP) application to include screening, thickening and anaerobic digestion of indigenous and imported wastewater (sewage) sludge at Leigh Wastewater Treatment Works (WwTW). This application is being made under the Environmental Permitting (England and Wales) Regulations 2016 (the EPR 2016).

The address of the installation is:
Leigh WwTW Sludge Treatment Facility,
Hope Carr Lane,
Leigh,
Lancashire,
WN7 3XB.

NGR: SJ 66302 99084

United Utilities Water Limited (UUW) operates a non-hazardous wastewater treatment facility at the Leigh WwTW. The treatment process consists of screening and thickening of sludge and subsequent anaerobic digestion of the thickened sludge via one digester and a thermal hydrolysis plant. Biogas produced at the site is combusted in combined heat and power (CHP) engines and a dual fuel boiler.

The site accepts indigenous and imported sewage sludge. The maximum treatment capacity at the facility is limited by the feed rate to the centrifuges, providing a total maximum treatment capacity of 630,720 tonnes per year.

The sludge treatment activity has not previously required an environmental permit as the digested sewage sludge from the site is normally sent for recovery to land. However, this application has been submitted based on the Environment Agency's (EA) recent conclusion that sewage sludge is a waste and therefore the treatment of sewage sludge by anaerobic digestion for recovery is a permittable activity under Schedule 1 of the EPR 2016, specifically Chapter 5, Section 5.4, Part A 1(b)(i).

Due to the non-flammable nature of wastes handled at the installation, the site falls outside the requirement to prepare and operate a fire prevention plan (FPP).

2. Non-Technical Summary

This application is for an Environmental Permit for the sludge treatment facility located at Leigh Wastewater Treatment Works (WwTW) to undertake screening, thickening and anaerobic digestion of indigenous and imported sewage sludges. The works are operated by United Utilities Water Limited (UUW).

The waste to be treated consists of sludges imported from other WwTWs and indigenous sludges produced from Leigh WwTW (on-site) from the urban wastewater flow. The sludge facility can process up to 630,720m^3 of wet sludge per year (equating to approximately 630,720 wet tonnes).

Imported and indigenous sludge passes through one of two raw screen sludges before combining within a screened sludge tank. Surplus activated sludge (SAS) also enters the screened sludge tank. From the screened sludge tank, the sludge is pumped through one of two thickening centrifuges where polyelectrolyte mix is added. The thickened sludge is then pumped into a cake silo (thickened sludge storage tank). From here it passes through the thermal hydrolysis plant (THP) and the hydrolysed sludge is then pumped into the anaerobic digester tank via a sludge cooler. Once anaerobic digestion is complete, the sludge is displaced from the digester into the degassing tank, before being directed to the digested sludge tank. The digested sludge is pumped to one of two dewatering centrifuges which is dosed with polyelectrolyte mix, in order to thicken the sludge into a cake. The sludge cake from the centrifuge then falls into a covered cake storage building. The digestate cake is spread to land for agricultural benefit in accordance with the Sludge (Use in Agriculture) Regulations 1988.

Biogas produced during the anaerobic digestion process is stored on site in a gas holder prior to being combusted in two CHP engines, generating renewable electricity. In the event of an emergency, or during planned maintenance of the engine, excess biogas is diverted to a flare to be combusted.

All tanks are constructed of materials suitable for the containment of urban wastewater sludges and the sludge treatment/storage areas are almost completely impermeably surfaced and drained via a private drainage system that it is understood returns all drainage to the WwTW flow to full treatment. In addition, process centrate, once treated in the liquor treatment plant, is returned to the WwTW flow to full treatment.

Odorous air from the raw sludge screens, screened sludge tank, sludge thickening centrifuges, thickened sludge cake silo, degassing tank, digested sludge storage tank, dewatering centrifuges, centrate buffer tanks and centrate balancing tank are treated within an odour control unit (OCU).

There are no point source emissions to land or water from this installation. Point source emissions to air are from the installation's OCU stack, CHP engines, boiler, pressure vacuum relief valves (PVRV) (fitted to the digester and gas holder) and the flare. Point source emissions to sewer are: biogas condensate; liquor from the treatment plant (which treats the centrate from the centrifuges); boiler blowdown; spent water from the OCU bio-scrubber; and surface water drainage, which are all discharged into the WwTW flow to full biological treatment.

3. Application Form B2 Supporting Information

3.1. Question 3a: Relevant Offences

UUW have been convicted of a number of relevant offences; these are detailed in the document "List of Relevant Offences for United Utilities Water Limited (formerly United Utilities Water Plc and North West Water Limited)" included with the application.

3.2. Question 3b: Technical Ability

Technically competent management will be provided by UUW's Environmental Regulatory Advisers (ERAs). A copy of the relevant CoTC certificate and continuing competency for the site's ERA is provided at Appendix A.

3.3. Question 3d: Management Systems

UUW operates a Business Quality and Environmental Management System (BQ&EMS) which is certified against the ISO9001 and 14001 standards. United Utilities environmental management system (EMS) is certified to ISO14001, which covers the management system of UUW Limited for all activities involved in the provision of utility services, including the proposed permitted waste activities. A copy of UUW's ISO14001 certificate is provided at Appendix B – the certificate covers all activities and locations therefore specific sites are not listed.

A Management System Summary for the installation is included at Appendix C. A Residue Management Plan is provided with this document (Attachment 7).

3.4. Question 5a: Plans

A site location plan for the WwTW is provided at Appendix D. A permit boundary and site layout plan for the sludge treatment installation is provided at Appendix E. A process flow diagram is provided at Appendix G.

3.5. Question 5b: Site Condition Report

A H5 Site Condition Report (SCR) is provided in Section 11.

No intrusive investigations have been undertaken for the SCR as the site is almost completely impermeably surfaced in the area where the permitted assets are located (and over most of the rest of the operational area of the WwTW as well).

The disturbance of the impermeable surface in order to obtain reference ground conditions is therefore considered disproportionate to the risk – this has been the approach that has been accepted by the EA for previous applications for similar such installations. There is a site ground investigation report from 2010, this has informed, and is referenced within, the SCR.

Since the site was constructed and commenced operating there have been no significant pollution incidents that may have resulted in contamination of the underlying ground and a visual assessment identified no location where any stains or residues of concern were present. A study of historical maps has identified that prior to the use of the site as a WwTW there were no previous land uses that may have resulted in contamination. The operation is considered to present a very low risk of pollution/ contamination of the environment.

3.6. Question 5c Provide a Non-Technical Summary of Your Application

Please see Section 2 of this report.

3.7. Question 6: Environmental Risk Assessment

Please see Section 10 of this report for a risk assessment and management plan.

4. Application Form B3 Supporting Information

4.1. Question 1: What activities are you applying for

The permitted activities proposed under this application are detailed in Table 4.1.1 (Table 1A of the form).

Table 4.1.1: Permitted Activities

Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
S5.4 A(1)(b)(i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion) involving biological treatment.	R3: Recycling/reclamation of organic substances which are not used as solvents.	From receipt of sewage sludge from the thickened cake silo and subsequent thermal hydrolysis plant through to digestion and recovery of by-products (digestate). Anaerobic digestion of waste in one primary digestion tank followed by burning of biogas produced from the process.
Directly Associated Activities (DAAs)		
Receipt and storage of sludges pending recovery via the S5.4 A(1)(b)(i) activity.	R13: Storage of waste pending the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced).	Storage of non-hazardous sewage sludge prior to anaerobic digestion. Storage of non-hazardous sewage sludge post anaerobic digestion. Blending and mixing of imported sewage sludge with indigenous site-produced sewage sludge from within the works. 1 x screened sludge tank 1 x thickened sludge cake silo 1 x digested sludge tank 1 x digested sludge cake storage building
Sludge screening and thickening/dewatering associated with the S5.4 A(1)(b)(i) activity.	R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced) R3: Recycling/reclamation of organic substances which are not used as solvents	Screening and thickening of non-hazardous sewage sludge within the following plant: 2 x raw sludge screens 4 x centrifuges (including polyelectrolyte dosing) – 2 pre-digestion and 2 post-digestion.
Pre-treatment of centrate by liquor treatment plant (a S5.4 A(1)(a)(i) activity)	D9: Physico-chemical treatment not specified elsewhere in this Annex which results in final compounds or mixtures which	From the receipt of centrate into the liquor treatment plant from the centrate balancing tank.

Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
	are discarded by means of any operation numbered D1 to D12	
Pre-treatment of sewage sludge prior to anaerobic digestion for recovery by means of treatment in a thermal hydrolysis plant (THP).	R3: Recycling/reclamation of organic substances which are not used as solvents	From receipt of non-hazardous sewage sludge into the thermal hydrolysis plant to discharge of treated sludges into the anaerobic digestion S5.4 A(1)(b)(i) activity for recovery.
Odour abatement	Odour control unit (OCU)	From receipt of odours from the raw sludge screens, screened sludge tank, sludge thickening centrifuges, thickened sludge cake silo, degassing tank, digested sludge storage tank, dewatering centrifuges, centrate buffer tanks and centrate balancing tank to emission to air.
Biogas storage and combustion	R1: Use principally as a fuel to generate energy	From the receipt of biogas produced at the on-site anaerobic digestion process, followed by siloxane removal in carbon filters and combustion in two combined heat and power (CHP) engines with the associated release of combustion gases.
Combustion of gas oil	Burning of gas oil in steam boiler	From receipt of gas oil, to combustion of fuel and delivery of steam to the thermal hydrolysis plant.
Flaring of excess biogas	D10: Incineration on land	From the receipt of biogas produced at the on-site anaerobic digestion process to incineration with the release of combustion gases. Use of one auxiliary flare required only to manage excess biogas, and/or periods of breakdown or maintenance of the CHP engines.
Raw materials storage and handling	Raw materials storage and handling	From delivery and acceptance of raw materials to storage awaiting use on site.
Disposal of process liquors to the UWWT flow to full treatment	D13	From generation of process liquors (centrate, biogas condensate, boiler blowdown and spent water from the OCU bio-scrubber) to discharge into the WwTW flow to full treatment.

Maximum Throughput

The maximum design throughput at the facility is limited by the feed rate to the centrifuges, providing a total maximum capacity of 630,720 m^3 per year. As set out in Table 4.1.2 below, throughput is limited by the operation of the centrifuges as a 'pinch point' in the process. There are two thickening centrifuges and

the capacity calculation is based on based on both centrifuges running 100% of the time and 10.5% dry solids flow to digestion. The current operational treatment capacity of the digester per year is 180,206 m^3, based on the feed into the digester. The daily throughput will vary depending on operational needs.

Table 4.1.2: Leigh Sludge Treatment Capacity Calculation

	Centrifuges	Units
Number	2	
Operation	D/A	Duty / Assist / Stand By
Maximum no. of machines in use	2	
Maximum daily throughput	1,728	m^3/day
Sludge output from thickening	494	m^3/day
Maximum annual throughput	**630,720**	**m^3/yr**
Maximum digester capacity	**180,206**	**m^3/yr**

Types of Waste Accepted

Table 4.1.3 (Table 1B of the form) details the waste types and associated waste codes the installation will accept – this waste arises from the on-site, off-installation wastewater treatment works and is also imported from other wastewater treatment works.

Table 4.1.3: Types of Waste Accepted

19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**	
19 02	**Physico/chemical treatments of waste**	**Restrictions**
19 02 06	Sludges from physico/chemical treatment other than those mentioned in 19 02 05	Sewage sludge only
Comprising: • Thickened imported sludge: sewage sludge arising from other WwTW (comprising of thickened sludge arising from sewage settlement and/or surplus activated sludge/humus sludge from biological stages).		
19 08	**Wastes from wastewater treatment plants not otherwise specified**	**Restrictions**
19 08 05	Sludges from treatment of urban wastewater	Sewage sludge only
Comprising: • Imported sludge: sewage sludge arising from other WwTW (comprising of raw sludge from sewage settlement and/or surplus activated sludge/humus sludge from biological stages). • Indigenous sludge: sewage sludge arising from Leigh WwTW. * Note: the EWC does not apply for the classification of indigenous sludges and SAS unless these streams are considered for removal off-site.		

4.2. Question 2: Emissions to Air, Water and Land

Point Source Emissions to Air

There will be seven point-source emissions to air from the following locations:

- A1 – CHP gas engine 1 (combusting biogas) (NGR SJ 66351 98973);
- A2 – CHP gas engine 2 (combusting biogas) (NGR SJ 66351 98973);
- A3 – Dual fuel boiler (the boiler is a dual fuel design and can run on biogas but currently runs on gas oil) (NGR SJ 66349 98973);
- A4 - the Odour Control Unit (OCU) serving the raw sludge screens, screened sludge tank, sludge thickening centrifuges, thickened sludge cake silo, degassing tank, digested sludge storage tank, dewatering centrifuges, centrate buffer tanks and centrate balancing tank (NGR SJ 66326 99072);
- A5 – Flare stack (NGR SJ 66253 99015);
- A6 – PVRV on digester (NGR SJ 66306 98972); and
- A7 – PVRV on gas holder (NGR SJ 66290 99010).

The location of these emission discharge points is shown on the air emissions point plan at Appendix F (Figure F1). The CHP engines discharge via a combined stack.

Please refer to Section 6 for details of gas emission controls from the AD facility.

Please refer to Section 7 for details of odour assessment and control.

Point Source Emissions to Sewer, Effluent Treatment Plants or Other Transfers Off Site

Emissions to sewer and effluent treatment plants are all routed into the wastewater treatment works' flow to full treatment. These emissions are limited to the following:

- W1 – Biogas condensate from the CHP engine and biogas lines (NGR SJ 66298 98999);
- W2 – Boiler blowdown (NGR SJ 66347 98967);
- W3 – Wastewater from OCU biotrickling filter process (NGR SJ 66326 99067);
- W4 – Centrate from the thickening centrifuges (NGR SJ 66340 99006);
- W5 - Centrate from the dewatering centrifuges (NGR SJ 66291 99151);
- W6 – Inlet of the liquor treatment plant (LTP) (NGR SJ 66313 99136);
- W7 – Outlet of the liquor treatment plant (NGR SJ 66322 99148);
- W8 – Leachate from the digested sludge cake stored within the cake storage building (NGR SJ 66285 99130);
- W9 – Site drainage (NGR SJ 66323 98993); and
- T1 – Combined centrate, boiler blowdown, condensate, OCU wastewater, leachate from the cake storage building and surface drainage (NGR SJ 66086 99222).

The location of these emission discharge points is shown on the wastewater emissions point plan at Appendix F (Figure F2). There are no point source emissions to other transfers.

Point Source Emissions to Water and Land

There are no point source emissions to water or land from this installation. Surface water from the drainage system is routed into the wastewater treatment works' flow to full treatment.

Fugitive Emissions

The Environmental Risk Assessment and Management Plan provided in Section 10 assesses potential fugitive emissions from the installation.

Further assessment of the potential environmental risks associated with a loss of containment from process tanks at the site[1] is provided in the Secondary Containment Modelling Assessment Report (already supplied). This assessment was undertaken using the Anaerobic Digestion & Bioresources Association (ADBA) Risk Assessment Tool, which is based on CIRIA 736: Containment systems for the prevention of pollution. The ADBA risk assessment was used to inform hydraulic spill modelling undertaken for the site.

Please refer to the Leigh BAT Improvement Programme document submitted with this application (see Attachment 1) for details on proposed containment mitigation measures to be installed and timescales for installation. Work is ongoing to provide the Environment Agency with a written secondary containment improvement plan containing the finalised designs and specifications and an implementation schedule for the proposed secondary containment systems. This will be submitted at a date to be agreed with the Environment Agency.

Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves (PVRVs) on gassing tanks or leaks in gas pipework e.g. around flanges.

Please refer to Section 6.4 for details of gas emission controls from the AD facility.

Fugitive odour emissions may arise during normal operations, this is to be mitigated by directing the air flow through the OCU.

Please refer to Section 7 for details of odour assessment and control.

4.3. Question 3a: Technical Standards

A block diagram of the process flow is provided at Appendix G. Please refer to Section 6 for a description of the operating techniques for the installation.

Please refer to Section 9 of this report for the BAT assessment.

4.4. Questions 4a & 4b: Measures for Monitoring Emissions

Table 4.4.1 below describes the measures used for monitoring air and wastewater emissions at the installation.

[1] Stantec Secondary Containment Modelling Assessment Report, dated 31 October 2023

Table 4.4.1: Emissions Monitoring

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
Gaseous Emissions					
CHP engines	A1 & A2 (shared stack): SJ 66351 98973	Oxides of nitrogen Carbon monoxide Total VOCs Sulphur dioxide	Annually	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526 BS EN 14791 or CEN TS 17021 or by calculation based on fuel sulphur	Sampling undertaken by a third party specialist
Boiler	A3: SJ 66349 98973	Oxides of nitrogen	Annually	BS EN 14792	Sampling undertaken by a third party specialist
Flare	A5: SJ 66253 99015	Oxides of nitrogen Carbon monoxide Total VOCs	Running time monitored; emissions only tested in the event that running time exceeds more than 10% of operational hours.	BS EN 14792 BS EN 15058 BS EN 12619 and/or BS EN 13526	Inspected annually, including mechanical and safety systems.
OCU	A4: SJ 66326 99072	Ammonia Hydrogen Sulphide	6 monthly 6 monthly	EN ISO 21877 CEN TS 13649 for sampling and NIOSH 6013 for analysis	No EN standard available for hydrogen sulphide Sampling undertaken by a third party specialist - taking 3 samples on the inlet and outlet of the OCU for each parameter over the course of 1 day
		Odour concentration	2 rounds of monitoring	EN 13725	
		Total volatile organic compounds (TVOC) HCl	1 round of monitoring	EN 12619 EN 1911	

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
Bioaerosol Monitoring	One upwind and 3 downwind locations * The monitoring locations are as shown in the Leigh Bioaerosol Risk Assessment (Attachment 4); however, should wind conditions be different on the day of sampling the monitoring locations may vary.	Total mesophilic bacteria Aspergillus fumigatus	1 round of monitoring	In accordance with Technical Guidance Note M9 – Environmental monitoring of bioaerosols at regulated facilities.	As described in the Technical Guidance Note M9, including all the additional data requirements specified therein.
Liquid Emissions					
Wastewater Monitoring (combined returns to WwTW)	T1 – Combined discharge point: SJ 66086 99222	156 hazardous and priority substances as per separate list	Monthly for 12 months	MCERTS or UKAS where possible*	*Please refer to Section 6.9 for further information
Wastewater Monitoring	W1 – Condensate pots SJ 66298 98999 W3 – OCU wastewater SJ 6326 99067 W9 – Site drainage SJ 66323 98993	pH; Total nitrogen; COD; Total phosphorous; Suspended solids; Ammonia; Oil and grease.	Monthly for 12 months	MCERTS MCERTS MCERTS MCERTS MCERTS Accredited by flexible scope to MCERTS Visual assessment only	
Wastewater Monitoring	W2 – Boiler blowdown SJ 66347 98967	pH; COD; Suspended solids; Oil and grease (visual only).	Monthly for 12 months	MCERTS MCERTS MCERTS Visual assessment only	
Wastewater Monitoring	W7 – Centrate (outlet of the liquor treatment plant) SJ 66322 99148	pH; Total nitrogen; COD;	Monthly for 12 months (except W7, which will	MCERTS MCERTS MCERTS	

Location or description	Grid Reference	Parameter	Monitoring Frequency	Monitoring standard or method	Other specifications/ Information
	W8 – Leachate from cake storage SJ 66285 99130	Total phosphorous; Suspended solids; Ammonia; Hydrocarbon oil index; BTEX; Free cyanide; Halogens (AOX); Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Mn); Mercury Hexavalent chromium(VI)); PFOS and PFOA.	continue on a monthly basis)	MCERTS MCERTS Accredited by flexible scope to MCERTS EN ISO 9377-2 EN ISO 15680 EN ISO 14403-1 or EN ISO 14403-2 EN ISO 9562 EN ISO 11885, EN ISO 17294-2 or EN ISO 15586 EN ISO 17852 or EN ISO 12846 EN ISO 10304-3 or EN ISO 23913 -	

Point Source Emissions to Air

The CHP emissions are discharged via a combined stack serving both engines. Emissions will be monitored annually in accordance with LFTGN08 and the relevant MCERTS Standards by a qualified third party. The results of the monitoring will be reviewed by the site's ERA and any other relevant staff to check that they are compliant with the relevant emissions limit value. The CHP stack has an M1 compliant sample location, with safe access provided as visible on Photo 13 later in this document. The CHP stack sampling is undertaken as a single point as it is not required to meet BS EN 15259[2] as homogeneity testing is only required on stacks exceeding 1.13m diameter, as specified in MID 15259.

The thermal input of the steam boiler is 1.16MW, which is above the threshold for MCPD controls. The CHP engines have a thermal input of 1.2MW (each), which is above the threshold for MCPD controls.

UUW commissioned Jacobs UK Limited to carry out an Air Quality Impact Assessment (AQIA) to assess the potential impact of emissions from the CHP engines (emission points A1 and A2) and boiler (emission point A3). The AQIA report forms Appendix H to this document.

[2] BS EN 15259 stipulates that the exhaust gases emitted from combustion processes are tested to ensure homogeneity and that a representative sample is obtained during the monitoring, subject to a number of caveats as elucidated in Environment Agency guidance MID15259. The stack at Leigh is 0.39m in diameter.

Emissions monitoring for the CHP engines (A1 and A2) was undertaken in May 2021 by Element Materials Technology Environmental UK Limited on behalf of UUW. The monitoring results are presented in Table 4.4.2 below and demonstrate that the ELV's are being met.

Table 4.4.2: CHP Emissions Monitoring Data

Emission Point Reference	Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Estimate of Uncertainty (2σ at 95% confidence)	Units	Reference Conditions	Date of Sampling	Start and End Times
CHP Engine 1	Oxides of Nitrogen (as NO_2)	190	**171.8**	±10.9	$mg(N)m^{-3}$	101.3 kPa, 273K, dry gas, 15% O_2	17/05/2021	11:05-11:35
	Oxygen	-	**8.07**	±0.39	%	101.3 kPa, 273K, dry gas		
CHP Engine 2	Oxides of Nitrogen (as NO_2)	190	**118.7**	±8.8	$mg(N)m^{-3}$	101.3 kPa, 273K, dry gas, 15% O_2	17/05/2021	12:55-13:25
	Oxygen	-	**7.35**	±0.37	%	101.3 kPa, 273K, dry gas		

The flare emissions will be monitored in accordance with LFTGN05. The running time of the flare will be recorded.

The CHP engines and boiler are serviced in accordance with the manufacturer's recommended frequency. Additional maintenance tasks are undertaken based on UUW's experience of running such plant.

The OCU stack has been included as a point source emission as all point source emissions are required to be identified within a permit application, we understand there is no requirement for an M1 compliant sample location. To meet BAT 8 requirements, monitoring of the OCU for hydrogen sulphide and ammonia[3], once every six months, will be introduced. Total volatile organic compounds (TVOC) and HCl will be monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCl may be added to the bi-annual monitoring schedule. In addition, the stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved. A suitable measurement port will be provided to allow monitoring of the OCU stack. A copy of the sites OMP is supplied with this permit application (Attachment 2).

Hydrogen sulphide monitors are fitted on the OCU inlet, biofilter outlet and the emissions stack. The stack outlet monitor continuously records hydrogen sulphide emissions in the range 0-1.5ppm. The biofilter monitor records concentrations in the range 0-50ppm and the inlet monitor in the range 0-200ppm. Hydrogen sulphide for the stack emissions is trended in the HMI and is set to alarm at 0.05ppm.

There is no proposal to monitor the PVRV's as these only emit emissions to air in an emergency or when equipment is being serviced/repaired.

[3] No EN standard is available for either ammonia or hydrogen sulphide monitoring.

There is no proposal to routinely monitor the flare, however its running time will be recorded and in the event of the flare operating for more than 10 per cent of a year, emissions monitoring will be undertaken in accordance with permit requirements.

Point Source Emissions to Sewers, Effluent Treatment Plants or Other Transfers Off Site

There are seven proposed wastewater emissions points from the installation (see Section 6.9). Monitoring is proposed over a 12 month period at W1, W2, W3, W7, W8 and W9 to characterise the wastewater streams in accordance with BAT 3, BAT 6 and BAT 7. Monitoring of centrate from the centrifuges/liquor treatment plant at W4 to W6 is not proposed as sampling from W7 is considered sufficiently representative of liquor returns.

Where monitoring is proposed, 12 samples (except W7, which will continue on a monthly basis) will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance. Monitoring for hazardous and priority substances will be undertaken at location T1 (the point at which the combined liquors leave the installation (Grid reference SJ 66086 99222)) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance. Please refer to Section 6.9 for further information on monitoring of wastewater streams.

Procedures for Data Review/Evaluation

A draft Standard Operating Procedure (SOP) detailing the operating requirements, practices and support processes required to undertake emission monitoring as per the environmental permit requirements and to assess the results is contained in Appendix L. This will be finalised on issue of the permit and incorporated into the company's management systems documentation as a controlled document.

4.5. Question 6a: Describe the Basic Measures for Improving how Energy Efficient the Activities Are

The thickening processes themselves are not energy intensive, so there is limited opportunity for improving energy efficiency. When selecting new and/or replacement pumps and motors, energy efficiency is one of the factors considered.

Biogas generated from the anaerobic digestion of the sludge is combusted to generate renewable electricity and heat by the CHP engines and can be used to provide steam for the thermal hydrolysis process via a combination boiler. The following measures are used to improve energy efficiency:

- All relevant buildings/vessels are appropriately insulated.
- Use of biogas in the CHP engines and/or boilers, with the heat generated recycled to sludge treatment.

AD Plant:

- The primary digester is insulated. The CHP engines are suitably sized to maximise energy utilisation for the parasitic load, while minimising the use of the flare.
- Low energy lighting is installed across the plant.

Energy consumption for the WwTW as a whole is monitored and tracked via the site environmental dashboard. The dashboard can provide reports on energy generation and consumption, including CHP performance and anaerobic digestion performance (e.g. information such as digester feed and biogas yield).

Periodic targets for energy improvements will be identified as part of the annual energy review, which identifies opportunities for improvement and sets out the site's energy management strategies and energy balance record. This review is set out in the Energy Review FY21, which has been provided with this document.

4.6. Question 6b: Provide a Breakdown of Changes to the Energy the Activities Use and Create

Table 4.6.1 provides the kW rating for all of the pumps and mixers used for movement and management of the sludge.

Table 4.6.1: Energy Ratings

Asset	Total kW rating
Polymer Dosing Pump No1	2.2
Polymer Dosing Pump No2	2.2
Centrate Return Pump No 3	7.5
Centrate Return Pump No 4	7.5
Centrate Tank Mixing Pump No 1	11
Centrate Tank Mixing Pump No 2	11
Sludge Dewatering Centrifuge Feed Pump1	11
Sludge Dewatering Centrifuge Feed Pump2	11
Boiler Feed Heat Exchanger Pump	0.55
Boiler Feed Water Pump	0.5
Hot Water Recirculation Pump No 1	2.2
Hot Water Recirculation Pump No 2	2.2
Cooling Water Circulation Pump A	5.5
Cooling Water Circulation Pump B	5.5
Hot Stream Circulation Pump	3
Cold Stream Circulation Pump	3
Hot Water Feed Pump No 1	2.2
Hot Water Feed Pump No 2	2.2
Screened Sludge Transfer Pump No 1	45
Screened Sludge Transfer Pump No 2	45

Asset	Total kW rating
Screened Sludge Transfer Pump No 3	45
Screened Sludge Transfer Pump No 4	45
Poly Dosing Pump No 1	2.2
Poly Dosing Pump No 2	2.2
Centrate Return Pump No 1	7.5
Centrate Return Pump No 2	7.5
Sludge Thickening Feed Pump No 1	15
Sludge Thickening Feed Pump No 2	15
Thickened Sludge Silo Feed Pump No 1	18.5
Thickened Sludge Silo Feed Pump No 2	18.5
Digester Mixing Pump No 1	37
Digester Mixing Pump No 2	37
Digester Recirculation Pump No 1	18.5
Digester Recirculation Pump No 2	18.5
Thermal Hydrolysis Feed Pump No 1	15
Thermal Hydrolysis Feed Pump No 2	15
Thickened Sludge Dilution Pump No 1	1.5
Thickened Sludge Dilution Pump No 2	1.5
THP Feed Final Effluent Dilution Pump 1	0.24
THP Feed Final Effluent Dilution Pump 2	0.24
Digester Feed Pump	4
Poly Solution Mixing Tank Mixer	7.5
Poly Mixing Tank Mixer	5.5

4.7. Question 6c: Specific Measures for Improving Energy Efficiency

See 6a above.

4.8. Question 6d: Raw Materials

The main raw materials used are polyelectrolyte powder and potable water (used for polyelectrolyte make up). These are used in the sludge dewatering process and they are monitored and optimised to achieve the required thickening parameters. The quantity of polyelectrolyte used and the concentration of the polyelectrolyte/water mix will be monitored and recorded; these records will be used to calculate annual potable water consumption.

All raw and other materials used are essential for the efficient and successful operation of the digestion activity and wider on-site (off-installation) wastewater treatment works. Only the quantities required are used and UUW regularly reviews the types and quantities of materials used.

Details of storage and usage are provided in Table 4.8.1 (Table 5 in the form). Copies of the Material Safety Data Sheets (MSDS) for the anti-foam, gas oil, Hydrex and polyelectrolyte are provided in Appendix K.

Table 4.8.1: Raw Materials

Schedule 1 Activity	Raw Material	Maximum amount stored	Annual throughput (tonnes / year)	Description of the use of the raw material including any main hazards (include safety data sheets)
Anaerobic digestion	Polyelectrolyte powder	20 bags (700kg each) – Zetag 8185	100,800 kg per annum	Used to enhance thickening of the sludge
Anaerobic digestion	Potable water	210,000 litres	Variable, as required	Used to enhance thickening of the sludge
Anaerobic digestion	Anti foam agent	8 IBCs – MAF-900	27m^3	Used to enhance thickening of the sludge
Anaerobic digestion	Gas oil	5,000 litres	320,000 litres	Used to fuel steam boiler
Anaerobic digestion	Anti-corrosion	10m^3	As required	Used in engines to prevent them freezing up during colder weather and acts as a corrosion inhibitor.
Anaerobic digestion	Boiler water treatment	Hydrex 1386 – 25 litres	Variable, as required	Used to aid operation of boiler

Information regarding the storage of raw hazardous substances is discussed in Section 5.8 of this document.

4.9. Question 6e: Waste

The treatment process itself produces waste screenings via the sludge screens, which consists of perforated polyurethane mat, retaining rags and large solids/debris. The finer material and water traverse the perforated polyurethane mat, into a sludge well sump below. Larger solids/screenings are carried along the mat and passed through a screenings compactor and collected in a skip. It is essential that these are removed from the sludge in order to attain the required sludge quality. Screenings are currently sent to landfill as there are currently no viable recycling or recovery routes available.

The digestion activity is a waste recovery activity and is undertaken to recover energy and organic materials that may otherwise be disposed of. UUW regard the sludge cake and biogas produced as useful

resources that are subject to full recovery. They replace fossil fuels and raw materials that would otherwise be required.

Centrate from the centrifuge processes for thickening and dewatering sludge is returned to the WwTW flow to full treatment after pre-treatment in the liquor treatment plant.

Limited amounts of servicing and maintenance waste are expected to be produced and these will be managed in accordance with the waste hierarchy.

4.10. Question 7: Installations that include a Combustion Plant

Biogas is combusted in two Jenbacher engines, each having a thermal input rating of 1.2MWth. The CHP engines provide heat to assist a boiler, which then provides steam to the Thermal Hydrolysis Plant (THP).

The boiler is a dual fuel design and can run on biogas but currently runs on gas oil. The thermal input of the boiler is 1.16MW. Table 4.10.1 provides some further information regarding the combustion plant.

Table 4.10.1: Combustion Plant

Equipment	Fuel Type	Specification	Thermal Input
CHP Engine 1	Biogas	Electrical output – 527 kW	1.2MWth
CHP Engine 2	Biogas	Electrical output – 527 kW	1.2MWth
Hot water/Steam Boiler	Gas oil	Flow rate – 2,430 kg/hr	1.16MWth
Flare	Biogas	Flow rate – 750 kg/hr	N/A

5. Application Form B6 - Point Source Emission to Water

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

585m^3/day.

5.2. Q 3c: What is the maximum rate of discharge in litres per second?

12.03litres/second.

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

585m^3/day.

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

Q3b – The main element of the effluent generated is the centrate.

- Treated liquor discharge average total over a week as found on SCADA is 2,898m^3/week and therefore is: 2898/7 = 414m^3/day.
- SAS returns on a timer to run for 2hrs/day at 75m^3/hr, therefore 75 x 2 = 150m^3/day.
- Dewatering centrifuge daily wash-down 36m^3/hr, but runs for 10 minutes per hour, normally undertaken once per day. Therefore 36/6 = 6m^3/day.
- Sludge thickening centrifuge wash-down as per dewatering centrifuge = 6m^3/day.
- OCU discharge based on drop test of 2 x 3l/m for the 2 biofilters. (6l/m x 1440)/1000 = 8.64m^3/day.
- Boiler blowdown only occurs twice per day for 6 seconds and condensate discharge too small to measure. No more than 10ltrs/day or 0.01m^3/day.

Total therefore: 414 + 150 + 6 + 6 + 8.64 + 0.01= 585m^3/day

Q3c – Site return pump runs 13.5 hours per day on average. Therefore (585m^3/(60*60*13.5)) x 1000 = 12.03litres/second

Q3d – As per Q3b

5.5. Q 5a: How far away is the nearest foul sewer from the boundary of the premises?

Not applicable – the installation is located within the curtilage of Leigh WwTW and the installation wastewater emissions discharge into the works UWWT inlet via the site's sealed drainage system.

5.6. Q 5b2: Discharges from all other premises including trade effluent

Not applicable – the installation is located within the curtilage of Leigh WwTW and the installation wastewater emissions discharge into the works UWWT inlet via the site's sealed drainage system.

5.7. Q 6a: Do you treat your effluent

Centrate generated in the sludge treatment process is pre-treated through a liquor treatment plant (LTP) – this is mainly to manage ammonia loading (see Section 6.2 for further information). The remaining wastewaters generated by the sludge treatment process are not subject to pre-treatment. All wastewater emissions are returned to the head of Leigh WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits.

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

Centrate generated in the sludge treatment process is pre-treated through a liquor treatment plant (LTP) – this is mainly to manage ammonia loading (see Section 6.2 for further information). The remaining wastewater emissions are returned to the head of Leigh WwTW to undergo full biological treatment.

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

The LTP achieves in excess of 95% ammonia removal. The LTP typically achieves the following quality levels (based on data from 1/4/22 to 30/6/22):

- BOD <7.7mg/l
- Suspended solids <26mg/l
- Ammonia 2.64mg/l
- Iron 1.23mg/l
- Aluminium <49.65ug/l
- Phosphate <2.08mg/l

The wider Leigh works meets the limits of its environmental permit discharge consent (ref. 016920134) – this consent has limits set for BOD, ammoniacal nitrogen, suspended solids, total iron, total aluminium, COD and total phosphorus.

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

No monitoring has been undertaken for the substances listed. See response to question 7e.

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

No monitoring has been undertaken for the substances listed. See response to question 7e.

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

No monitoring has been undertaken for the substances listed. See response to question 7e.

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

There are no direct emissions to surface water or groundwater from this installation; however, on direction from the EA we propose to carry out monitoring for all substances listed within the referenced guidance documents for the wastewater returns from the sludge treatment process that are routed into the WwTW.

The wastewater emissions monitoring points are therefore limited to the following:

- W1 – Condensate from the CHP engine and biogas lines;
- W2 – Boiler blowdown;
- W3 –Odour Control Unit (OCU) biotrickling filter wastewater;
- W4 – Centrate from the thickening centrifuges;
- W5 - Centrate from the dewatering centrifuges;
- W6 – Inlet of the liquor treatment plant (LTP);
- W7 – Outlet of the liquor treatment plant;
- W8 – Leachate from cake storage building;
- W9 - Surface water drainage; and
- T1 – Combined centrate, boiler blowdown, condensate, OCU wastewater, leachate from cake storage building and surface drainage.

As Leigh WwTW final effluent discharges into the River Glaze/Pennington Brook, testing for the hazardous and priority substances listed for fresh waters will be undertaken. There are 60 priority hazardous pollutants and 96 specific pollutants listed in the tables contained in the EA Guidance 'Surface water pollution risk assessment for your environmental permit' - Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk). The total number of parameters, excluding duplicates between the two lists, is 156.

UUW is committed to undertaking full characterisation of the wastewater streams to meet BAT 3, however we will assess whether it is possible to screen out any of these parameters based on the character of the wastewater coming into the works and, if so, provide a justification to the EA during the permit determination period for any reduction in the list of parameters to be analysed.

Monitoring for hazardous and priority substances will be undertaken at location T1 (the point at which the combined effluent streams leave the installation before being returned to the WwTW inlet (Grid reference SJ 66086 99222)) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance. Laboratory analysis will be undertaken to MCERTS or UKAS ISO17025 standards for determinands where available. However, it should be noted that only around 10% of the 156 hazardous and priority substances can be analysed in-house at UUWs laboratories (please refer to Appendix M for a copy of UU's UKAS Accreditation Certificate) and initial contact with commercial

laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate/ filtrate matrix and potentially may not be able to analyse at all.

Monitoring for wastewater returns to the WwTW inlet has also been reviewed against BAT 6 and BAT 7 requirements.

BAT 6 specifies that 'for relevant emissions to water, as identified by the inventory of wastewater streams (see BAT 3), BAT is to monitor key process parameters (e.g. wastewater flow, pH, temperature, conductivity, COD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)'.

BAT 7 states: BAT is to monitor emissions to water with at least the defined frequency, and in accordance with EN standards. The proposed BAT monitoring requirements have been compared with those for biological treatment of waste. The EA has directed that 'treatment of water-based liquid waste' BAT AELs are also appropriate.

Based on the BAT requirements, monitoring for the following parameters is proposed at emission points W7 and W8 to characterise the centrate and cake storage leachate wastewater streams, at the frequency set out in Table 6.9.2:

- pH;
- Total nitrogen;
- Ammonia;
- Chemical oxygen demand (COD);
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- Benzene, toluene, ethylbenzene, xylene (BTEX);
- Free cyanide;
- Halogens (AOX);
- Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI));
- PFOS and PFOA.

Monitoring for a more limited suite of parameters is proposed to characterise the biogas condensate, OCU wastewater and site drainage/surface run-off at emission points W1, W3 and W9 as these are smaller volume wastewater streams and have less potential for contaminants such as metals to be present. Monitoring for the following parameters is proposed at the frequency set out in Table 6.9.2:

- pH;
- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Ammonia; and

- Oil and grease (visual assessment only)

Monitoring of the boiler blowdown at emission point W2 is proposed for the following limited suite of parameters, given the small volume of water and low potential for contamination (refer to Table 6.9.2 for frequency):

- pH;
- COD;
- Suspended solids; and
- Oil and grease (visual assessment only)

The liquor treatment plant (LPT) returns treated centrate to the WwTW at a rate of approximately 29 to 40m^3/hr. The centrate is sampled and tested on at least a weekly basis. The main parameter that requires control is the loading of ammonia to the works. The LTP achieves in excess of 95% ammonia removal.

Flow meters are installed to record the flow at a number of locations throughout the sludge treatment process (see response to question 9d). Flows to the head of the works, from the sludge treatment process installation area, consist of the treated liquor pumping station and site drainage pumping station. An MCERTS flow meter is currently being installed/updated at the inlet of the wider WwTW works at grid reference SJ 66091 99240, but there is no MCERTS flow meter at the final effluent discharge point. The final effluent discharge is recorded at the original MCERTS measurement point by a calculation of flow passed forward from the BAFF plant. The flow is calculated by subtracting the wash water returns to the inlet from the feed to the BAFF Plant.

Monitoring of the wastewater returns to the head of the works is summarised in Table 6.9.2.

5.14. Q 7f: What is the maximum temperature of your discharge?

The temperature of the treated liquor is approximately 30^{o}C as the treatment process runs around this temp. All other discharges are ambient (i.e. approximately 20^{o}C).

5.15. Q 7g: What is the maximum expected temperature change compared to the incoming water supply?

The main WwTW's site can take up to 51 Ml/d so although the treated liquor is coming in at 30^{o}C it will be significantly diluted so does not increase the ambient temperature.

5.16. Q 8b: Discharges to lakes, estuaries, coastal waters or bathing waters

Not applicable – the installation does not discharge to lakes, estuaries, coastal waters or bathing waters.

5.17. Q 8d: Discharges to groundwater

Not applicable – the installation does not discharge to groundwater.

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

No screening or modelling has been undertaken on the wastewater emissions from the installation at present, due to a current lack of quality data for a number of the wastewater emission sources and a lack of flow data.

5.19. Q 8f: Environmental Impact Assessment

Not applicable – an environmental impact assessment has not been undertaken as this is an existing facility/installation.

5.20. Q 9a: What is the national grid reference of the inlet sampling point?

Not applicable to this installation.

5.21. Q 9b: What is the national grid reference of the effluent sample point?

T1 – NGR SJ 66086 99222. This location is where the combined effluent (i.e. centrate, boiler blowdown, condensate, OCU wastewater, leachate from cake storage building and surface drainage) emission leaves the installation and joins the wider works for flow to full biological treatment. The new effluent sampling point will be available from permit issue. Only centrate monitoring locations (and one parameter for boiler blowdown) are currently available.

5.22. Q 9d: What is the national grid reference of the flow monitoring point?

There is no flow meter installed at the effluent sampling point (T1). There are a number of flow monitoring locations throughout the sludge treatment process as follows:

- Inlet flow to the sludge screen;
- Flow to the sludge thickening centrifuge;
- Sludge thickening centrifuge return;
- Thickened sludge silo feed pump;
- Screened sludge dilution pump;
- Final effluent ring main;
- Thermal hydrolysis feed pump;
- Pulper recirculation/reactor feed;
- Flash tank;
- Digester feed pump;
- Digester recirculation pump;
- Degassing tank;
- Dewatering centrifuge feed pump;
- Dewatering centrifuge return pump;
- LTP inlet feed;
- Caustic pump;
- Glycol pump (not currently used);

- MLSS recycle flow; and
- RAS/SAS pumps.

An MCERTS flow meter is installed at the inlet of the wider WwTW works at Grid reference SJ 66091 99240, but there is no MCERTS flow meter at the final effluent discharge point. The final effluent discharge is recorded at the original MCERTS measurement point by a calculation of flow passed forward from the BAFF plant. The flow is calculated by subtracting the wash water returns to the inlet from the feed to the BAFF Plant.

5.23. Q 9e: Does the flow monitor have an MCERTS certificate?

No flow meter installed at the effluent sampling point.

5.24. Q 9f: Do you have a UV disinfection efficacy monitoring point?

No this is not installed as part of this installation.

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

Refer to Appendix F2.

5.26. Q 9i: Do you intend to do your own effluent monitoring?

Yes. Monitoring will be carried out in accordance with established process monitoring procedures using appropriate equipment, which will be calibrated to manufacturer's instructions where required. All samples will be collected and stored in an appropriate manner by suitably qualified personnel, with analysis carried out in line with BAT 3, as appropriate. All analysis is undertaken at UU Scientific Services Lingley Mere Laboratory, which is a United Kingdom Accreditation Services (UKAS) laboratory accredited to ISO/IEC 17025:2017 (included at Appendix M). Wherever possible sampling and analysis is accredited to MCERTS by UKAS.

However, it should be noted that only around 10% of the 156 hazardous and priority substances (to be analysed at monitoring location T1) can be analysed in-house at UUWs laboratories and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate matrix and potentially may not be able to analyse at all.

5.27. Q 10: Where will the effluent discharge to?

Not applicable. There are no direct emissions to water from the sludge treatment activities. The wastewater streams are returned to the head of Leigh WwTW for full biological treatment, before being discharged (indirectly) via the WwTW final effluent discharge into the River Glaze/Pennington Brook.

6. Technical Description and Operations

6.1. Pre-acceptance, Acceptance and Storage of Waste

The wastewater sludge to be received for treatment is limited to sewage sludges imported from other WwTWs and indigenous sludges produced from Leigh WwTW. The process has been designed to treat sewage sludges generated within the UUW network in compliance with the Biosolids Assurance Scheme (BAS). A BAS risk assessment is carried out for each source of sewage sludge, indigenous sewage sludge and imported raw sludge. A copy of Leigh's Site Specific Instruction (SSI) Waste Characterisation and Acceptance Procedure is provided with this document (Attachment 8). This includes information regarding staff responsibilities; waste types accepted; waste characterisation; waste acceptance, waste non-conformance and rejection; and waste audit and reassessment.

In summary, the imported sludge arrives at site via tanker where it joins the indigenous sludge and passes through one of two raw sludge screens. The tanker off-loading point is a flexible pipe and bauer coupling. The following sludge acceptance/recording procedures are used at Leigh:

- United Utilities Bioresources is responsible for the movement of all UUW sludges produced. The "PODFather" system is used to plan and manage the movement of UU tankers transporting UUW sludges between wastewater treatment works. POD stands for "Proof of Delivery".
- Waste characterisation and pre-acceptance is provided for each sewage sludge import. This is provided through completion of the "WwTW Sludge Waste Declaration Form". The WwTW Sludge Waste Declaration Form is completed by a representative of the WwTW production site or production area with knowledge and authority to provide this information (e.g. Process Controller, Technical Officer, Production Manager, or Area Production Manager).
- The characterisation provided on the WwTW Sludge Waste Declaration Form is required in order for a technical assessment of the waste to be completed by the Leigh site. The Technical Assessment will confirm if the proposed import stream is suitable for processing. The Leigh Production Manager is responsible for the approval of incoming waste.
- Following approval, the POD Father system provides a link each week to Process Controllers (PC) at export sites, the PC then provides information relating to sludge levels on site and what volume they need exporting the following week.
- Import sites provide information on what volume they are able to accept and ensure that volumes received are within Permit and licence conditions.
- Sludge loggers linked to the PODFather system are present at all import sites; they automatically monitor the quantity and the dry solids (DS) content of the sludge imports as they are discharged from the tanker.
- The PODFather system records all sludge movements, detailing the site it has come from, the volume, the quality (dry solids content) and date and time delivered. These records are all kept electronically and used in the quarterly submissions to the EA as well as the annual reporting to OFWAT.
- Sampling of imports on arrival is not required as the material consists of sewage sludge which will have undergone pre-acceptance characterisation and technical evaluation. Where there are

operational or technical reasons to carry out sampling these will be done as detailed in the waste acceptance procedure.

- The tanker discharge point has a WaSP system that doesn't allow discharge unless the tanker driver has the correct access fob. As well as allowing the discharge to take place, the driver has to enter details such as name, registration number and sludge source, these records are kept as part of the duty of care compliance.

6.2. Waste Treatment and Processing

A process block diagram for the sludge treatment process is included at Appendix G.

Imported and indigenous sludge pass through one of two raw sludges screens, Photo 1, before combining in a screened sludge tank, Photo 2.

Photo 1: Sludge screen

Photo 2: Screened sludge tank

Surplus activate sludge (SAS) also enters the screened sludge tank. From the screened sludge tank the sludge is pumped via two pumps through two thickening centrifuges where polyelectrolyte mix is added, Photo 3. Centrate generated from this process is pumped to a centrate buffer tank (Photo 3), from where it is pumped to the liquor treatment plant for processing, before being returned to the WwTW flow to full treatment.

Photo 3: Thickening centrifuges

The thickened sludge is then pumped into a thickened sludge cake silo. From here it passes through the thermal hydrolysis (TH) plant, Photo 4.

Photo 4: TH Plant

The TH plant provides two key functions as follows:

- To ensure that, through destruction of pathogens in the sludge, an enhanced quality sludge is produced; and
- To break down organic matter in the co-settled sludge in order to make more organic matter readily available for digestion in the anaerobic digester. (This improves gas yield in the digester, reduces the sludge solids load after digestion, and produces a digested sludge which dewaters to a higher dry solids content).

The main concept for the thermal hydrolysis process is a stepwise heating and cooling of sludge through pressure and temperature control.

The TH plant is a package unit and includes the following:

- Pulper reception vessel;
- Treatment reactor x4;
- Flash tank (for blowdown); and
- Digester feed pump.

Pulper Filling

The thickened sludge from the thickened sludge storage silo is pumped to the pulper by duty/standby variable speed pumps. The thickened sludge is diluted to 16% dry solids (DS) using screened raw sludge, with dilution controlled via pump delivery discharge pressure. Sludge enters the pulper at circa 16% ±1 DS.

Pulper

The sludge is pre-heated in the pulper by injecting recycled steam from the flash tank. The pulper provides the necessary buffer capacity for recovery of energy from the flash tank and it absorbs any thermal shock that could arise by feeding cold sludge into a hot environment.

The flash tank level controls the blowdown (emptying) of a vessel, as the flash tank cannot empty until capacity is available. The filling sequence picks the next available empty vessel.

The pulper is continually pump mixed (except during periods of forward flow) and the sludge is homogenised by circulation.

Reactor Filling

When a reactor is available to fill, the mixing pump in the pulper diverts the pre-heated sludge to the hydrolysis reactor in service. The reactor fills to a given level (approximately 75% of the reactor vessel); this is measured by a dual flow meter.

Live steam is then introduced into the reactor vessel from two steam lances, the temperature is further increased to ~165°C and the reactor attained at a desired pressure (~6 bar) for a duration of 30 minutes. The outcome of this batch process produces hydrolysed sludge.

After the hold period when desired conditions are met, the reactor vessel is partly depressurised from the top using a control valve (let-down valve), taking energy back to the pulper vessel in order to vacate non condensable gases and serve to pre-heat the in-coming sludge to pulper vessel. Once the reactor reaches a set-point pressure, the let-down valve is closed.

Flashing

Once the let-down valve is closed, a blow down valve (actuated valve) to the flash tank is opened. The differential pressure blows the hydrolysed sludge to the flash tank, the sludge is rapidly depressurised, a further flash steam (second flash) is displaced to the pulper for energy recovery via steam lances and the sludge is disintegrated by a steam implosion reaction.

During the hydrolysis process, cells and cell clusters are broken open and dissolved and therefore become more easily accessible for digestion. This results in a higher potential for the conversion of volatile matter and stabilization, especially for biological sludge. Dissolved organic solids are more digestible than suspended solids (cell walls, etc.). The dissolution of cellular organic material increases with the degree of hydrolysis.

Digester Feed

The hydrolysed sludge is pumped from the flash tank to the digester via a variable speed duty only pump (a boxed spare is available for standby provision).

The hydrolysed sludge is diluted and cooled with UV treated final effluent to approximately 90°C and 10% DS. It is critical at this point that the final effluent is treated to ensure the sludge remains pathogen free. It is then mixed with the digester recirculated sludge (at a rate of 3:1). This has two advantages; it will ensure high velocities to prevent scaling within the pipes between the TH process and digester and minimise precipitation of salts. It also further cools the incoming sludge, thus reducing the amount of cooling required by the air blast coolers, reducing power requirements.

Process Gas

Odour from the TH process consists mainly of mercaptans, amines and hydrogen sulphide. All flash steam from the process ends in the pulper. To secure the outlet of the non-condensable gases, a controlled flow is released from this vessel. The gases released from the pulper first pass through a water-cooled foul gas cooler. All condensed liquid is fed back into the digester feed line. The foul gases are compressed to the necessary pressure using closed circuit ejectors and injected into the sludge pipe to the digester. The ejectors and their circulation systems are duty/standby. All gases from the TH plant are contained within the TH plant and the digester system and are not directly released to atmosphere.

The air blast cooler then cools the sludge prior to feeding the anaerobic digester, Photo 5.

Photo 5: Anaerobic digester

Anaerobic Digestion

The purpose of the sludge digester is to break down organic material in the sludge and convert it to methane and carbon dioxide, in order to produce a more stable sludge and to produce a methane rich biogas which can be burned in the boiler (to produce steam for the TH plant) and in the CHP engines (to produce electricity and release heat).

The digester has a working volume of 3,264m^3. Sludge is fed into the digester and, following completion of the digestion process, sludge exits from a limpet box at the top of the digester.

An ultrasonic level instrument monitors the sludge level in the digester.

In the digester, anaerobic digestion of the sludge produces biogas which is discharged from the digester headspace under pressure to the gas holder.

Degassing Tank and Digested Sludge Tank Operations

From the anaerobic digester the digested sludge is displaced from the digester into the digested sludge degassing tank, Photo 6, by the incoming hydrolysed sludge. Should the degassing tank be unavailable then the digested sludge can be passed straight into the digested sludge tank, Photo 7.

Photo 6: Degassing tank

The purpose of the degassing tank is to inhibit the anaerobic digestion process, remove any residual methane gas and precipitate struvite. This is achieved by applying air which establishes aerobic conditions, increases the pH by stripping carbon dioxide, and decreases struvite solubility.

Struvite, also known as magnesium ammonia phosphate ($Mg\ NH_4\ PO_4\ 6H_2O$), is a hard compound which precipitates out of solution, forms crystals and can adhere to piping systems causing restricted flows or blockages.

Aeration for the digested degassing tank is provided by two blowers that operate duty/standby providing a constant airflow of 170m^3/hr at 0.7 bar. The blowers draw fresh air and discharge to the piping system and diffuser membrane at the bottom of the digested sludge degassing tank. The total airflow and pressure are monitored.

The digested sludge degassing tank is enclosed; any gas arising from the sludge is taken off from a common line and diverted to the OCU. Struvite formation will settle at the bottom of the tank, once enough struvite has accumulated it is transferred into a tanker for disposal off-site via a drain-out valve located at the bottom of the tank.

Sludge is then transferred from the degassing tank to the digested sludge tank, Photo 7. Should the degassing tank be unavailable then the digested sludge can be passed straight into the digested sludge tank.

Photo 7: Digested sludge tank

The digested sludge tank provides storage/buffering prior to the digested sludge dewatering facilities. The digested sludge tank has a capacity of 757m^3, combined with the degassing tank this is equivalent to 4 days storage capacity to enable digestion to be a continuous process.

The tank is air mixed periodically, as necessary, to improve the homogeneity of the sludge feed to the dewatering centrifuges and prevent settlement of sludge solids. Any gas arising from the sludge is taken off and transferred to the OCU.

An overflow pipe is provided to ensure the tank cannot be pressurised in the event of failure of the digested sludge balance tank feed pumps control system. The overflow pipe incorporates a barometric leg of minimum 200 mm depth in order to prevent air being extracted from it.

From the digested sludge tank, the sludge is then pumped to two dewatering centrifuges, background of Photo 8, and dosed with polyelectrolyte prior to entering the centrifuges, Photo 9.

Photo 8: De watering centrifuges and centrate buffer tank

Photo 9: Polyelectrolyte mixing and storage tank

Dewatering Process

The purpose of the digested sludge dewatering facility is to increase the solids concentration of the digested sludge up to 30% DS to reduce export volume and associated costs.

Dedicated feed pumps draw sludge from the digested sludge tank and feed into two identical and independent sludge dewatering centrifuges (duty/standby) streams. The dry solids content of the feed is measured by in-line dry solids monitors.

Each stream comprises of a feed pump, centrifuge, cake hopper and cake conveyor. The centrate gravitates to a digested centrate buffer tank. Polyelectrolyte solution is dosed directly into the drum of the centrifuges from a powder polyelectrolyte make up facility to aid the dewatering process.

The sludge cake from each centrifuge falls to a screw conveyor which transports the cake to the digested cake storage building, Photo 10.

Photo 10: Cake storage building

Centrate is collected in the centre buffer tank, foreground of Photo 7, before passing into the centrate balancing tank. The centrate from the dewatering centrifuges flows by gravity to the centrate buffer tank.

Duty-Standby, variable speed digested centrate return pumps feed the centrate balancing tank. The pumps run as required to keep the level in the buffer tank at a low set value.

Connection points for an anti-foam system are provided on both the centrate lines from the centrifuges and on the pump mixer line for the centrate buffer tank.

The centrifuges, centrate buffer tank and centrate balancing tank are enclosed and connected to the OCU.

Liquor Treatment Plant

The centrate from the thickening and dewatering centrifuges is treated within the Liquor Treatment Plant (LTP) and the treated centrate is then returned to the WwTW flow to full treatment. The LTP has a maximum capacity of ~50m^3/hr.

The LTP is designed to nitrify the ammonia found in the digested centrate such that the addition of the centrate returned to the WwTW flow can be effectively treated. The LTP is a package plant, consisting of the following two components:

- Amtreat activated sludge reactor; and
- Settlement tank (including scraper).

The Amtreat reactor has an anoxic zone in the centre with a recirculation pump for just that zone, and an aerated zone around the edge using a dissolved oxygen (DO) setpoint to modulate the air blowers. The centrate is then fed to the settlement tank via a stilling tube to allow fast settling Returned Activated Sludge (RAS) to return before settlement. The settlement tank has a pumped RAS return to the Amtreat

tank, with a SAS line that can divert surplus back to the screened sludge tank based on a configurable timer. The process has the facility to dose glycol as a carbon feed (although this has not been required) and has caustic dosing for pH correction based on a pH instrument. It also has an electric boiler to maintain optimal temperature for nitrification. The plant achieves in excess of 95% ammonia removal.

6.3. Biogas System

The purpose of the biogas system is to provide (via the gas holder) buffer storage of biogas generated in the digester prior to the gas consumers (CHP engines and boiler), and to treat the biogas to remove contaminants which may otherwise compromise the performance of the gas consumers or their ability to meet the required emissions targets.

Biogas produced by the anaerobic digester is discharged under pressure to a double skinned inflatable gas bag/holder, Photo 11. The gas bag/holder has a 2,216m^3 capacity.

Photo 11: Gas holder

Online monitoring of the biogas is undertaken for CH_4, CO_2, H_2S and flow. The gas holder is used to store biogas and assist in maintaining the working pressure in the gas system.

Condensate traps are provided at various points in the gas pipelines. The condensate is discharged automatically to the site drainage system and is then returned to the WwTW treatment process.

From the gas holder, untreated biogas is transferred under the pressure of the gas holder to the gas conditioning system. The gas conditioning system consists of:

- Dehumidifier – used to remove evaporated moisture from the biogas. The dehumidifier pulls the biogas into the unit through a vent, cools it down rapidly which causes the moisture to condense, and then a fan pushes the dehumidified air back out the unit's ventilation system. The water that is collected from the air is discharged to the site drainage system and is then returned to the WwTW flow to full treatment;
- Gas booster - Gas is drawn from the gas holder and fed to two gas boosters that operate duty/standby. The boosters are located beside the gas holder and boost the pressure for use by the CHP engines and hot water boilers; and

- Carbon filter - to remove siloxanes. The activated carbon systems adsorb silicon oxygen alkanes (siloxanes) which could otherwise cause operational problems due to scale formation during combustion in the CHP engines.

From the gas clean up system, treated biogas is transferred under pressure to the CHP engines. Online monitoring of the biogas is provided to monitor CH_4, CO_2, O_2, H_2S, temperature and flow prior to the engines (this is for information only and to monitor performance of the assets).

Flare Stack

It is also possible to flare off biogas during periods when biogas production exceeds biogas use capacity (e.g. during maintenance activities) or during periods of poor gas quality (e.g. during start-up of the plant). Flaring of biogas is achieved via the waste gas burner/flare stack which receives biogas directly from the gas holder.

Boiler Plant

The purpose of the boiler is to produce steam to match the steam demand of the TH plant. The dual fuel boiler raises steam via heat from the CHP engines exhaust and by burning biogas or gas oil. The boiler is currently running on gas oil as the CHP engines are utilising all biogas produced at the installation.

CHP Plant

The primary purpose of the CHP engines is to produce electricity from the remaining biogas once the demands of the boiler to produce steam for the TH plant has been met.

There are two CHP engines (duty/assist), both engines are Jenbacher models. Exhaust heat (high grade heat) from the CHP engines flows to the boiler where it is used to generate steam. Low grade heat is recovered from the jacket and the first stage of the after cooler on each engine to preheat the boiler feed to hot well. The low grade heat recovered is also used to pre-heat the liquor treatment plant influent.

Photo 12 shows the THP boiler building and one of the containerised CHP engines.

Photo 12: THP boiler and CHP engine

The emissions from the CHP engines were modelled in 2015 and this resulted in a stack height of ~35m in order to ensure that both the long and short term process contributions were insignificant for all parameters. Photo 13 shows the CHP combined stack.

Photo 13: CHP stack

Gas production rates are measured via gas flowmeters; and organic loading is assessed based on the composition of raw digested sludge which is monitored via instrumentation (Metso) and affirmed by regular lab analysis. The calculated digester feed rate is built into the Hazard and Critical Control Point (HACCP) Plan and Biosolids Assurance Scheme (BAS) plans and feed rates are not exceeded to ensure organic loading is controlled.

Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves on gassing tanks (see Section 6.4) or leaks in gas pipework e.g. around flanges. Leak detection for biogas is not currently undertaken unless a fault is suspected. However, a Leak Detection and Repair (LDAR) Plan (Attachment 6) Site Specific Instruction (SSI) has been developed for the site which is included with this application. Assets (such as the digesters, gas holder, PVRV's, CHP engines, boilers and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis.

6.4. Pressure Vacuum Relief Valves (PVRVs)

PVRV's are installed on the digester and the gas holder. PVRVs are calibrated, serviced and installed by a trusted competent/specialist contractor (Qualtech). The PVRVs only operate when the pressures within the system occasionally exceed a set value and this value is set at a level whereby the PVRVs will be able to reduce the excess pressure prior to any critical pressure point being exceeded. The size and number of PVRVs for each vessel is based upon design criteria, taking into account system pressure and biogas

volumes. PVRVs at Leigh WwTW are set to operate on the digesters at 23mb and on the gas holder at 23mb, as per the design criteria.

All PVRV's are installed in accordance with the current Asset Standards which consider current industry best practice. We note that BS EN ISO 28300-2008 is relevant to usage in the petrochemical industry and we consider the current standards, including compliance with IGEM standards, are appropriate for the operating conditions.

PVRVs are installed with wildlife cages to prevent nesting birds; and frost protection measures are not considered necessary due to the normal operating temperature of the biogas, i.e. 30 – 38^{o}C. The condition and performance of the PVRVs will be monitored via a 2-yearly service and calibration programme carried out by a specialist contractor in accordance with design specifications; and regular site tours by operational staff which include inspection of the PVRVs.

In the event of an overtopping or foaming event, the digester will be dosed with antifoam (at a rate of 2l/hr) to inhibit foam generation. Once foam levels subside, the PVRVs will be cleaned down and inspected for debris blocking the sealing plate or protective cage, and checked to ensure the PVRV seal is operating correctly. If there is any suspicion that the integrity of the PVRV has been affected, then service and calibration by the specialist contractor will be arranged.

Any releases from PVRVs (or foaming events) observed will be recorded in the site diary, along with any escalations or remedial actions taken.

There is no requirement to monitor emissions from the PVRVs as they are a safety critical system that do not operate routinely and, when they do operate, are only open for a very limited period of time; however, the volume of gas released can be estimated based on measured gas generation rates at the time of PVRV operation.

The PVRVs will be checked for fugitive biogas leaks on an annual basis with an optical gas imaging camera as part of the site LDAR Plan (Attachment 6).

6.5. Process Controls

The site makes extensive use of SCADA technology, which allows plant operations personnel to monitor, control and record the status and performance of key equipment in the various plant areas. The system also provides alarms in the event of an equipment failure.

The monitoring of digester key process parameters and biogas key process parameters is summarised in Table 6.5.1 below. The digestate batch monitoring measures are summarised in Table 6.5.2 below.

Table 6.5.1: Summary of Process Monitoring

Parameter	Frequency of measurement	Point of measurement	System of measurement
pH	Weekly	Sample taken (digester feed)	Lab analysis
Alkalinity	Weekly	Sample taken (digester feed)	Lab analysis
Temperature - Digester	Continuous	Temperature probe within digester	SCADA
Temperature - THP	Continuous	Temperature probe within plant vessel	SCADA
Volatile fatty acids concentration	Weekly	Sample taken (digester)	Lab analysis
Ammonia	Weekly	Sample taken (digester)	Lab analysis
Hydraulic loading rate – THP Batch Rate	Continuous	Digester Feed	SCADA
Organic loading rate	Monthly	Calculation from lab analysis and SCADA data	Calculation from lab analysis and SCADA data
Liquid foam levels	Continuous	Level probe	SCADA
Flow	Continuous	Flow meter	SCADA
Methane	Continuous	Gas meter	SCADA
CO_2	Continuous	Gas meter	SCADA
Hydrogen Sulphide	Continuous	H_2S analyser	SCADA
Pressure	Continuous	Pressure Transducer	SCADA

Table 6.5.2: Digestate Batch Monitoring

Parameter	Frequency of measurement	Point of measurement	System of measurement
Volatile fatty acids	Approximately twice per week	Sample taken (digestate)	Lab analysis
Ammonia	Approximately twice per week	Sample taken (digestate)	Lab analysis

Process control monitoring is also used to assess tank and sludge pipework integrity e.g. comparison of flow meters (where present) throughout the system to identify any losses. Flow readings are displayed and monitored continuously via the site SCADA system.

The sludge digestion process is operated under a HACCP Plan which sets out operating conditions, critical control points within the process and sampling requirements. It also sets out a corrective action plan in the event of a critical control point breach. The HACCP sets out the process to be taken in the event of a breach of a critical control point. Examples of site specific corrective actions are provided in Table 6.5.3.

Several Site Specific Instructions (SSI) (such as the Digestion and Biogas Emergency Plan and the Process Loss Contingency Plan) are also contained within the overall environmental management system for the site. If normal operating parameters are not met, then suitable actions are undertaken in accordance with the relevant SOPs.

Table 6.5.3: Corrective Actions in the Event of a Critical Control Point Breach

Local Action Plan Assumption 1: Failure to Meet Critical Control Point Parameter (HACCP) (Hazard Analysis Critical Control Point)
• Check that Thermal Hydrolysis Plant was operational, interrogate SCADA trends at the time of sampling • Check that digestion retention time is 12 days or greater based of digester feed flow calculation • Stop all sludge cake movements from site by informing the Agriculture Advisors or the Biosolids Technical Officer • Inform Area Production Manager, Production Manager and Production Engineer
Local Action Plan Assumption 2: Failure to meet six Log Kill or, a Maximum Allowable Concentration (MAC) of 1,000 E. coli/gram dry solids and be free from Salmonella spp before Disposal to Land
• Stop all sludge cake movements from site by informing the Agriculture Advisors or the Biosolids Technical Officer • Inform Area Production Manager and Production Manager • Sample sludge cake and send for analysis until it becomes compliant • Segregate the cake by placing it into daily piles and send daily samples for analysis • Ensure Thermal Hydrolysis Plant is HACCP compliant (pressure, retention) (follow assumption 1) • Check that digestion retention time is 12 days or greater • Process controller to complete Leigh WwTW tick sheet for audit trial in case of HACCP Failure

6.6. Containment and Drainage

The sludge storage/treatment tanks, their construction details and capacity are summarised in Table 6.6.1.

***Table 6.6.1*: Sludge Storage/Treatment Tank Construction and Capacities**

Tank Name	Construction	Tank Emplacement	Year of Installation	Tank Capacity
Screened sludge tank	Glass fused to steel	Wholly above ground. Enclosed.	2015	948m^3
Thickened sludge cake silo	Glass coated steel	Wholly above ground. Enclosed.	2015	454m^3
Centrate buffer tank (thickening centrifuges)	Glass reinforced plastic	Wholly above ground. Enclosed.	2015	18m^3
THP reactor vessels (x 4 – each 1.7m^3)	Stainless steel	Wholly above ground. Enclosed.	2015	6.8m^3
Digester	Glass fused to steel	Wholly above ground. Enclosed.	2015	3,264m^3

Tank Name	Construction	Tank Emplacement	Year of Installation	Tank Capacity
Degassing tank	Fibreglass	Wholly above ground. Enclosed.	2015	87m^3
Digested sludge tank	Glass fused to steel	Wholly above ground. Enclosed.	2015	757m^3
Digested centrate buffer tank (dewatering centrifuges)	Glass reinforced plastic	Wholly above ground. Enclosed.	2015	18m^3
Centrate balancing tank (dewatering centrifuges)	Glass fused to steel	Wholly above ground. Enclosed.	2015	1,500m^3
Liquor treatment plant (Amtreat activated sludge reactor)	Concrete base with circular steel panelled tank	Wholly above ground. Enclosed.	2015	~3,800m^3
Liquor treatment plant settlement tank	Concrete base with circular steel panelled tank	Wholly above ground. Enclosed.	2015	~330m^3
Total Storage Capacity				**11,182.8m^3**

All above ground and below ground tanks and pipework related to the sludge treatment process[4] are constructed of suitable materials, in accordance with UUW asset standards, to ensure longevity and minimise the risks of failure/leaks.

The site is predominantly hard standing with all tanks sat on an impermeable surface with drains to the surrounding drainage channels, see Photo 14.

The majority of sludge storage tanks do not have secondary containment and rely on tertiary containment provided by the site drainage system. The surface water drains provide a 'self-contained' system, i.e. all drains on site are connected to private drainage leading to the WwTW treatment process. All sludge storage assets (except the site drainage pumping station and treated liquor pumping station) are fully above ground tanks, which are sited on concrete bases with kerbing and are constructed of either steel or glass fused to steel. The tanks are approximately 8 years old. An external visual inspection by Stantec UK Limited in 2021 identified no signs of wear of any of these tanks (other than slight weathering on the thickening centrate buffer tank, dewatering centrate buffer tank and leachate/liquor treatment reactor). A site surfacing plan is provided at Appendix J.

UUW commissioned Stantec Limited to undertake an assessment of the potential environmental risks associated with a loss of containment from process tanks at the site. The assessment was undertaken using the Anaerobic Digestion & Bioresources Association (ADBA) Risk Assessment Tool, which is based on CIRIA 736: Containment systems for the prevention of pollution. The ADBA risk assessment was used to inform hydraulic spill modelling undertaken for the site. A 2D model of the Leigh site was constructed in InfoWorks ICM to assess the impact of failure or loss of containment on site. Use of the 2D hydraulic model allows the failure of a containment vessel to be represented, including the subsequent overland flow and ponding of released flow. A copy of the Stantec Secondary Containment Modelling Assessment Report is provided with this application (already supplied).

[4] Which also includes the polyelectrolyte mixing and storage tanks.

Results from the simulations indicate that the spilled flows from these tanks could reach receptors, as detailed in the Stantec report. High-level containment solutions for each critical asset have therefore been developed to meet the requirements set out in CIRIA c736. The proposed mitigation measures to be installed and timescales for installation are detailed in the Leigh BAT Improvement Programme document (Attachment 1) submitted with this application. Solution modelling has been completed on all tanks to show the simulated flood extents and the depths of the settled sludge with the proposed mitigation measures in place. The modelling has confirmed that the solutions proposed would provide adequate containment, and thus meet the requirements under BAT conclusion 19.

The existing site drainage and any new connections associated with the sacrificial areas within the permit boundary will include locations for isolation (or multiple points of isolation) of the system in the event of a catastrophic failure. The location and full solution will be determined during detailed design and will follow the principles identified in Section 11.2.1 and Figure 11.1 of CIRIA 736 guidance.

In the interim period, site inspection tours of the impermeable surface, storage tanks and drainage system will be carried out on a daily basis by site-based staff and monthly by the site's ERA. These tours will include visual inspection of the site drains to ensure they are working as expected. Once the proposed secondary containment measures are in place, the site inspection tours will be extended to include a visual check of these also.

A full assessment of the site drainage system utilising CCTV survey was completed in Autumn 2021. Regular CCTV inspections will also be carried out (every 5 years) on the drainage systems (next one due Autumn 2026). If any issues or concerns are identified, they will be logged on the corporate action tracker for prompt remediation. Process control monitoring is also used to assess tank and sludge pipework integrity e.g. comparison of flow meters (where present) throughout the system to identify any losses. Flow readings are displayed and monitored continuously via the site SCADA system. A site drainage plan is provided at Appendix I.

Photo 14: Impermeable surface and drainage around tanks

6.7. Monitoring and Maintenance

The site operates under an EMS manual detailing the Standard Operating Procedures (SOP's) and Site-Specific Instructions (SSI's) applicable to each process. These instructions have been designed to ensure

safe and effective operation and to minimise known hazards from the installation and include procedures for maintenance, training and accident response.

The Production Manager reviews the EMS for the installation and arranges the necessary updates to include the operations, inspection and maintenance of the plant. The Production Manager also arranges staffing resources and training for operation, monitoring and maintenance of the plant.

All scheduled maintenance will be set up on the Mobile Asset Resource Scheduling (MARS) and all proactive and reactive maintenance undertaken will be recorded on MARS against the requirements of the plan.

Equipment and pipework at site are installed in accordance with UUW asset standards to ensure reliability. The UUW standards are based on industry best practice and are regularly reviewed by technical specialists within the business. Assets are also subject to regular inspections and defect management via UUW's statutory maintenance team, which includes checking for corrosion and the general condition of pipework and equipment. In addition, site inspection tours are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Advisor (ERA). These tours include tank level monitoring, visual inspection of asset integrity, where possible, and general ground conditions. If any evidence of leaks or ground contamination is seen further investigations or remedial actions will be instigated immediately.

Critical parts and chemicals are available in the event of equipment failure. Stocks are counted biannually on site, and on a cycle counting basis at the central stores. The central stores is the default storage location for all spares and is a third party warehouse. All counts are held in SAP, a resource planning software system used across UUW activities. This same SAP system links stock movements to work instructions for the site and reorders via the Purchasing team. Chemicals stocks are managed through procurement framework agreements with suppliers and a quantity is stored on site which may be used in an emergency.

6.8. Storage of Hazardous Substances

Raw hazardous substances are used and stored at the site. Table 6.8.1 sets out the risk assessment of hazardous substances for Leigh WwTW.

Table 6.8.1: Hazardous Substances Risk Assessment

Hazardous Substance	Capable of Causing Pollution?	Maximum volume stored	Pollution Prevention Measures Assessment	Risk of Soil & Groundwater Contamination
Gas oil (diesel or kerosene) – used as a back-up fuel supply.	Y	$5m^3$	Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. Situated on impermeable concrete that is curbed and any loss of containment collect by site drainage - drained to the WwTW flow to full treatment via the site's sealed drainage system.	Low

Hazardous Substance	Capable of Causing Pollution?	Maximum volume stored	Pollution Prevention Measures Assessment	Risk of Soil & Groundwater Contamination
Lubricating oil – clean oil for CHP engine maintenance.	Y	4.5m^3	Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. Situated on impermeable concrete that is curbed and any loss of containment collect by site drainage - drained to the WwTW flow to full treatment via the site's sealed drainage system.	Low
Waste lubricating oil – arising from CHP engine maintenance.	Y	4.5m^3	Stored in a double skinned steel tank that is fully compliant with The Control of Pollution (Oil Storage) (England) Regulations 2001. Situated on impermeable concrete that is curbed and any loss of containment collect by site drainage - drained to the WwTW flow to full treatment via the site's sealed drainage system.	Low
Boiler water treatment (Hydrex 1368)	Y	0.25m^3	25L plastic containers stored on a spill pallet within the boiler house.	Low
Anti-corrosives – used in the heat exchangers	Y	10m^3	Situated in concrete bund to contain 110% of tank volume.	Very low as no pathway
Sodium hydroxide – used in the liquor treatment plant	Y	10m^3	Situated in concrete bund to contain 110% of tank volume.	Very low as no pathway
Note: Both polyelectrolyte and anti-foam were assessed and determined to be non-hazardous substances.				

6.9. Process Emissions

There are a number of emission points from the sludge treatment process. The location of all the emission points are shown on the figures included in Appendix F.

Table 6.9.1 sets out the inventory of wastewater and waste gas stream emissions from the sludge treatment process, in line with BAT 3 requirements. Wastewater streams at the site consist of:

- Gas condensate (from the CHP engines, boiler plant and biogas lines) - condensate pots are strategically placed in the biogas pipework systems to collect water that condenses from the biogas. The condensate comprises water with trace components of acid gases. Condensate is

automatically discharged from the collection pots to the site's surface water drainage system for return to the WwTW inlet for treatment.

- Boiler blowdown - the steam boiler periodically releases blowdown water into the surface water drainage system for return to the WwTW. Boiler blowdown will contain dissolved solids and may contain traces of the boiler treatment chemicals used to correct the hardness and pH of the water.
- Centrate (from the centrifuges) - centrate is an organic nutrient-rich watery effluent. The centrate contains elevated levels of ammonia, nitrogen and phosphorus, and is typically characterised by a BOD up to approximately 6,030mg/l (thickening centrifuges) and 2,420mg/l (dewatering centrifuges). Centrate from the thickening centrifuges is piped to a centrate buffer tank before being piped to the head of the works for biological treatment. Centrate from the dewatering centrifuges is piped to a centrate buffer tank and centrate balancing tank before being sent for treatment in a liquor treatment plant then piped to the head of the works for further biological treatment.
- OCU wastewater - liquors from the odour abatement plant biotrickling filter are released into a surface water drain for return to the head of the WwTW.
- Cake storage building wastewater - digested sludge is stored in a concrete surfaced covered cake bay. Although the sludge is up to 30% dry solids content, there is still some leachate produced during storage which drains to a surface water catchment drain for return to the head of the WwTW. The leachate will be nutrient rich containing elevated levels of ammonia, nitrogen and phosphorus.
- Surface water drainage – surface water run off should be clean and uncontaminated but carries a risk of contamination arising from any spillages of sludge. All surface water drainage is returned to the head of the WwTW as part of the site's containment strategy.

Waste gas streams at the site consist of:

- Biogas combustion exhaust (from the CHP engines stack and flare) - biogas flow and quality (methane, carbon dioxide and hydrogen sulphide) from the primary digesters is continuously monitored and displayed on the site SCADA system.
- Combustion exhaust (from the boiler) - the boiler is fuelled by gas oil and as such the emissions will principally comprise carbon dioxide, carbon monoxide and oxides of nitrogen. The boilers can run on biogas but gas oil is the primary fuel.
- Biogas releases from PVRVs (digester and gas holder) - the PVRVs are safety devices and as such only operate when the pressure set points are triggered, as described in Section 5.4. Biogas composition is monitored continuously for methane and hydrogen sulphide, as detailed in Section 5.5.
- Treated foul air (from the odour abatement plant) – hydrogen sulphide and ammonia readings will be used to characterise emissions from the OCU.

Table 6.9.1: Inventory of Wastewater and Waste Gas Streams

Nature	Source	Typical Composition	Variability	Control Measures
Gaseous Streams				
Biogas combustion	CHP engines stack (A1 & A2)	Combustion products: NO_2 - <190mg/m^3 SO_2 - <60 mg/m^3 (after 1st January 2030) CO - 519 mg/m^3 Total VOCs - 371 mg/m^3 Note: the NO_x and SO_2 emission concentrations are the MCPD limits Note: The CO and TVOC emission concentrations were derived from the EA's guidance 'Guidance for monitoring landfill gas engine emissions' (EA, 2010). Refer to the Air Emissions Impact Assessment Report (Appendix H).	NO_2 – 118.7 to 171.8mg/m^3 O_2 – 7.35 to 8.07%v/v Note: Results from 2021 monitoring	Annual emissions monitoring. CHP maintenance in accordance with engine manufacturers recommended frequency. Biogas is passed through carbon filter unit to remove siloxanes and other VOCs prior to flow to the CHP engine.
Gas oil combustion	Boiler stack (A3)	Combustion products: NO_2 - 250 mg/m^3 (200 after 1st January 2030) SO_2 - <200 mg/m^3 CO - 100 mg/m^3 TVOCs -1,126 mg/m^3 Note: the NO_2 emission concentration is the MCPD limit for gas oil Note: the SO_2 emission concentration is the MCPD limit for the boiler running on biogas Note: The CO ELV was obtained from Defra's Process Guidance Note 1/3,'Statutory Guidance for Boilers and Furnaces 20-50MW thermal input' (Defra, 2012) and the TVOC ELV was derived from the EA guidance 'Guidance for monitoring landfill gas engine emissions', (EA, 2010). Refer to the Air Emissions Impact Assessment Report (Appendix H).	NO_2, CO, Total VOCs Emissions not tested	Boiler maintenance in accordance with engine manufacturers recommended frequency.
Biogas combustion	Flare (A5)	Combustion products: NO_x, CO, VOCs NOx <150 mg/m^3 CO <50 mg/m^3 Total VOCs <10 mg/m^3	Emissions not tested	Running time monitored and does not exceed more than 10% of operational hours. Inspected annually, including mechanical and safety systems.

Nature	Source	Typical Composition	Variability	Control Measures
		Note: ELVs from 'Guidance for monitoring enclosed landfill gas flares' LFTGN05 v2 2010		
Biogas	Primary digester PVRV (A6)	CH_4 - 62% CO_2 - 38%	CH_4 - 60–65% CO_2 – 35-40% H_2S - <25 – 125ppm	Inspected and calibrated on a periodic basis to ensure they are operating at the correct set points. Gas quality (CH_4, CO_2) and flow rate are continuously monitored and displayed on the SCADA system. DSEAR zoning.
Biogas	Gas holder PVRV (A7)	CH_4 - 62% CO_2 - 38%	CH_4 - 60–65% CO_2 – 35-40% H_2S - <25 – 125ppm	Inspected and calibrated on a periodic basis to ensure they are operating at the correct set points. Gas quality (CH_4, CO_2) and flow rate are continuously monitored and displayed on the SCADA system. DSEAR zoning.
Foul air	Sludge treatment facility OCU (A4)	H_2S, NH_4, VOCs	H_2S – 20 to 300ppb	Hydrogen sulphide is continuously monitored and displayed on the SCADA system. Monitoring of the stack will be undertaken on a six monthly basis for hydrogen sulphide and ammonia in line with BAT. Daily odour tours by site staff.
Liquid Streams				
Gas condensate	Condensate pots and drain valves on the biogas lines	Mildly acidic, organic content No testing available	Not known	None required – process controls in place for biogas quality.
Blowdown water	Steam boiler	Mildly alkaline TDS typically 3,000mg/l COD	TDS Not known	Daily testing of Total Dissolved Solids from the hot well and boiler. The boiler has an auto blowdown valve, which is operated manually daily to test and there's also an automatic valve which operates based on the TDS reading from the probe.

Nature	Source	Typical Composition	Variability	Control Measures
Wastewater	OCU biotrickling filter	Mildly acidic COD, BOD, NH_3 No testing available	Not known	No control measures in place currently.
Centrate	Thickening centrifuges	COD, BOD, Ammonia as N, pH, suspended solids Ammonia as N – 119mg/l COD – 3,315mg/l BOD – 1,751mg/l Suspended Solids – 725mg/l pH - 6 *Average results over 6 years of data	Ammonia as N – 0.9- 1,040mg/l COD – 632 – 13,700mg/l BOD – 168 – 6,030mg/l Suspended Solids – 55 – 6,760mg/l pH – 5.1 – 8.56mg/l *Over 200 results in period of 2016 to April 2022	Centrate is stored in a centrate buffer tank before treatment in the liquor treatment plant. Treated centrate is then returned to the WwTW at a rate of approximately 29 to 40m^3/hr. The main parameter that requires control is the loading of ammonia to the works.
Centrate	Dewatering centrifuges	COD, BOD, Ammonia as N, pH, suspended solids Ammonia as N – 947mg/l COD – 2,009mg/l BOD – 380mg/l Suspended Solids – 262mg/l pH – 8.4 *Average results over 9 months of data in 2016	Ammonia as N – 0.9- 2,390mg/l COD – 109 – 9,980mg/l BOD – 2 – 2,196mg/l Suspended Solids – 28 – 9,470mg/l pH – 5.1 – 8.8mg/l *Over 250 results over 9 months period in 2016	Centrate is pumped to a centrate buffer tank before treatment in the liquor treatment plant. Treated centrate is then returned to the WwTW at a rate of approximately 29 to 40m^3/hr. The centrate was sampled and tested on a daily basis for a 9 month period. The main parameter that requires control is the loading of ammonia to the works.
Centrate	Liquor treatment plant	COD, BOD, Ammonia as N, Phosphorous, pH, Total Nitrogen, suspended solids **Inlet*:** Ammonia as N – 306mg/l COD – 2,898mg/l BOD – 1,182mg/l Suspended Solids – 750mg/l Total Nitrogen – 413mg/l	**Inlet*:** Ammonia as N – 0.9- 615mg/l COD – 120 – 6,850mg/l BOD – 28 – 2,420mg/l Suspended Solids – 26 – 2,860mg/l Total Nitrogen – 87 – 787mg/l pH – 5.91 – 7.62	The liquor treatment plant returns treated centrate to the WwTW at a rate of approximately 29 to 40m^3/hr. The centrate is sampled and tested on at least a weekly basis. The main parameter that requires control is the loading of ammonia to the works.

Nature	Source	Typical Composition	Variability	Control Measures
		pH – 7.1 Phosphorous – 48mg/l **Outlet**:** Ammonia as N – 5mg/l COD – 309mg/l BOD – 29mg/l Suspended Solids – 193mg/l pH – 7.4 Total Nitrogen – 74mg/l Phosphorous – 6.3mg/l *Average results over 12 month period (based on between 40 and 100 results)	Phosphorous – 0.6 - 164mg/l **Outlet**:** Ammonia as N – 0.9- 46mg/l COD – 93 – 3,990mg/l BOD – 1.6 – 225mg/l Suspended Solids – 26 – 4,940mg/l pH – 7 – 7.9 Total Nitrogen – 2.5 – 187mg/l Phosphorous – 0.3 - 140mg/l * Inlet – approximately once per week – data for Apr 21 to Apr 22 **Outlet – approximately 6 times per month – data from Apr 21 to Apr 22	
Leachate	Cake storage building	COD, BOD, NH_3 No testing available	Not known	Quality controls for digested sludge. Run-off directed to surface water drainage for return to head of works for treatment.
Surface water	Site drainage	COD, BOD, NH_3, SS No testing available	Not known	Emergency and Spill Response Procedures to control any unplanned discharges to the drainage system.

Table 6.9.2 summarises the emission points sources to air and water, associated monitoring points and the monitoring schedule.

Monitoring for emissions to air has been assessed in relation to the BAT 8 requirements for biological waste treatment processes and BAT 10 for odour emissions. Combustion emissions from the CHP and boilers have been assessed in relation to the MCPD and specified generator monitoring requirements.

The proposed monitoring for wastewater returns to the WwTW inlet has been reviewed against BAT 6 and BAT 7 requirements. On direction from the EA, monitoring requirements have also been assessed with reference to EA Guidance on discharges to surface waters 'Surface water pollution risk assessment for your

environmental permit'; Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk). This guidance requires operators to evaluate and assess any hazardous chemicals and elements to be released into surface water. No monitoring has been undertaken to date to investigate the presence of hazardous substances in the wastewater returns.

As the final effluent from Leigh WwTW discharges into the River Glaze/Pennington Brook, testing for the hazardous and priority substances listed for fresh waters will be undertaken. There are 60 priority hazardous pollutants and 96 specific pollutants listed in the tables contained in the EA Guidance 'Surface water pollution risk assessment for your environmental permit'. The total number of parameters, excluding duplicates between the two lists, is 156. UUW is committed to undertaking full characterisation of the wastewater streams to meet BAT 3, however we will assess whether it is possible to screen out any of these parameters based on the character of the wastewater coming into the works and, if so, provide a justification to the EA during the permit determination period for any reduction in the list of parameters to be analysed.

Monitoring for hazardous and priority substances will be undertaken at location T1 (the point at which the combined effluent streams leave the installation before being returned to the WwTW inlet (Grid reference SJ 66086 99222)) on 12 occasions and the results will be screened against relevant environmental quality standards detailed in the EA guidance. Laboratory analysis will be undertaken to MCERTS or UKAS ISO17025 standards for determinands where available. However, it should be noted that only around 10% of the 156 hazardous and priority substances can be analysed in-house at UUWs laboratories and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate matrix and potentially may not be able to analyse at all.

Monitoring for wastewater returns to the WwTW inlet has also been reviewed against BAT 6 and BAT 7 requirements.

BAT 6 specifies that 'for relevant emissions to water, as identified by the inventory of wastewater streams (see BAT 3), BAT is to monitor key process parameters (e.g. waste water flow, pH, temperature, conductivity, COD) at key locations (e.g. at the inlet and/or outlet of the pre-treatment, at the inlet to the final treatment, at the point where the emission leaves the installation)'.

BAT 7. States: BAT is to monitor emissions to water with at least the defined frequency, and in accordance with EN standards. The proposed BAT monitoring requirements have been compared with those for biological treatment of waste. The EA has directed that 'treatment of water-based liquid waste' BAT AELs are also appropriate.

Based on the BAT requirements, monitoring for the following parameters is proposed at emission points W7 and W8 to characterise the centrate and cake storage leachate wastewater streams, at the frequency set out in Table 6.9.2:

- pH;
- Total nitrogen;
- Ammonia;

- Chemical oxygen demand (COD);
- Total phosphorous;
- Suspended solids;
- Hydrocarbon oil index;
- Benzene, toluene, ethylbenzene, xylene (BTEX);
- Free cyanide;
- Halogens (AOX);
- Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI));
- PFOS and PFOA.

Monitoring for a more limited suite of parameters is proposed to characterise the biogas condensate, OCU wastewater and site drainage/surface run-off at emission points W1, W3 and W9 as these are smaller volume wastewater streams and/or have less potential for contaminants such as metals to be present. Monitoring for the following parameters is proposed at the frequency set out in Table 6.9.2:

- pH;
- Total nitrogen;
- COD;
- Total phosphorous;
- Suspended solids;
- Ammonia; and
- Oil and grease (visual assessment only)

Monitoring of the boiler blowdown at emission point W2 is proposed for the following limited suite of parameters, given the small volume of water and low potential for contamination (refer to Table 6.9.2 for frequency):

- pH;
- COD;
- Suspended solids; and
- Oil and grease (visual assessment only)

Monitoring from locations W4 to W6 has not been proposed as sampling from W7 is considered sufficiently representative of liquor returns.

Where monitoring is proposed, a minimum of 12 samples will be taken in accordance with the minimum sampling requirement for screening in the EAs 'surface water pollution risk assessment' guidance.

Monitoring of the wastewater returns to the head of the works is summarised in Table 6.9.2 below.

Table 6.9.2: Emission Point Sources & Monitoring

Source	Emission Point	Current Monitoring	Proposed Monitoring	Frequency
Gaseous Streams				
Biogas combustion	CHP engine stack (A1 and A2)	Annually for NO_2 and O_2	Sulphur dioxide Oxides of nitrogen Carbon monoxide Total VOCs	Annually
Gas oil combustion	Boiler stack (A3)	None	Oxides of nitrogen	Annually
Foul air	Sludge treatment facility OCU (A4)	H_2S continuously (to continue)	Hydrogen sulphide Ammonia Odour concentration Total volatile organic compounds (TVOC) and HCl Odour tours by site staff	Six monthly Six monthly 2 rounds 1 round 1 round Daily
Biogas combustion	Flare stack (A5)	None	Oxides of nitrogen Carbon monoxide Total VOCs	Running time monitored; emissions only tested in the event that running time exceeds more than 10% of operational hours
Biogas	Primary Digester PVRV (A6)	None	None	n/a
Biogas	Gas holder PVRV (A7)	None	None	n/a
Liquid Streams				
Biogas condensate	W1 – Condensate pots	None	pH, Total nitrogen, COD, total phosphorous, suspended solids, ammonia and oil & grease (visual only)	Monthly – 12 samples
Steam boiler	W2 – Boiler blowdown	Daily for TDS	pH, COD, suspended solids and oil & grease (visual only)	Monthly – 12 samples
OCU biotrickling filter	W3 - Wastewater	None	pH, Total nitrogen, COD, total phosphorous, suspended solids,	Monthly – 12 samples

Source	Emission Point	Current Monitoring	Proposed Monitoring	Frequency
			ammonia and oil & grease (visual only)	
Thickening centrifuges	W4 - Centrate	No longer undertaken. Formerly monitored for Ammonia, COD, BOD, suspended solids and pH	None Samples to be taken from the outlet of the liquor treatment plant (W7).	n/a
Dewatering centrifuges	W5 - Centrate	Weekly testing for: COD, BOD, Ammonia as N, pH and suspended solids	None Samples to be taken from the outlet of the liquor treatment plant (W7).	n/a
Inlet of liquor treatment plant	W6 - Centrate	Weekly testing for: COD, BOD, Ammonia as N, pH, Total Nitrogen, Phosphorous and suspended solids	None Samples to be taken from the outlet of the liquor treatment plant (W7).	n/a
Outlet of liquor treatment plant	W7 - Centrate	Weekly testing for: COD, BOD, Ammonia as N, pH, Total nitrogen, Phosphorous and suspended solids	To further characterise the centrate, monthly testing over a 12 month period for: • pH; • Total nitrogen; • COD; • Total phosphorous; • Suspended solids; • Ammonia; • Hydrocarbon oil index; • BTEX; • Free cyanide; • Halogens; • Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)); • PFOS and PFOA. Samples to be taken from the outlet of the liquor treatment plant (W7).	Monthly
Cake storage building	W8 – Leachate	None	• pH; • Total nitrogen; • COD; • Total phosphorous;	Monthly – 12 samples

Source	Emission Point	Current Monitoring	Proposed Monitoring	Frequency
			• Suspended solids; • Ammonia; • Hydrocarbon oil index; • BTEX; • Free cyanide; • Halogens; • Metals (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg, Mn, Cr(VI)); • PFOS and PFOA.	
Site drainage	W9 - Site drainage	None	pH, Total nitrogen, COD, total phosphorous, suspended solids, ammonia and oil & grease (visual only)	Monthly – 12 samples
Combined centrate, boiler blowdown, condensate, OCU wastewater, leachate from cake storage building and surface drainage	T1 – Location of return to head of WwTW flow	None	156 hazardous and priority substances as per separate list	Monthly – 12 samples

Monitoring will be carried out in accordance with established process monitoring procedures using appropriate equipment, which will be calibrated to manufacturer's instructions where required. All samples will be collected and stored in an appropriate manner by suitably qualified personnel. All liquid stream analysis is undertaken at UU Scientific Services Lingley Mere Laboratory, which is a United Kingdom Accreditation Services (UKAS) laboratory accredited to ISO/IEC 17025:2017. Wherever possible sampling and analysis is accredited to MCERTS by UKAS (confirmed by the laboratory for Suspended Solids, COD, Total nitrogen and Total phosphorous, with Ammonia as N accredited by flexible scope to MCERTS).

However, it should be noted that only around 10% of the 156 hazardous and priority substances (to be analysed at monitoring location T1) can be analysed in-house at UUWs laboratories (please refer to Appendix M for a copy of UU's UKAS Accreditation Certificate) and initial contact with commercial laboratories has indicated that for some parameters they would not be able to achieve the EQS levels as a limit of detection on a centrate matrix and potentially may not be able to analyse at all.

Where monitoring and/or sampling is undertaken by third party (e.g. gas emissions monitoring from the gas engines) this would be undertaken to similar standards. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory. Suitable measurement ports will be provided to allow access and monitoring of the OCU stack.

7. Odour Control System

7.1. Odour Monitoring and Management

The site has an Odour Management Plan (OMP), which provides the requirements, procedures and actions to be taken in the event of the potential release of odours at Leigh WwTW Sludge Treatment Facility and a copy is included with this application. The objective of the OMP is to provide guidance to all Operations and Maintenance staff regarding practices that will minimise the risk of odour emissions being discharged from the Leigh WwTW Sludge Treatment Facility. The odour control equipment is detailed below.

There is one odour control unit (OCU), Photo 15, that treats the odours from the raw sludge screens, screened sludge tank, sludge thickening centrifuges, thickened sludge cake silo, degassing tank, digested sludge storage tank, dewatering centrifuges, centrate buffer tanks and centrate balancing tank. The odour control system includes two stages of treatment, consisting of two biotrickling filters and a subsequent activated carbon scrubber.

Photo 15: OCU

Odour Technology Selection

The odour control technologies were designed in accordance with UUW's Asset Standard for Odour Control and Removal[5]. A combination of biotrickling filter and activated carbon technologies were chosen for this facility.

[5] Odour Control and Removal Asset Standard, Document Reference 33412

Table 7.1.1 below details the odour abatement technology for the OCU:

Table 7.1.1: Odour Abatement Technologies

Technology Type	Purpose
2 x pumice media biotrickling filter (biofiltration)	Biofilter designed to remove range of compounds including hydrogen sulphide, mercaptans and soluble biodegradable VOCs.
Activated carbon treatment (adsorption)	Carbon media designed to remove wide range of odorous compounds. The use of adsorption/chemisorption downstream of biofiltration provides process security in the event of operational issues with first stage and also provides final stages of treatment.

The design operating parameters and odour removal efficiencies for the OCU at Leigh are detailed in the OMP. The design operating parameters for air flow rate and odour emission concentration were used to conduct odour dispersion modelling on two occasions:

- To determine the type of storage arrangement suitable for the digested sludge cake; and
- To confirm that the emissions of odour from the on-site OCU are below the H4 odour benchmark at sensitive receptors and that the odour control technologies comply with BAT for the treatment process.

In November 2013 an odour modelling report was carried out in relation to where and how sludge cake would be stored on site. The report looked at several options, as a result the preferred solution was a covered but not enclosed cake slab, with modelling showing odour at the vast majority of receptors being below the H4 indicative guidance of 1.5ouE/m^3. A covered but not enclosed cake storage building is in place at Leigh, as shown in Photo 10. The cake storage building is bounded by concrete walls on three sides (north, east and west), plus a roof. Cake is stored below the top of the wall and the prevailing winds are from the south.

A further odour modelling exercise was undertaken in November 2022. Odour dispersion modelling was undertaken using ADMS 5.2.4 software to quantify the odour impacts at relevant sensitive receptor locations, surrounding the site[6] (included with this application as Attachment 3). The dispersion model included the site layout buildings and infrastructure (as appropriate).

For the modelling exercise, emissions of odour from the on-site OCU was assessed against an odour benchmark level of 1.5 ou_E/m^3 at nearby sensitive receptors, which is the H4 odour benchmark for the most offensive odours and the UU Odour Control and Removal Asset Standard (for high sensitivity receptors).

The results indicate that the maximum predicted 1-hour mean (98th percentile) odour concentration at the assessed sensitive receptors is less than 0.2 ou_E/m^3, which is below the 1.5 ou_E/m^3 benchmark.

[6] Odour Impact Assessment, UUW Leigh, Jacobs, September 2022 (Attachment 3)

Table 7.1.2: OCU Operating Parameters and Emission Rates

Emission point	Source	Stack height (m)	Effective stack diameter (m)	Efflux velocity (m/s)	Design air flow rate (m^3/s)	Odour concentration (ou_E/m^3)	Odour release rate (ou_E/s)
A4	OCU 1	15.00	0.39	15.9	1.905	1,000	1904.72

The odour dispersion modelling demonstrates that the design and operation of the OCU at the site is compliant with H4 standards and with the UUW Odour Control and Removal Asset Standard.

The design of the odour control technologies is considered to comply with BAT for the treatment process.

Odour Monitoring

As detailed in Table 6.9.2, odour monitoring will be undertaken from the OCU stack for the following:

- Hydrogen sulphide once every six months; and
- Ammonia once every six months

Total volatile organic compounds (TVOC) and HCl will be monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCL may be added to the bi-annual monitoring schedule. In addition, each stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved. Measurements will be taken at the OCU inlet and outlet.

Suitable measurement ports will be provided to allow access and monitoring of the OCU stack. Emissions monitoring will be carried out by an MCERTS accredited third party laboratory.

In addition, there are H_2S monitors fitted on the OCU inlet, biofilter outlet and the emissions stack. The stack outlet monitor continuously records H_2S emissions in the range 0-1.5ppm. The biofilter monitor records concentrations in the range 0-50ppm and the inlet monitor in the range 0-200ppm. H_2S for the stack emissions is trended in the HMI and is set to alarm at 0.05ppm.

8. Application Form F1 Charges

The application charges consist of:

- New application for an installation - Charge A 1.16.2.1 Non-hazardous waste installation - biological treatment for recovery;
- Liquor treatment plant - Charge A 1.16.2.1 Non-hazardous waste installation - biological treatment for recovery (new repeat, hence 90% fee reduction);
- Habitats Assessment - Charge B 1.19.2;
- Bioaerosol Risk Assessment – Charge B 1.19.5; and
- Odour Management Plan - Charge B 1.19.6.

The total application fee is therefore £18,648.

9. BAT Assessment

9.1. Assessment Against BAT

As this is a waste treatment operation, an assessment of best available techniques (BAT) has been made for the installation against the BAT Conclusions for Waste Treatment provided within Commission Implementing Decision 2018/1147, published on 17th August 2018. The assessment against BAT is presented in Table 9.1.1 below.

An Environmental Risk Assessment for the installation is contained in Section 10 of this document.

Table 9.1.1: Assessment against Indicative BAT Conclusions for Waste Treatment

BAT conclusions for waste treatment reference:		**Treatment of Best Available Technique (BAT)**
BAT 1.	Overall environmental performance	*In order to improve the overall environmental performance, BAT is to implement and adhere to an environmental management system (EMS).* UUW operates the site under a fully certified ISO14001 management system. A copy of the ISO14001 certificate is provided in Appendix B and a management systems summary is provided in Appendix C. A residue management plan is included with this application.
BAT 2.	Waste acceptance techniques	BAT is to use all of the techniques given below. • *Set up and implement waste characterisation and pre-acceptance procedures* - the waste received is produced and treated by the same operator (UUW) (it is either indigenous sludges produced by Leigh WwTW or sludges from other similar WwTW works) and the waste type is well known and controlled. Therefore the applicability of pre-acceptance and acceptance procedures are considered to be very low risk in terms of process safety, occupational safety and environmental impacts. Leigh's Waste Characterisation and Acceptance Procedure SSI (Attachment 8) details that each incoming waste stream will be subject to pre-acceptance checks and records will be retained in electronic format for a minimum of 3 years. Only waste codes EWC 19 08 05 (urban wastewater sludges) and 19 02 06 (sludge from physico/chemical treatment, sewage sludge only) are accepted at the facility. • *Set up and implement waste acceptance procedures* – as above; indigenous sludge is delivered directly to the installation via an underground pipe from the primary settlement tanks to the raw sludge screen. Imported sludge from other WwTW sites arrives at the site via road tanker and is pumped from the tanker off-loading point. • *Set up and implement a waste tracking system and inventory* - refer to BAT 5 for imported sludge. United Utilities Bioresources monitors and tracks all movements of UUW sludges between wastewater treatment works. Movement of sewage sludge is planned and managed via PODFather.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		• *Set up and implement an output quality management system* - treated sludge in the form of digestate cake is recovered to land in accordance with The Sludge (Use in Agriculture) Regulations 1988. • *Ensure waste segregation* – not applicable for incoming waste, only sewage sludge is treated at the installation. Digestate cake (output) found to be non-compliant with the required standards (The Sludge (Use in Agriculture) Regulations 1988) will be sent to a regulated waste transfer station (e.g. Halewood). Non-compliant cake will not be stored at site therefore site-based segregation measures are not required. In this situation, waste imports would be suspended until digestate cake production is back in compliance. • *Ensure waste compatibility prior to mixing or blending of waste* - not applicable, only sewage sludge is treated at the installation. • *Sort incoming solid waste* – not applicable.
BAT 3.	Inventory of waste water and waste gas streams	*In order to facilitate the reduction of emissions to water and air, BAT is to establish and to maintain an inventory of wastewater and waste gas streams, as part of the EMS.* Please see Section 6.9 for an inventory of wastewater and waste gas streams for the installation. The location of all the emission points are shown on the figures included in Appendix F. Routine operation checks and maintenance are undertaken on all relevant assets. The sites discharge consent limits are being met. Sampling and analysis will be carried out in line with BAT 3, as appropriate. Sampling and analysis will be undertaken to MCERTs, or evidence of equivalent standards will be provided.
BAT 4.	Storage of waste	*In order to reduce the environmental risk associated with the storage of waste, BAT is to use techniques to optimise storage locations, provide adequate storage capacity and safely store wastes.* The maximum storage capacity of the tanks is adequate for the process flow and the quantity of waste in the tanks is monitored by level probes connected to PLCs and displayed on the SCADA. All sludge treatment tanks and pipework are enclosed. The only open storage of waste is the screening solids arising from the sludge screen, and digestate cake which has a roof covering. Digestate cake produced on site is carried by enclosed conveyors and deposited in a concrete surfaced and enclosed (on three sides and roofed) cake storage building. The turnaround time for storage of sludge in the cake storage building is typically 1 to 3 days. The cake is transferred onto covered trailers using a telehandler and removed off site for agricultural land spreading. Under normal operations, loading a trailer typically takes approximately 30 minutes, before it is automatically covered and removed from site. Storage duration within trailers prior to removal is typically less than 24 hours.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
BAT 5.	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.* Indigenous sludge is piped directly from the primary settlement tanks to a raw sludge screen within the installation. Imported sludge from other similar WwTW sites arrives at the site via tanker. United Utilities Bioresources is responsible for the movement of all UUW sludges produced. The "PODFather" system is used to plan and manage the movement of UU tankers transporting UUW sludges between wastewater treatment works. POD stands for "Proof of Delivery". The system records all sludge movements, detailing the site it has come from, the volume, the quality (dry solids content) and date and time delivered. These records are all kept electronically and used in the quarterly submissions to the EA as well as the annual reporting to OFWAT. Digestate is removed off site in trailers for agricultural land spreading. The movement of digestate cake is coordinated regionally. A list of potential outlets is maintained and includes suitably regulated storage, enhanced treatment (e.g. lime treatment to increase the scope of onward recovery options); recovery (deposit) and, as a contingency only, disposal facilities (e.g. permitted landfill restoration sites). The availability of potential outlets is constantly reviewed in line with legislative developments and local market changes (e.g. closure of an outlet site).
BAT 6.	Emissions to water	There are no direct emissions to water from the sludge treatment activities. The wastewater streams are returned to the head of the WwTW for full treatment (either directly or after treatment in the liquor treatment plant), before being discharged (indirectly) via the WwTW final effluent discharge into the River Glaze following biological treatment through the WwTW. There is monitoring of these returned wastewater streams for key process parameters, and it should be noted that the WwTW site undertakes regular routine monitoring of final effluent quality and is meeting the discharge consent limits to the River Glaze (NGR SJ 6650 9846). Monitoring of wastewater streams is proposed as detailed in BAT 7 below and Section 6.9 of this document.
BAT 7.	Emissions to water	Additional monitoring is proposed to meet BAT 7 in order to characterise the wastewater streams from the sludge treatment process returned to the wastewater treatment plant. Please refer to Table 4.4.1 (Emissions Monitoring), Table 6.9.2 (Emission Point Sources) and Section 6.9 of this document. Monitoring from the centrate liquor treatment plant outlet will continue as is.
BAT 8.	Emissions to air	*BAT is to monitor channelled emissions to air with at least the frequency given below, and in accordance with EN standards:* • *H_2S – once every six months* • *NH_3 - once every six months* • *Odour concentration – once every six months*

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		The channelled emissions to air i.e. point source emissions are shown on Figure F1 in Appendix F. The only channelled emissions to air from the treatment process, relevant to this BAT requirement, are from the odour control unit (OCU) stack and the pressure vacuum relief valves (PVRVs) on the digester and gas holder. The PVRV on the digester operate on a Duty/Stand-by configuration (with all others operating on a duty only basis) to protect against over/under pressurisation of the vessel. The PVRV's are maintained, monitored, inspected and calibrated on a periodic basis to reduce fugitive emissions (See Section 6.4 for further information). There is no requirement to monitor emissions from the PVRVs as they are a safety critical system that do not operate routinely and, when they do operate, are only open for a very limited period of time. The OCU treats the air using a two-stage process consisting of biotrickling filter and a subsequent activated carbon scrubber. Hydrogen sulphide readings are automatically undertaken on the in-line monitor and are recorded continuously at the OCU to ensure concentrations are below 50ppb. To meet this BAT requirement, monitoring of the OCU will comprise hydrogen sulphide and ammonia monitoring, to be undertaken once every six months. Total volatile organic compounds (TVOC) and HCl will be monitored on one occasion to check for their presence in the emissions from each stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCl may be added to the bi-annual monitoring schedule. In addition, each stack will be sampled for odour concentration on two occasions during the first year of monitoring to validate that the design odour concentration is being achieved. Measurements will be taken at the OCU inlet and outlet. Hydrogen sulphide monitoring will remain continuous as it is used as a surrogate or indicator of odour because it is almost always present under septic conditions. The CHP emissions will be monitored annually in accordance with LFTGN08. The results of the monitoring will be reviewed by the site's ERA and any other relevant staff to check that they are compliant with the relevant emissions limit value. The potential for dust emissions is very low as it is a wet treatment process.
BAT 9.	Emissions to air	Not applicable – there are no treatment processes involving solvents.
BAT 10.	Odour emissions	*BAT is to periodically monitor odour emissions. However, applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.* Odour emissions are monitored in accordance with BAT 8 and the OMP, a copy of which is attached to this application. There is no history of frequent odour complaints at the site and the only recent complaint was unsubstantiated.
BAT 11.	Monitor consumption of	*BAT is to monitor the annual consumption of water, energy and raw materials as well as the annual generation of residues and wastewater, with a frequency of at least once per year.*

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
	water, energy and raw materials	Energy consumption for the WwTW is monitored and tracked via the site environmental dashboard. Potable water consumption for the sludge treatment process is not recorded separately but is relatively small as it is only used for polyelectrolyte make up. The volume of water consumed will recorded based on the use of polyelectrolyte. Raw material use is measured in accordance with Table 4.8.1 to this document and is recorded annually. As part of the permit requirements, UUW will report annual energy consumption and raw material usage to the EA and will conduct periodic reviews to consider where future energy and raw material savings can be delivered. The tonnage of waste screenings is recorded on a monthly basis.
BAT 12.	Odour Management Plan	*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 EMS. The applicability is restricted to cases where an odour nuisance at sensitive receptors is expected and/or has been substantiated.* The works Odour Management Plan is provided with the application and is updated regularly. See also Section 7 and 10.1.
BAT 13.	Odour Management	*In order to prevent or, where that is not practicable, to reduce odour emissions, BAT is to use one or a combination of these techniques:* • *Minimising residence times of (potentially) odorous waste in storage or in open handling systems* – all of the process tanks at the facility are covered and equipment such as centrifuges are enclosed. There are no open systems within the sludge treatment installation. • *Using chemicals to destroy or to reduce the formation of odorous compounds* – this has not been necessary. • *Optimising aerobic treatment* – not applicable.
BAT 14.	Diffuse air emissions	*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 following techniques:* • *minimising the number of potential diffuse emission sources* • *selection and use of high-integrity equipment* • *corrosion prevention* • *containment, collection and treatment of diffuse emissions* • *dampening in dusty areas* • *maintenance* • *cleaning of waste treatment and storage areas* • *leak detection and repair (LDAR) programme* The potential for dust emissions is very low as it is a wet treatment process. Pre-digested sludge is thickened using two centrifuges and digested sludge thickened using two dewatering centrifuges, all housed within buildings.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		Digestate cake produced on site is carried by enclosed conveyors and deposited in a concrete surfaced and enclosed (on three sides and roofed) cake storage building. Cake is stored below the top of the wall and the prevailing winds are from the south. The concrete walls, approximately 3.5m in height, provide protection from wind dispersion. Sludge cake from the storage building is loaded onto trailers via a telehandler. Under normal operations, loading a trailer typically takes approximately 30 minutes before it is automatically covered and removed from site. Storage duration within trailers prior to removal is typically less than 24 hours. Fugitive emissions of biogas may arise from the activation of pressure vacuum relief valves on gassing tanks or leaks in gas pipework e.g. around flanges. There are several pressure vacuum relief valves (PVRVs) and vents on the process tanks. Leak detection for biogas is not currently undertaken unless a fault is suspected. However, an LDAR Site Specific Instruction (SSI) has been developed for the site and is included with this application. Assets (such as the digesters, gas holder, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis. Fugitive odour emissions may arise during normal operations, this is mitigated by directing the air flow through an OCU. Localised odours may arise from the screenings, screened sludge tank, thickened sludge storage tank, digester, de-gassing tank, digested sludge tank, cake storage building, centrate buffer and balancing tanks. Any leaks or spills of sludge that may be a source of odour emissions are cleaned up promptly as part of the spill response procedure. Refer to the fugitive emissions risk assessment in Section 10.2 for further information.
BAT 15.	Flaring	*BAT is to use flaring only for safety reasons or for non-routine operating conditions (e.g. start-ups, shutdowns) by using the correct plant design and by plant management.* The facility has a biogas holder that can hold 2,216m^3 of gas in the event that the CHP engines are down or excess gas is being produced; the gas holder design volume is based on 12 to 15 hours biogas yield. The flare is only used for safety reasons, or during periods of planned maintenance, or if the storage capacity is exceeded. The plant is designed to maximise biogas combustion in the engines. A modern enclosed flare is used, which is designed in accordance with UUW asset standards, which are based on industry best practice, EA technical guidance (e.g. LFTGN05) the relevant British Standards and IGEM standards. The flare was designed, constructed and installed by a specialist contractor in accordance with the UUW asset standard to ensure correct operation over the complete range of ambient conditions that can be experienced at the stack location, including the maximum recorded wind speed and precipitation. All component parts are adequately heat resistant and designed to a modern standard to minimise noise emissions.

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		If necessary (e.g. due to CHP failure), digester feed rates will be adjusted in line with available storage or usage capacity in order to minimise the use of the flare.
BAT 16.	Flaring	*In order to reduce emissions to air from flares when flaring is unavoidable, BAT is to use the correct design of flaring devices and monitoring and recording.* A modern enclosed flare is used, which is designed in accordance with UUW asset standards, which are based on industry best practice, EA technical guidance (e.g. LFTGN05) the relevant British Standards and IGEM standards. The flare is monitored in accordance with the requirements of LFTGN05 – it achieves 1,000°C with 0.3 seconds retention time at this temperature. The flare was designed, constructed and installed by a specialist contractor in accordance with the UUW asset standard to ensure correct operation over the complete range of ambient conditions that can be experienced at the stack location, including the maximum recorded wind speed and precipitation. All component parts are adequately heat resistant and designed to a modern standard to minimise noise emissions. The operation of the flare and its running time are recorded. The quantity of biogas combusted can be approximated from the running time.
BAT 17.	Noise and vibration	*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 EMS. However, the applicability is restricted to cases where a noise or vibration nuisance at sensitive receptors is expected and/or has been substantiated.* The facility does not currently operate a formal noise and vibration management plan. The permitted activity is not inherently noisy and there is no history of noise complaints at the site; therefore a noise and vibration plan is not required.
BAT 18.	Noise and vibration	*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 these techniques; appropriate location of equipment and buildings; operational measures, low-noise equipment, noise and vibration control equipment, noise attenuation.* The permitted activity is not inherently noisy, although the centrifuges and CHP Plant can be sources of localised noise. In mitigation, the CHP engines are housed in ISO containers that are is clad to achieve a noise emission level of 65 dB(A) at 10m and the centrifuges are also contained within acoustic enclosures. Vibration calibration is undertaken on the centrifuges to check their performance.
BAT 19.	Emissions to water	*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.* • *Water management* – potable water is only used for mixing with polyelectrolyte. Where water is required for dilution, final effluent is

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		used instead of potable water. The opportunity to use final effluent instead of potable water for polyelectrolyte dilution has been considered but it cannot meet the required quality standards. Final effluent is used where it can, such as for washing down the centrifuges, digester and for cleaning other assets, where appropriate. • *Water recirculation* – all wastewater streams are recirculated back to the head of the works for full biological treatment (see BAT 20). • *Impermeable surface* - the majority of the installation area is hard surfaced so that it is impermeable with small bunds surrounding the tanks with drainage. However, there are some gravelled areas adjacent to the bunds. All sludge storage assets (except the site drainage pumping station and treated liquor pumping station) are fully above ground tanks, which are sited on concrete bases with kerbing and are constructed of either steel or glass fused to steel. The tanks are approximately 8 years old. An external visual inspection by Stantec UK Limited in 2021 identified no signs of wear of any of these tanks (other than slight weathering on the thickening centrate buffer tank, dewatering centrate buffer tank and leachate/liquor treatment reactor). • *Techniques to reduce the likelihood and impact of overflows and failures from tanks and vessels* – the sludge treatment process is fully automated (apart from the centrifuges which are run manually) and all of the process tanks are fitted with level indicators connected to PLCs that allow tank levels to be monitored on SCADA. A risk assessment in the form of spill risk modelling has been undertaken at the site. Findings of the modelling/assessment, including improvements identified to ensure appropriate measures to meet equivalent BAT containment, are supplied with this application. • *Roofing of waste storage and treatment areas* – waste treatment takes place in enclosed tanks, vessels and equipment. The only open storage is for digested cake, which has a roof and the sludge screen skip which is emptied regularly. • *Segregation of water streams* – uncontaminated surface water run-off is not segregated, it is returned to the WwTW treatment process for biological treatment. This forms part of the containment strategy for the site. • *Adequate drainage infrastructure* – all surface water drains in the waste treatment area discharge back into the WwTW treatment process to full biological treatment. This forms part of the containment strategy for the site. • *Design and maintenance provisions to allow detection and repair of leaks* – regular visual checks of above ground pipework, pumps and tanks is undertaken. Site inspection tours are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Advisor (ERA). These tours include tank level monitoring, visual inspection of

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		asset integrity, where possible, and general ground conditions. A programme of monitoring to allow detection of leaks from existing below ground assets is detailed in Table 10.2.1: Fugitive Emissions Risk Assessment of this document. If any evidence of leaks or ground contamination is seen further investigations or remedial actions will be instigated immediately. • *Appropriate buffer storage capacity* – the buffer tanks used to hold liquid centrate from the centrifuges are adequately sized. There is adequate buffer storage capacity for the sludge treatment process. There is a thickened sludge cake silo (454m^3) to manage sludge inputs.
BAT 20.	Treatment of waste water	*In order to reduce emissions to water, BAT is to treat wastewater using an appropriate combination of the techniques stated.* The principle wastewater stream generated is liquid centrate from the sludge thickening centrifuges and the dewatering centrifuges. The centrate from the thickening centrifuges is discharged into a buffer tank and then pumped to the Liquor Treatment Plant (LTP) for treatment, before returning it back into the WwTW flow to full treatment. The centrate (from the dewatering centrifuges process) is discharged into a buffer tank and then a balancing tank at the installation prior to being treated in the Liquor Treatment Plant (LTP) and then using an automated system is pumped back into the WwTW flow to full treatment. Small quantities of process wastewater are generated from gas condensate, boiler blowdown, cake storage building and the OCU bio-trickling filter. The wastewater streams are discharged into the site drainage system which is returned to the WwTW flow to full treatment. All wastewater emissions are returned to the head of Leigh WwTW to undergo full biological treatment comprising primary treatment, secondary and tertiary treatment, in order to achieve the consented discharge limits. The treatment processes undertaken at Leigh works are summarised below: • Primary treatment – including screens, detritor, descumming, settlement tanks and desludging; • Secondary treatment – biological filtration process, scraper bridges, desludging and final settlement tanks; and • Tertiary treatment – Biological Activated Flooded Filter (BAFF), which includes nitrification. The only other wastewater generated routinely is from cleaning activities. This is also returned to the WwTW for biological treatment via the site drainage system. This is a circular process and is considered to represent BAT.
BAT 21.	Accidents and incidents	*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.* A summary of accident risks is presented in Section 10.4 of this document. There is a site-specific Accident Management Plan for the WwTW, including the sludge treatment processes. A copy of Leigh Accident Management Plan (attachment 5) is also included with this application along with the relevant

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		Standard Operation Procedures (SOP). These live documents form part of the site's Environmental Management System, which is regularly reviewed and updated. Lightning protection is confirmed to be in place on the sludge treatment tanks, CHP engines and boiler, CHP kiosk, flare stack, chemical dosing kiosk, and liquor treatment plant (Amtreat reactor and anoxic/settlement tank), which we consider to be the key assets requiring protective measures at Leigh WwTW. We do not believe any further lightning protection measures are required at this time. Any operational problem that cannot be dealt with by normal operational procedures is classed as an Incident and the UU Incident Management Procedure and associated Standard Operating Procedure (WP/S/001/30/01 Incident Response) followed. All actions and communications are recorded using form WwP/F/001/31/08 Site Diary Log.
BAT 22.	Material efficiency	*In order to use materials efficiently, BAT is to substitute materials with waste.* The only materials used in the treatment process are potable water, anti-foaming agents and polyelectrolyte. Where water is required for dilution, final effluent is used instead of potable water. Potable water is required for polyelectrolyte dilution as final effluent cannot meet the required quality. The polyelectrolyte and other anti-foaming agents cannot be substituted by any waste materials.
BAT 23.	Energy efficiency	*In order to use energy efficiently, BAT is to maintain an energy efficiency plan and an energy balance record.* The treatment process is inherently sustainable, in that biogas is used to generate renewable electricity which is used to power the process. Energy efficiency is considered when sourcing new plant and equipment. Biogas produced by anaerobic digestion of the sludge is used to generate electricity via CHP engines, and to provide steam for the thermal hydrolysis process via combination boilers. As part of the permit requirements, UUW will report annual energy consumption to the EA and will conduct periodic reviews to consider where future energy savings can be delivered.
BAT 24.	Re-use of 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.* Very little packaging waste is generated at the installation. Spent polyelectrolyte bags are disposed of as general waste in the WwTW skips.
BAT 25 - 32	Mechanical treatment of waste	Not applicable
BAT 33.	Biological treatment	*In order to reduce odour emissions and to improve the overall environmental performance, BAT is to select the waste input. The technique consists of carrying out the pre-acceptance, acceptance and sorting of the waste input (see BAT 2) so as to ensure the suitability of the waste input for the waste treatment.*

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		Not applicable as only indigenous sludge from the Leigh WwTW and other similar WwTW sludges will be accepted.
BAT 34.	Biological treatment, emissions to air	*In order to reduce channelled emissions to air of dust, organic compounds and odorous compounds, including H_2S and NH_3, BAT is to use one or a combination of these techniques; adsorption, biofilter, wet scrubbing.* The operational odour control unit (OCU) treats the odours from the raw sludge screens, screened sludge tank, sludge thickening centrifuges, thickened sludge cake silo, degassing tank, digested sludge storage tank, centrate buffer tanks, centrate balancing tank and dewatering centrifuges. The OCU consists of two stages of treatment. The first is a biological stage consisting of a biotrickling filter, the second is an activated carbon treatment system. The installation of these techniques complies with BAT.
BAT 35.	Biological treatment, water usage	*In order to reduce the generation of wastewater and to reduce water usage, BAT is to recirculate water.* See BAT 20.
BAT 36 & 37.	Biological treatment	Not applicable – relates to composting
BAT 38.	Anaerobic treatment of waste, emissions to air	*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.* Process information on gas levels, tank levels, gas quality and temperature are continuously monitored and displayed on the SCADA panels in the control room. Routine process sampling and testing is undertaken for the FOS/TAC ratio (volatile acid to alkalinity ratio), pH and dry solids. A daily visual tour is also undertaken of the process. See Section 6 of this ASD for key process parameter measurements for the primary digester. A series of SOPs and SSIs related to the primary digestion are also available, which set out recommended actions based on the results of key parameters. A copy of Leigh Accident Management Plan is also included with this application (Attachment 5).
BAT 39.	Segregation and recirculation of waste gas	*In order to reduce emissions to air, BAT is to:* • *Segregate waste gas streams with a high and low pollutant content* – not applicable. Only one gas stream produced. • *Recirculate waste gas with a low pollutant content in the biological process followed by waste gas treatment adapted to the concentration of pollutants* – not applicable. All biogas generated in the process is combusted to generate power and heat to sustain the process.
BAT 40.	Physico-chemical treatment, waste input	*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.*

BAT conclusions for waste treatment reference:		Treatment of Best Available Technique (BAT)
		Not applicable as only indigenous from Leigh WwTW and imported sludges from other WwTW sites will be accepted.
BAT 41.	Physico-chemical treatment, emissions to air	*In order to reduce emissions of dust, organic compounds and NH_3 to air is to use one or a combination of adsorption, biofilter, wet scrubbing, fabric filter.* See BAT 34.
BAT 42. – BAT 52.	Various	Not applicable – relate to waste oil, solvent waste, contaminated soils, PCB containing equipment and liquid wastes.
BAT 53	Emissions to air	*In order to reduce emissions of HCl, NH_3 and organic compounds to air, BAT is to apply BAT 14d and to use one or a combination of the techniques given below.* • *Adsorption* • *Biofilter* • *Thermal oxidation* • *Wet scrubbing* Refer to BAT 14 and BAT 34. Total volatile organic compounds (TVOC) and HCl will be monitored on one occasion to check for their presence in the emissions from the OCU stack and the results provided to the EA. The sampling will be undertaken three times over the course of one day. Dependent upon the results, TVOCs and/or HCl may be added to the bi-annual monitoring schedule for OCU emissions.

10. Environmental Risk Assessment and Management Plan

10.1. Odour Risk Assessment

Table 10.1.1: Odour Risk Assessment

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
Sludge screen and skip	Local residents (closest ~190m NNE)	Air	The sludge screen and tanks listed are linked to an odour control unit (OCU). The odour control system consists of two stages of treatment. The first is a biological stage consisting of a biotrickling filter, the second is an activated carbon treatment system (refer to Section 7 and the OMP).	Very low	Localised odour annoyance	Not significant
Screened sludge tank, centrate balancing and buffer tanks, thickened sludge storage tank, de-gassing tank and digested sludge tank.		Air				
Digester & TH Plant		Air	Tanks are gas tight and connected to the biogas system. PVRV activation is considered below.	Very low		
Liquor treatment plant		Air	Tanks are enclosed but risk of fugitive emissions	Low		
Leaks/ spills of sludge from process		Air	Any leaks or spills of sludge that may be a source of odour emissions are cleaned up promptly as part of the spill response procedure.	Low		

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
Activation of pressure vacuum relief valves on gassing tanks i.e. digester and or gas holder		Air	The pressure vacuum relief valves (PVRVs) are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points (refer to Section 6.4).	Low		
Leaks in gas pipework e.g. around flanges		Air	A site specific leak detection and repair (LDAR) plan has been developed for the site and is included with this application. Assets (such as the digester, gas holder, PVRV's, CHP engine and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis.	Low		
Fugitive emissions from cake storage building		Air	Pad covered and walled on three sides. Digested and dewatered sludge has a relatively low odour potential and is removed as soon as possible.	Low		

10.2. Fugitive Emissions Risk Assessment

Table 10.2.1: Fugitive Emissions Risk Assessment

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
Dust, mud and litter	The potential for dust emissions is very low as it is a wet treatment process. The site is predominantly hard surfaced and all roadways are in good condition; the potential for mud to be generated and tracked onto the highway is therefore very low. The potential for wind-blown litter is also very low; there are only small amounts of packaging and general waste generated which are stored in covered skips. Digested sludge cake (around 30% dry solids) is directed via an enclosed conveyor to be deposited into the cake storage area (which is roofed and has walls on three sides), in order for it to be reloaded into vehicles for transportation to land. The usual turnaround time for this is typically 1 to 3 days. Cake movements are scheduled for daily collection on a week by week basis by agricultural services. However, notwithstanding this the storage area will be emptied each week subject to land bank availability. The storage time for the cake is not sufficient to allow drying out to create a dust nuisance. Therefore, active dust suppression measures are not considered necessary.					
Fine particulate and fumes	The potential for particulate emissions is very low as it is a wet treatment process and the main combustion fuel is biogas in the CHP engine. There will be some particulate matter emissions from the combustion of diesel in the boiler. There are no fume emissions from the process.					
Vermin	All treatment tanks and pipework are enclosed. The only open storage of waste is of screenings solids and digestate cake. The screenings are stored within a skip. A Pest Control contractor provides pest control services for the site.					

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
Leaks and spills from treatment process and plant Connective pipelines Tanker off-loading point	Ground, groundwater and surface waters	Ground	All assets are located on extensive impermeably surfaced (concrete) apron areas (the majority of the site is so surfaced), with kerbs to provide containment in case of spills to the WwTW's drainage system. See site surfacing plan in Appendix J. The drainage system directs spillages to the start of the WwTW full biological treatment process. Sludge storage tanks fitted with level detectors and alarms. The sludge feed, thickened sludge and tanker sludge loading all have flow meters, displayed locally in the sludge handling building (with totalisers) and on SCADA for instantaneous display. All above ground effluent transfer pipelines within the treatment process run over areas of impermeable concrete, drained to the WwTW drainage system. Above ground pipework is regularly inspected for any signs of damage and/or leaks and any issues are rectified promptly. Findings of the 2022 spill modelling/assessment, including improvements identified to ensure appropriate measures to meet equivalent BAT containment, are supplied with this application.	Very low	Contamination of soils, ground and surface waters	Not significant

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
			Below ground pipework is monitored using flow meters where installed to identify larger than usual flow recordings. Where no flow meters are installed pipework with buried mechanical fittings will be surveyed every 2 years and every 5 years where not present, using techniques such as thermal cameras, magnetic flux leakage and in pipe crack detection technology. CCTV of site drainage undertaken every 5 years. Pipework is installed in accordance with United Utilities asset standards that applied at the time of construction. Existing pipework will be surveyed to ensure fit for purpose. Environment Management System in place for inspections, management and monitoring.			
Bioaerosols	Local residential properties - closest properties are approximately 190m north-north east. Work places – closest buildings are approximately 75m to the south east.	Air	The only open storage of waste is the wet digestate cake. The cake storage building is situated approximately 90m from the nearest occupied building (to the west). The water/wastewater industry understands that there is a low level risk of bioaerosols from this material. The cake storage building is bounded by concrete walls on three sides (north, east and west), plus a roof.	Medium	Potential impacts upon human health	Low[1]

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
			Cake is stored below the top of the wall and the prevailing winds are from the south. Sludge cake from the storage building is loaded onto trailers via a telehandler and removed off site for agricultural land spreading. Under normal operations, loading a trailer typically takes approximately 30 minutes, before it is automatically covered and removed from site. Storage duration within trailers prior to removal is typically less than 24 hours. The odour control system consists of two stages of treatment. The first is a biological stage consisting of a biotrickling filter, the second is an activated carbon treatment system. Adsorption of micro-organisms onto the activated carbon would be expected, and therefore the likelihood of bioaerosol release is anticipated to be minimal. See Leigh Bioaerosol Risk Assessment for further information.			
Fugitive emissions from leaks in gas pipework e.g. around flanges	Local residential properties - closest properties are approximately 190m to the north.	Air	A site-specific leak detection and repair plan has been developed for the site and is included with this application. Assets (such as the digester, gas holder, PVRV's, CHP engines and flare stack) are scheduled for routine proactive inspection by thermal imaging camera on an annual basis.	Low	Localised odour annoyance	Not significant

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
Activation of PVRVs on gassing tanks	Local residential properties - closest properties are approximately 190m to the north.	Air	The PVRVs are inspected and calibrated on a periodic basis to ensure they are operating at the correct set points (refer to Section 6.4).	Low	Localised odour annoyance	Not significant

Note 1: The water/wastewater industry is not aware of any issues with bioaerosols from the storage of wet digestate cake. This is therefore considered to be a conservative risk level.

10.3. Noise and Vibration Risk Assessment

Table 10.3.1: Noise and Vibration Risk Assessment

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
Treatment process and associated activities	Local residents - closest properties are approximately 190m to the north	Air	Good practice measures for the control of noise, including suitable noise attenuation and management. Adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise. Centrifuges are contained within individual steel enclosures and the TH plant is contained within a building.	Low	Noise disturbance	Not significant

10.4. Accidents

Table 10.4.1: Accidents

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
Failure of any of the transfer pipework on the installation	Ground/ Groundwater/ surface water	Ground	Good design; all transfer pipework is constructed of suitable materials that are resistant to the contents. All tanker delivery drivers are provided with appropriate training which includes the safe use of tanker equipment and safe unloading/loading procedures. Waste is accepted via a fixed offloading point which includes an alarmed, auto-shutoff when the high level is reached. All sludge treatment assets are located within extensive impermeably surfaced (concrete) apron areas to provide containment in case of spills. The concrete surfaces are connected to the drainage system that directs spillages to on-site off-installation WwTW flow to full treatment. Environment Management System in place for inspections, management and monitoring.	Very low	Minor localised odour. Contamination of soils, ground and surface waters	Not significant
	Local residents	Air				

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
			Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage.			
Loss of containment of vessels	Ground/ Groundwater/ surface water	Ground	Tanks and vessels are designed to contain intended material and volumes. All of the main tanks are fitted with level probes and transmitters so that tank levels can be continually monitored via the SCADA display screens. Any uncontrolled outflows will go to hard surface areas that drain back to the treatment works. Environment Management System in place for inspections, management and monitoring. Containment is provided for oil and chemical storage. Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage. A release of sludge arising from a catastrophic tank failure has been modelled. Findings of the modelling/assessment, including improvements identified to ensure appropriate measures to meet equivalent BAT containment, are supplied with this application.	Very low	Minor localised odour. Contamination of soils, ground and surface waters Additional loading on WwTW	Not significant
	Local Residents	Air				

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
Polyelectrolyte spillage or leakage of liquid polyelectrolyte	Ground/ Groundwater/ surface water	Ground	Polyelectrolyte mix is made with polyelectrolyte powder and potable water, any leakage would be contained on hard surfaces that drain back to the treatment works. Staff are trained in the operation of spillage kits to ensure that prompt and effective action is taken in the event of accidental spillage. Spillage containment is provided as required.	Very low	Minor localised odour. Contamination of soils, ground and surface waters	Not significant
	Local Residents	Air				
Equipment/plant item fire e.g. electric cabling	Ground/ Groundwater	Ground	Design and fabrication standards; Inspection and maintenance; Routine operator inspection; Firefighting systems; Emergency Response procedure; Limited sources of ignition adjacent to likely leak sources (e.g. hot surfaces, hot work). Risk is also managed by the removal of ignition sources and a rigorous permit to work system, backed up by appropriate purging and isolation procedures and staff training. Fixed gas detectors and alarms installed: H_2S detection within the THP kiosk and gas bag/holder annular space has CH_4 detection.	Very low	Possible toxic hazard. Fire/explosion. Potential contamination of soils, ground and surface waters	Not significant

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of exposure**	**Consequence**	**Overall Risk**
			The sludge treatment tanks, plus the CHP engines and boiler are fitted with lightning protection.			
Flood	Ground/ Groundwater/ surface water	Ground	The site is not within a flood risk area. Ensure that surface water drains are adequately maintained and periodically cleaned out to maximise throughflow. Monitor bund water levels and pump out rainwater as required to ensure that pipework, valves and pumps do not become submerged.	Low	Permitted waste types are non-hazardous so any waste washed off site will add to the volume of the local post-flood clean-up workload, rather than the hazard.	Not significant
Lightning strike	Ground/ Groundwater/ surface water	Ground	Lightning protection is in place on the sludge treatment tanks, CHP engines and boiler, CHP kiosk, flare stack, chemical dosing kiosk and liquor treatment plant (Amtreat reactor and anoxic/settlement tank).	Very low	Fire/explosion. Potential contamination of soils, ground and surface waters.	Low
	Local Residents	Air				

10.5. Designated/Protected Sites

Table 10.5.1: Designated/Protected Sites

The following table details the location of designated/protected sites within the conservation screening report provided by the EA dated 17th February 2021.

Site Type	Site Name	Distance from Installation	At Risk from Activities?
Special Areas of Conservation	Manchester Mosses	~2,355m to south east	No – see table below
	Rixton Clay Pits	~8,535m to south	No – see table below
Local Nature Sites	Pennington Flash	~1,665m to east	No – see table below
Local Wildlife Sites	Atherton & Bedford Woods	~2,025m to north	No – see table below
	Wetland off Orchard Lane	~2,140m to north	No – see table below
	Pennington Flash	~1,665m to east	No – see table below
	Hope Carr Nature Reserve	~160m to south	No – see table below

Table 10.5.2: Risk from Onsite Activities

Table 10.5.2 assesses the risks from the permitted activity on designated/protected sites identified within the conservation screening report provided by the EA dated 17 February 2021.

What do you do that can harm and what could be harmed			Managing the Risk	Assessing the Risk		
Hazard	**Receptor**	**Pathway**	**Risk Management**	**Probability of Exposure**	**Consequence**	**Overall Risk**
Treatment process and associated activities	Local Wildlife Site – Hope Carr Nature Reserve Local residents	Air	The primary emissions to air from the sludge treatment process are combustion emissions from the CHP engines and boiler. Air dispersion modelling demonstrated that emissions would not exceed ecological assessment levels for NO_2 or SO_2 for local residents or wildlife sites with a stack of 35m. Odorous air is treated prior to discharge and continuous monitoring for hydrogen sulphide is undertaken at the stack outlet. As there is very limited potential for any significant fugitive emissions from the sludge treatment facilities at the site, it is not considered that the operations at the Leigh WwTW Sludge Treatment Facility will have any impact upon this designated site. Hope Carr Nature Reserve is the closest ecological receptor which is situated approximately ~160m away, but does not fall within a distance to be considered by the dispersion modelling.	Low	Damage to vegetation and potential toxicity to animal species	Not significant

11. Site Condition Report

1.0 Site Details	
Name of the applicant	United Utilities Water Ltd
Activity address	Leigh WwTW Sludge Treatment Facility Hope Carr Lane, Leigh, Lancashire, WN7 3XA
National grid reference	SJ 66302 99084
Document reference and dates for Site Condition Report at permit application and surrender	This is the permit application Site Condition Report
Document references for site plans (including location and boundaries)	See Appendices D to F to Application Support Document.

2.0 Condition of the land at permit issue	
Environmental setting including: • geology • hydrogeology • surface waters	The published British Geological Survey (BGS) map for Leigh shows the installation area is underlain by: • Made ground • Drift geology consisting of alluvium, glaciofluvial and glacial till • Bedrock geology consisting of Perm Triassic Sherwood Sandstone. A north-northwest trending fault is indicated to cross the WwTW. The WwTW is located on a Non-Aquifer (within the Glacial Till), but this is underlain by a Major Aquifer (within the Sherwood Sandstone). The WwTW is in a Source Protection Zone III. Borehole data from previous ground investigations confirms that beneath the Made Ground is a layer of Glacial Till clay, which potentially confines the Sherwood Sandstone aquifer. The site is located in a Nitrate Vulnerable Zone. There are no surface water features within the installation boundary. The nearest watercourse is Pennington Brook, which is greater than 450 metres from the sludge treatment facility.
Pollution history including: 1. pollution incidents that may have affected land	There are no known pollution incidents that may have affected the land within the installation boundary.

2. historical land-uses and associated contaminants 3. any visual/olfactory evidence of existing contamination 4. evidence of damage to pollution prevention measures	A site walkover conducted in October 2020 did not identify any visual or olfactory evidence of contamination of concern. The coal authority report from December 2009 identified that the WwTWs is in the likely zone of influence from workings in 9 seams of coal 610m to 1230m depth and last worked in 1988. Ground movement from these should have ceased by now.
Evidence of historic contamination, for example, historical site investigation, assessment, remediation and verification reports (where available)	A study of historical maps has identified that prior to the use of the site as a WwTW there were no previous land uses that may have resulted in contamination. The installation area is shown as agricultural land until 1907 when sewage works are shown. Between 1993 and 1999 the site area underwent significant expansion to achieve its current configuration. There have been a number of ground investigations at the WwTW site, undertaken between 1990 and 2013, associated with various stages of development and expansion of the works. Boreholes drilled within the installation area confirm the published geology; with made ground deposits comprising sandy gravelly clay and silty sand and gravel, which varied in depth from 0.8 to 2.9m. Underlying these are the superficial drifts deposits comprising sandy gravelly clay (Glacial Till) and silty gravelly sand or sandy gravel (Glaciofluvial Deposits) with depths ranging from 0.8m to over 8m. These bands of deposits are usually 2 to 3m thick in the northern part of the site and 5 to 8m thick in the southern part of the site. These deposits are underlain by bedrock made up of medium grained sandstone, which was encountered at depths of 4m in the northern part of the site and 8.5 m in the southern part of the site. Groundwater was encountered on average at depths of 3m.
Baseline soil and groundwater reference data	The most recent ground investigations were carried out by Allied Exploration & Geotechnics Limited in February 2012 and Structural Soils Ltd in February/March 2013. Soil and groundwater samples were obtained for chemical testing. The samples were tested for a range of metals, pH, sulphate, and total petroleum hydrocarbons. Although the chemical analysis was undertaken eight years previously, the site is mostly hard surfaced and there have been no major spill events since this time. It is therefore considered that the range of results recorded has been presented as being generally indicative of baseline conditions in the

	installation area. The range of contaminant levels recorded within the installation area are shown in the table below. Further parameter results are listed in the AEG 2012 and Structural Soils 2013 reports

Soil Sample Results

Parameter	Minimum	Maximum	Units
pH	7.23	9.05	
Sulphate (acid soluble)	22	1,700	mg/kg
Ammoniacal nitrogen	<0.2	21	mg/kg
Arsenic	2	29	mg/kg
Boron	0.4	2.1	mg/kg
Cadmium	<0.5	4.3	mg/kg
Chromium	15	34	mg/kg
Hexavalent Chromium	<1	<1	mg/kg
Copper	19	140	mg/kg
Lead	12	307	mg/kg
Manganese	189	4,310	mg/kg
Mercury	<0.05	0.64	mg/kg
Nickel	12	49	mg/kg
Zinc	29	324	mg/kg
Cyanide	<0.1	0.1	mg/kg
TPH	<0.1	67	mg/kg
Total PAHs	0.49	22.6	mg/kg
PCB	<0.01	<0.01	mg/kg
Phenol	<0.2	<0.2	mg/kg

Groundwater Results

Parameter	Minimum	Maximum	Unit
pH	6	10.2	
Sulphate (acid soluble)	11	350	mg/l
Ammonia	0.534	0.881	mg/l
Ammoniacal Nitrogen as N	<0.015	0.17	mg/l
Arsenic	<1	2	ug/l
Boron	96	274	ug/l
Cadmium	<1	<2	ug/l
Chromium	<1	10	ug/l
Copper	<2	14	ug/l
Lead	<1	<4	ug/l
Manganese	42	531	ug/l
Mercury	<0.05	<0.1	ug/l
Nickel	4	12	ug/l
Zinc	<1	11	ug/l
Cyanide	<0.005	0.006	mg/l
TPH	<5	27	ug/l
Phenol	<0.01	<0.01	mg/l

3.0 Permitted activities	
Permitted activities	As detailed in the Environmental Permit application
Non-permitted activities undertaken	Outside of the sludge treatment installation, that is the subject of the permit application, there are the wider UUW WwTW operations.
Document references for: 1. plan showing activity layout; and 2. environmental risk assessment.	1. See Appendices D and E to Application Support Document. 2. See Section 10 to the Application Support Document

Appendix A: CoTC Certificate

wamitab

Qualification Title:

WAMITAB Level 4 Medium Risk Operator Competence for Anaerobic Digestion

Qualification Accreditation Number:

601/8515/6

This Certificate is awarded to

Christopher Donald Maggs

Verification date: 24/04/2019

Authorised:

Learner ID: 14299

Certificate No.: 5143068

Date of Issue: 24/04/2019

Chris James
WAMITAB Chief Executive Officer

Regulated by Ofqual

Corff dyfarnu cydnabyddedig
Cymwysterau Cymru Qualifications Wales
Recognised awarding body

Regulation

The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland. Qualifications Wales regulates this qualification where it is awarded to learners assessed wholly or mainly in Wales.

00141288

wamitab

Operator Competence Certificate

Title:

Anaerobic Digestion

This Certificate is awarded to

Christopher Donald Maggs

Verification date: 24/04/2019
Authorised:

Learner ID: 14299
Certificate No.: 5143068
Date of Issue: 24/04/2019

WAMITAB Chief Executive Officer

CIWM Executive Director

The Chartered Institution of Wastes Management

This certificate is jointly awarded by WAMITAB and the Chartered Institution of Wastes Management (CIWM) and provides evidence to meet the Operator Competence requirements of the Environmental Permitting (EP) Regulations, which came into force on 6 April 2008.

00141290

wamitab

Credit certificate
This certificate determines credit awarded to:

Christopher Donald Maggs

Units gained:

		Credit Value	Credit Level
A/508/0756	Maintain health and safety in the waste resource management industry	4	L4
F/508/0757	Manage the environmental impact of work activities	3	L4
F/508/0760	Manage the movement, sorting and storage of waste	5	L4
J/508/0887	Manage the reception of non-hazardous waste	6	L3
A/508/1003	Manage site operations for the anaerobic digestion of non-hazardous waste	6	L4
T/508/0979	Manage transfer and disposal from anaerobic digestion operations	5	L4

Verification date: 24/04/2019
Authorised:

Learner ID: 14299
Certificate No.: 5143068
Date of issue: 24/04/2019

Chris James
WAMITAB Chief Executive Officer

Regulated by Ofqual

Corff dyfarnu cydnabyddedig
Cymwysterau Cymru Qualifications Wales
Recognised awarding body

The qualifications regulators logos on this certificate indicate that the qualification is accredited only for England, Wales and Northern Ireland. Qualifications Wales regulates this qualification where it is awarded to learners assessed wholly or mainly in Wales.

00141289

CIWM

Continuing Competence Certificate

This certificate confirms that

Christopher Maggs

Has met the relevant requirements of the Continuing Competence scheme for the following award(s) which will remain current for two years from 27/01/2023

TSH	Transfer - Hazardous Waste
TMH	Treatment - Hazardous Waste
AD	Anaerobic Digestion

Expiry Date: 27/01/2025

Verification date: 17/01/2023

Authorised:

Professional Services Director

Learner ID: 14299

Certificate No.: 5216084

Date of issue: 27/01/2023

CIWM Chief Executive Officer

The Chartered Institution of Wastes Management

Scan code on reverse to authenticate that this is a genuine paper

Appendix B: ISO14001 Certificate

Certificate GB04/63183

The management system of

United Utilities Water Limited

Haweswater House Lingley Mere Business Park Great Sankey Warrington WA5 3LP United Kingdom

has been assessed and certified as meeting the requirements of

ISO 14001:2015

For the following activities

The provision of utility services through the management of our assets by head office staff. Including, their operation, maintenance and support service activities which strive to meet stakeholder requirements and minimise the impact upon the environment. We manage capital projects by project teams and supply chain arrangements, to achieve sustainable improvement.

This certificate is valid from 23 May 2023 until 23 May 2026 and remains valid subject to satisfactory surveillance audits.

Issue 13. Certified since 28 October 2004

Authorised by
Jonathan Hall
Global Head - Certification Services

SGS United Kingdom Ltd
Rossmore Business Park, Ellesmere Port, Cheshire, CH65 3EN, UK
t +44 (0)151 350-6666 - www.sgs.com

Appendix C: Management System Summary

Leigh WwTW Sludge Treatment Facility

Environmental Permit Application

Management System - Summary

December 2022

1. Introduction

As part of our application for an environmental permit for Leigh WwTW Sludge Treatment Facility, United Utilities Water Limited (UUW) is required to provide details of the management system that we will provide for the facility, including a summary of the management system. This document provides that summary.

UUW was awarded certification to BS EN ISO14001:2004 for our Environmental Management System in October 2004 and have maintained this certification. A copy of the latest certificate is provided with this document. In addition, UUW also holds certification to BS EN ISO 9001:2015; this is the quality assurance document management system which supports the ISO14001 and other written procedures for delivering the key aspects of the ISO14001. Together these form the backbone of UUW's Environmental Management System (EMS).

In accordance with the Environment Agency (EA) guidance "Develop a management system: environmental permits" on the gov.uk website, the following sections summarise the management system (MS) that will be provided for Leigh WwTW Sludge Treatment Facility under our ISO14001 EMS.

2. Site Infrastructure Plan

The permit application includes a scaled location plan, a site boundary plan that identified the different elements of the waste treatment process, a process flow diagram and drainage plan. The MS will include suitable plan(s) that meet the requirements of the EA guidance.

3. Site Operations

The site operations and how they are controlled are detailed within the Application Support Document of the permit application package. The MS will include all necessary information about site operations and waste storage and management.

No fire prevention plan is required.

4. Site equipment and maintenance plan

As detailed in the Application Support Document of the permit application package, the site operates under an EMS manual detailing the Standard Operating Procedures (SOP's) and Site Specific Instructions (SSI's) applicable to each process. These instructions have been designed to ensure safe and effective operation and to minimise known hazards from the installation and include procedures for maintenance, training and accident response.

The Production Manager will review the EMS for the installation and arrange the necessary updates to include the operations, inspection and maintenance of the new plant. The Production Manager will also arrange staffing resources and training for operation, monitoring and maintenance of the new plant.

All scheduled maintenance will be set up on the Master Asset Management System (MAMS)SAP and all proactive and reactive maintenance undertaken will be recorded on MARS against the requirements of the plan. For activities proposed at the site, please see Table 4.1.1 in Section 4.

5. Contingency Plans

The MS will include contingency plans detailing what actions UUW will take to minimise the impact on the environment for each of the following scenarios:

- breakdowns
- enforced shutdowns
- any other changes in normal operations that may result in an impact on the environment

Many of these have already been detailed within the Environmental Risk Assessment and Management Plan provided in the Application Support Document of the permit application package.

6. Accident prevention and management plan

An accident risk assessment has been provided in Section 10.4 of the Application Support Document. An accident management plan is provided as an Attachment to this application.

In accordance with our ISO14001 procedures, UUW will record, investigate and respond to accidents or breaches of any permit conditions.

Any operational problem that cannot be dealt with by normal operational procedures is classed as an Incident and the UUW Incident Management Procedure and associated Standard Operating Procedure will be followed. All actions and communications will be recorded in accordance with the procedure.

7. Climate change

Being a responsible business means understanding the role we play in safeguarding the quality of the environment, protecting and enhancing it whilst delivering our services, now and in the future. Our Environment Policy (and daughter Climate Change Mitigation Policy) sets out our commitments to climate change mitigation and principles to deliver this vision. More specific to our resilience to climate change is how we are adapting to climate change. Every 4 to 5 years we report on our progress with climate change resilience, which includes outputs of various risk assessments of our operation and sites to expected (and being experienced) impacts of climate change.

8. Contact information

As with all our other sites holding waste and/or installations environmental permits, we display a notice board at or near the site entrance providing the following information:

- the company name, site name and permit number
- emergency contact details
- a statement that the site is permitted by the Environment Agency

9. Complaints procedure

In accordance with our ISO14001 accreditation, UUW has a well established complaints recording and investigation procedure. This procedure is applied at all other UUW permitted sites and will form part of the MS for this installation.

10. Managing staff competence and training records

In accordance with our ISO14001 accreditation, the MS will detail the management and responsibilities for the operations of the installation, including details of technically competent management (CoTC holders). UUW procedures for checking staff and contractors required training and/or qualifications will be applied at this installation and all training and qualifications will be recorded.

11. Keeping records

In accordance with our ISO14001 and ISO9001 accreditations, UUW will hold and maintain all records appropriate to the operation and management of the installation, including (but not limited to):

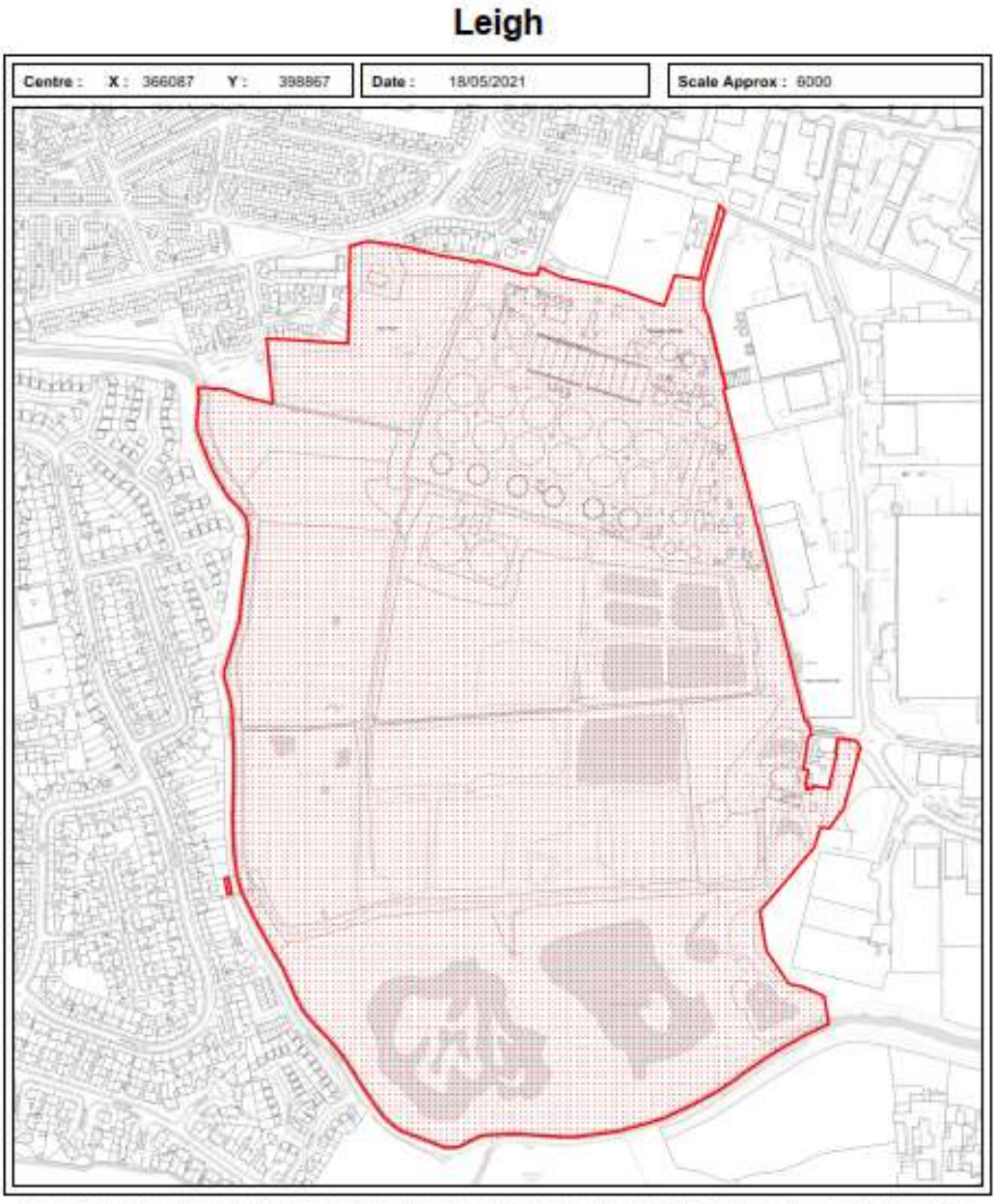
- copies of all permits
- risk assessments
- all management system plans
- odour management plan
- site operating procedures
- staff competence and training
- environmental monitoring
- compliance checks, findings of investigations and actions taken
- complaints made, findings of investigations and actions taken
- audits of management system, findings (reports) and actions taken
- management reviews and changes made to the management system

In accordance with the Duty of Care for waste, records will also be kept of all waste movements.

12. Management system reviews

The management system for the installation will be subject to regular review and updating. All reviews and any resulting changes will be recorded.

Appendix D: Site Location Plan



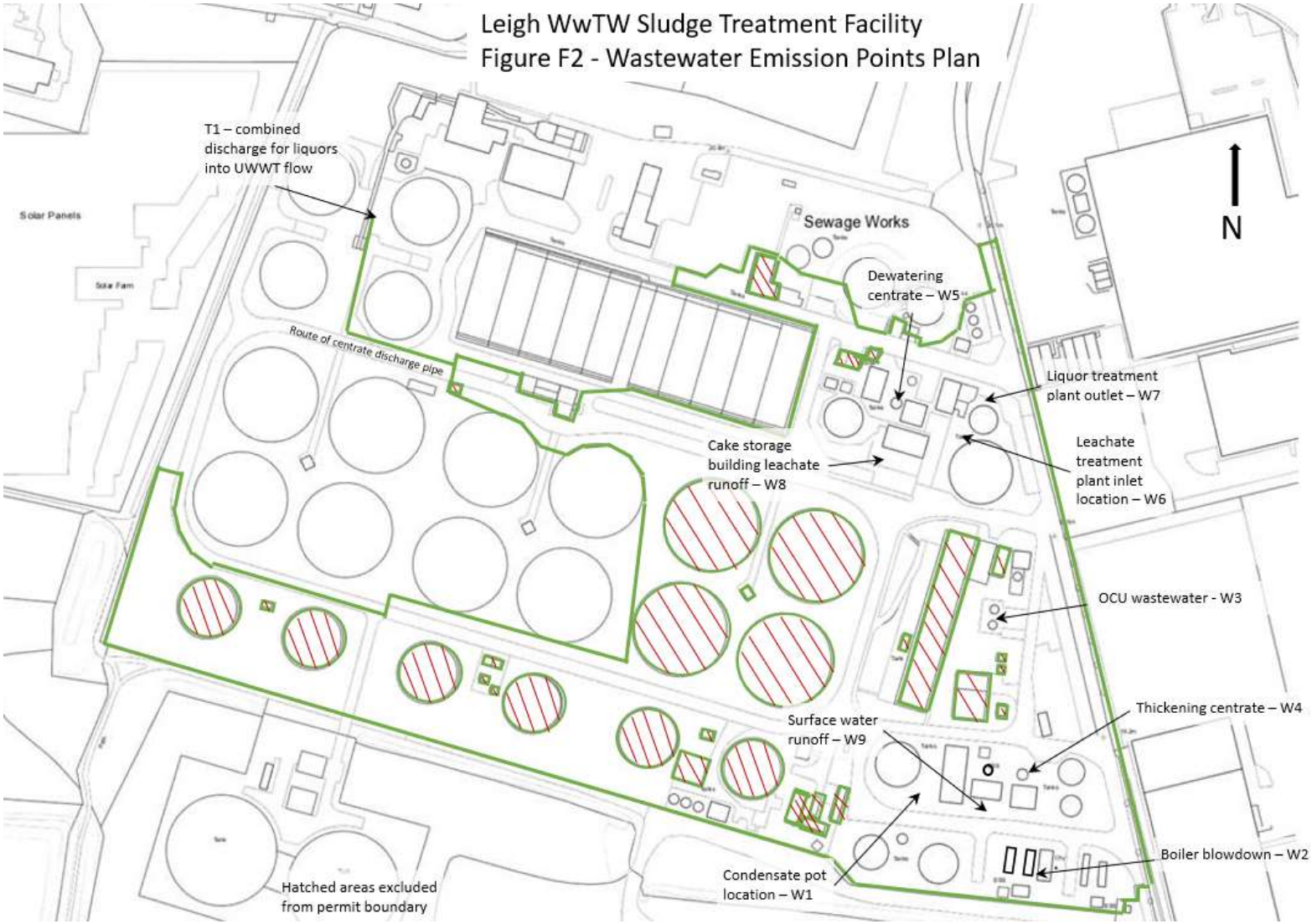
The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

Appendix E: Site Permit Boundary and Layout Plan

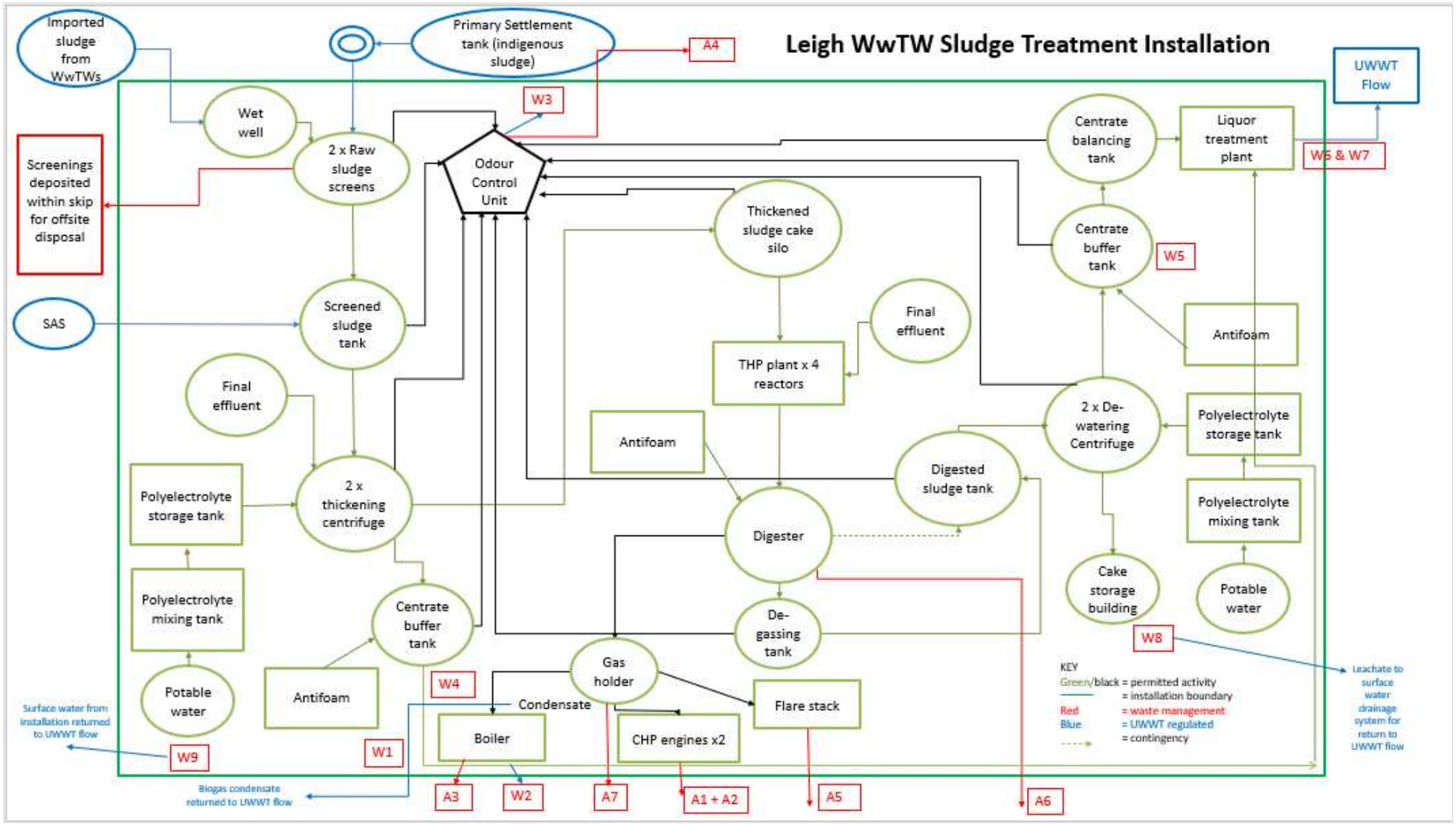
Leigh WwTW Sludge Treatment Facility
Environmental Permit Application

Appendix F: Emissions Point Plans


Leigh WwTW Sludge Treatment Facility
Figure F1 – Air Emission Points Plan
Solar Panels
Solar Farm
Sewage Works
N
A4 - odour control unit
A5 - Flare stack
A7 - Gas holder PVRV
A3 - Dual fuel steam boiler
Hatched areas excluded from permit boundary
A6 – Digester PVRV
A1 & A2 - CHP engines



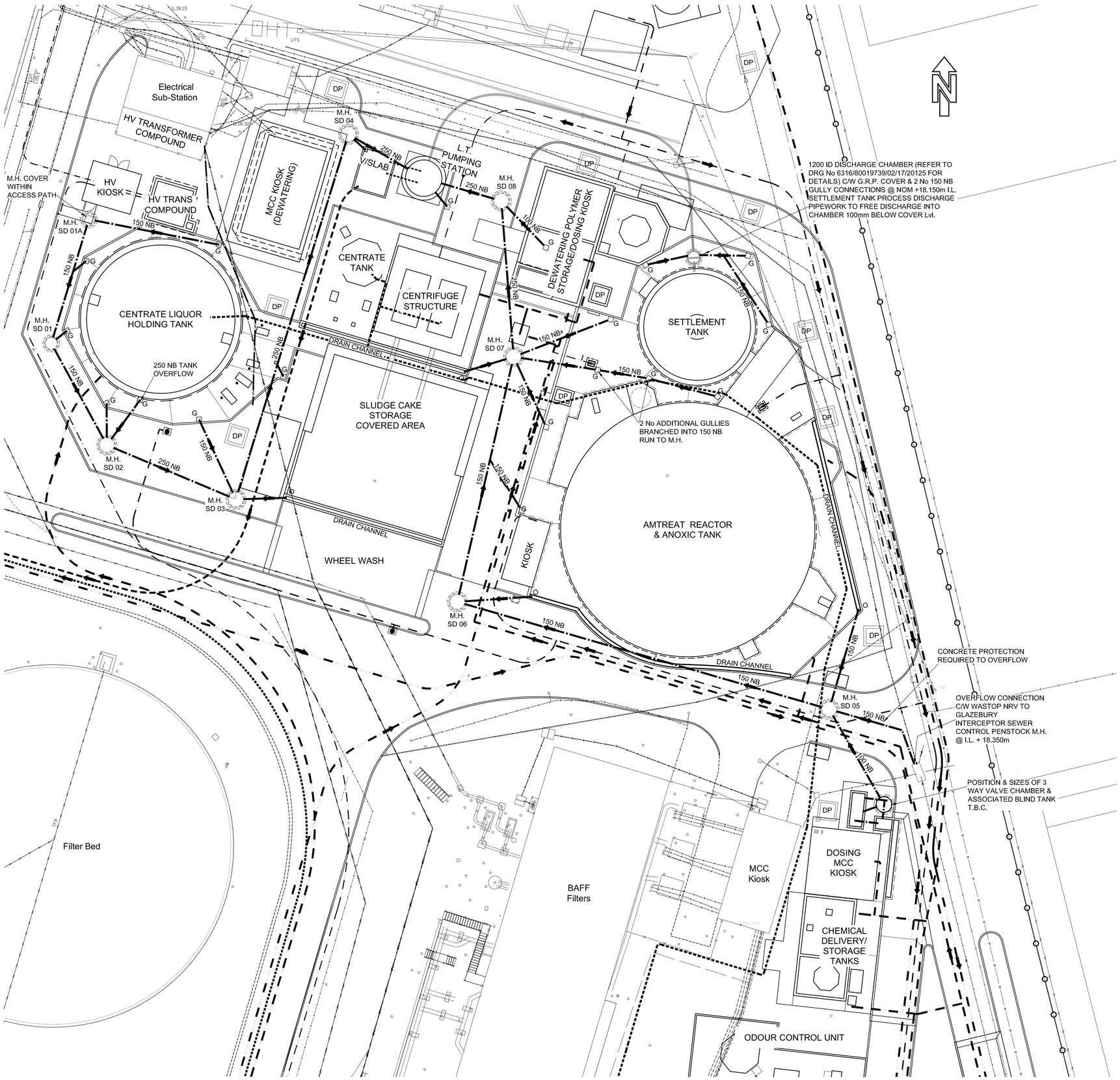
Appendix G: Block Process Diagram


Leigh WwTW Sludge Treatment Installation
Imported sludge from WwTWs
Primary Settlement tank (indigenous sludge)
A4
UWWT Flow
Wet well
W3
Screenings deposited within skip for offsite disposal
2 x Raw sludge screens
Odour Control Unit
Centrate balancing tank
Liquor treatment plant
W5 & W7
Thickened sludge cake silo
Centrate buffer tank
W5
SAS
Screened sludge tank
Final effluent
Antifoam
Final effluent
THP plant x 4 reactors
2 x De-watering Centrifuge
Polyelectrolyte storage tank
Antifoam
Digested sludge tank
Polyelectrolyte storage tank
2 x thickening centrifuge
Digester
Polyelectrolyte mixing tank
Polyelectrolyte mixing tank
Centrate buffer tank
De-gassing tank
Cake storage building
Potable water
W8
Potable water
Antifoam
W4
Gas holder
Condensate
Flare stack
KEY
Green/black = permitted activity
= installation boundary
Red = waste management
Blue = UWWT regulated
= contingency
Leachate to surface water drainage system for return to UWWT flow
Surface water from installation returned to UWWT flow
W9
W1
Boiler
CHP engines x2
Biogas condensate returned to UWWT flow
A3
W2
A7
A1 + A2
A5
A6

Appendix H: Air Quality Impact Assessment Report

This report is provided separately.

Appendix I: Site Drainage Plan



DRAINAGE PLAN - NORTH.

SCALE 1:200.

NOTES

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS IN MILLIMETERS (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.
3. ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE AND ANY DISCREPANCIES SHOULD BE REPORTED TO GHA LIVIGUNN.
4. ALL LEVELS SHOWN ARE RELATIVE TO ORDINANCE DATUM.
5. MANHOLES DETAILED TO BE BUILT IN ACCORDANCE WITH U.U. STANDARD DETAILS. SPECIFICALLY FOR MANHOLE TYPES REFER TO U.U. STANDARD DETAIL DRG No STND/01/004.

LEGEND

- SITE DRAINAGE PIPEWORK AND MANHOLES
- G GULLY
- O OUTLET POINT

AS BUILT

RECORD DRAWING STATUS

· INFORMATION PROVIDED BY THE CONTRACTOR THAT HAS BEEN INCORPORATED IN THIS DRAWING HAS NOT BEEN INDEPENDENTLY CHECKED AND VERIFIED BY THE DESIGNER.
· THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT INFORMATION PROVIDED BY OTHERS INCLUDING THE CONTRACTOR, ARCHITECT, OTHER CONSULTANTS, SPECIALIST SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS.

REFERENCE DRAWINGS.

6316/80019739/02/01/10031	SITE DRAINAGE (SHEET 2 OF 2)
6316/80019739/02/01/10032	MANHOLE SCHEDULE

CURRENT ISSUE INFORMATION

VERSION	DRWN	CHKD	REVD		DATE
E	ZD	TM	GB	AS BUILT	24.07.2018
D	M.R.	K.C.	G.B.	MINOR REVISIONS	02.06.15
C	M.R.	K.C.	G.B.	ISSUED FOR CONSTRUCTION	11.03.15
B	M.R.	K.C.	G.B.	ISSUED FOR CODING	17.02.15
A	M.R.	K.C.	G.B.	ISSUED FOR CODING	03/01/14

United Utilities

Solution design supported by MWH

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i - www.ghalivigunn.com

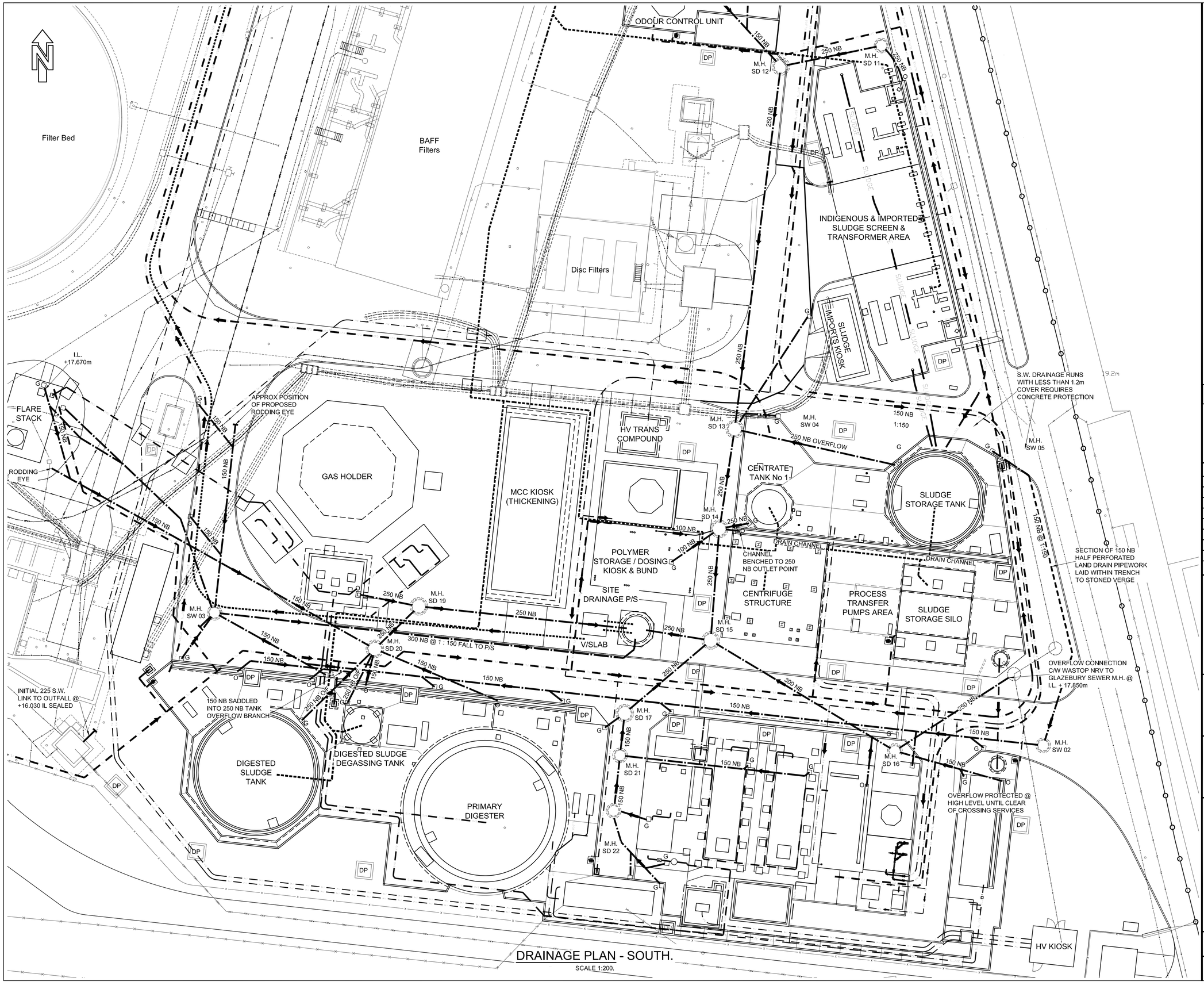
UNITED UTILITIES

LEIGH WwTW SLUDGE

SITE DRAINAGE PLAN - (NORTH)

SHEET 1 OF 2

SCALE	SHEET SIZE
1:200	A1
DRAWING NUMBER	REVISION
6316/80019739/02/01/10030	E



DRAINAGE PLAN - SOUTH.

SCALE 1:200.

NOTES

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS IN MILLIMETERS (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.
3. ALL DIMENSIONS & LEVELS CHECKED ON SITE AND ANY DISCREPANCIES REPORTED TO GHA LIVIGUNN.
4. ALL LEVELS SHOWN ARE RELATIVE TO ORDINANCE DATUM.
5. MANHOLES DETAILED BUILT IN ACCORDANCE WITH U.U. STANDARD DETAILS. SPECIFICALLY FOR MANHOLE TYPES REFER TO U.U. STANDARD DETAIL DRG No STND/01/004.

LEGEND

- SITE DRAINAGE PIPEWORK AND MANHOLES
- G — GULLY
- O — OUTLET POINT

AS BUILT

RECORD DRAWING STATUS

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REFERENCE DRAWINGS.

6316/80019739/02/01/10030	SITE DRAINAGE (SHEET 1 OF 2)
6316/80019739/02/01/10032	MANHOLE SCHEDULE

CURRENT ISSUE INFORMATION

VERSION	DRWN	CHKD	REVD		DATE
H	H.M	K.C	G.B	AS BUILT	22.03.18
G	M.R.	R.T.	G.B.	S.W. M.H 06 REMOVED	23.11.15
F	M.R.	R.T.	G.B.	REVISIONS AS NOTED, S.W. ROUTE REVISED	06.11.15
E	M.R.	K.C.	G.B.	MINOR REVISIONS AS NOTED	02.06.15
D	M.R.	K.C.	G.B.	ISSUED FOR CONSTRUCTION	11.03.15
C	M.R.	K.C.	G.B.	ISSUED FOR CODING	09.02.15
B	M.R.	K.C.	G.B.	ISSUED PRELIMINARY	24.11.14
A	M.R.	K.C.	G.B.	ISSUED FOR CODING	03/01/14

United Utilities

Solution design supported by MWH

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e - mail@ghalivigunn.com
i - www.ghalivigunn.com

UNITED UTILITIES

LEIGH WwTW SLUDGE

SITE DRAINAGE PLAN - (SOUTH)

SHEET 2 OF 2

SCALE	SHEET SIZE
1:200	A1
DRAWING NUMBER	REVISION
6316/80019739/02/01/10031	I

Appendix J: Site Surfacing Plan

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES AOD UNLESS NOTED OTHERWISE

KEY

A. CENTRATE DISCHARGE POINT
B. POTABLE WATER STORAGE TANKS
C. DEWATERING CENTRIFUGES
D. POLYELECTROLYTE STORAGE AND DOSING PLANT
E. LIQUOR TREATMENT PLANT SETTLEMENT TANK
F. LIQUOR TREATMENT PLANT
G. CENTRATE BUFFER TANK
H. CENTRATE BALANCING TANK
I. CAKE STORAGE BUILDING
J. ODOUR CONTROL UNIT
K. TANKER OFFLOADING AREA
L. SLUDGE SCREENS
M. THICKENING CENTRIFUGES
N. SCREENED SLUDGE HOLDING TANK
O. CAKE SILO
P. THERMAL HYDROLYSIS PLANT
Q. DUAL FUEL STEAM BOILER
R. GAS HOLDER
S. FLARE STACK
T. FINAL EFFLUENT PUMPING STATION AND STORAGE
U. DIGESTED SLUDGE TANK
V. DEGASSING TANK
W. DIGESTER
X. CHP ENGINES

LEGEND

- Permit Boundary
- Route of centrate discharge pipe
- Hardstanding / Concrete
- Permeable area
- Tarmac
- Gravel
- Areas excluded from Permit Boundary

O.S. MAP REFERENCE:

SJ 6598, SJ 6599, SJ 6698 & SJ 6699.

CURRENT ISSUE INFORMATION

CURRENT DRAWING STATUS	Approved
FOR INFORMATION	05/12/2022
REASON FOR ISSUE	DATE

United Utilities
Water for the North West

IED - SITE SURVEYS AND PERMITTING
LEIGH WwTW
SITE SURFACING

TO BE REPRODUCED IN COLOUR ONLY

SCALE 1 : 1250

m50 0 50m

SCALE 1:1250	SHEET SIZE A3
DRAWING NUMBER 80063025-LEIGH-DR-C-000001	REVISION A

Appendix K: Raw Materials - Material Specification Data Sheets

Biochemica MAF-900

1) PRODUCT & COMPANY

Product Name:	MAF-900
Product Usage:	Antifoam for use in Fermentation Processes
Supplier:	Biochemica UK Ltd. Unit 4 – Daimler Drive Cowpen Lane Industrial Estate Billingham TS23 4JD Telephone: +44 (0)8455 045440, Fax: +44 (0)1642 562920 Email: info@biochemica.co.uk, Website: www.biochemica.co.uk

2) HAZARDS IDENTIFICATION

Nature of Hazard:	Not classed as hazardous according to the CHIP 4 regulations.
Risk Phrases:	None
Safety Phrases:	None

3) COMPOSITION & INFORMATION ON HAZARDOUS INGREDIENTS

Description:	Aqueous Graphite Dispertion				
Non Hazardous Substance	***CAS No.***	***EINECS No.***	***Symbol***	***R Phrase***	***%***
None					

4) FIRST AID

Eye Contact:	May cause discomfort. Irrigate eye with clean water for at least 10 minutes. If discomfort persists, seek medical advice.
Skin Contact:	Unlikely to cause harmful absorption. Wash with soap and water. Launder any contaminated clothing before re-use.
Inhalation:	Low inhalation hazard. Remove to fresh air.
Ingestion:	May cause nausea and vomiting. Seek medical attention. DO NOT induce vomiting.

5) FIRE FIGHTING MEASURES

Suitable Extinguishing Media:	Carbon dioxide, foam, water jet, dry powder
Unsuitable Extinguishing Media:	None known
Protective Equip. for Fire fighters:	N/A.
Exposure Hazards:	Oxides of carbon will be produced in the event of fire.

6) ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Wear gloves (PVC or nitrile) and goggles if there is a risk of splashing. Spillage will be slippery.
Environmental Precautions:	Prevent large spillage's entering drains.
Clean-up Procedures:	Absorb using suitable material e.g. sand, universal absorbent. Scrape up and place into suitable containers for disposal

7) HANDLING & STORAGE

Precautions for safe handling:	Wear gloves and goggles if product is likely to be splashed.
Storage Protection:	Store away from frost, and below 30°C.

8) EXPOSURE CONTROL/ PERSONAL PROTECTION

Biochemica MAF-900

Technical Protective Measures:	None required.
Exposure Control Limits:	N/A.
Respiratory Protection:	Not necessary, unless used in a confined poorly ventilated area.
Hand Protection:	Gloves (PVC or nitrile) recommended
Eye/Face Protection:	Goggles advised if there is a risk of splashing.
Skin Protection:	If splashing risk is significant, the use of a chemical apron is recommended.

9) PHYSICAL & CHEMICAL PROPERTIES

Physical State:	Mobile liquid
Colour:	Colourless.
Odour:	None.
Boiling Point/Range:	Decomposes.
Relative Density/Specific Gravity:	1.02g/cm^3
Viscosity:	approx. 1000cps at 25°C
Solubility in Water:	Soluble in cold water.
Solubility in fats & Oils:	Dispersible.
pH value:	N/A
Flash Point:	>150°C
Auto-Ignition Temperature:	>300°C
Partitian Co-Eff. (n-Octanol/Water):	Not determined.
Oxidising Properties:	N/A.
Explosive limits:	N/A.
Flammability:	Product is combustible.
Vapour Pressure:	N/A.
Vapour Density:	Not determined.
Melting Point/Range:	Not determined.
Miscibility:	With water and oily/fatty systems.
Autoflammability:	Auto ignition temperature is greater than 300°C.

10) STABILITY & REACTIVITY

Material is Stable and unreactive:	
Conditions to Avoid:	Extremes of heat and cold.
Materials to Avoid:	Strong oxidising agents.
Hazardous Decomposition Products:	None.

11) TOXICOLOGICAL INFORMATION

The product is of low toxicity.

12) ECOLOGICAL INFORMATION

Passes OECD test for Biodegradability. Not classed as dangerous for aquatic organisms.

13) DISPOSAL CONSIDERATIONS

Action:	Disposal method; Product may be incinerated at an approved site in accordance with local and national regulations.

14) TRANSPORT INFORMATION

Action:	This product is not subject to regulation.

15) REGULATORY INFORMATION

Classification:	Non hazardous.
Specific EC Controls:	CHIP 4 Regulations.

Biochemica MAF-900

16) OTHER INFORMATION

Recommended Uses & Restrictions:	As an antifoam for use in fermentation processes.
Sources of Key data:	Suppliers Health & Safety Data Information CHIP4 Regulations.
General:	Whilst Biochemica UK Ltd has taken every care to ensure the accuracy of the data contained in this document, no guarantee or liability will be assumed. It is recommended that customers satisfy themselves of the suitability of all products purchased for their own use.
	Every effort has been made to ensure that the information in this Safety Data Sheet is accurate and reliable, but the company cannot accept liability for any loss, injury or damage resulting from its use.
	The data given in this Material Safety Data Sheet is solely for the guidance in safe handling and use of the product by customers - it does not constitute a specification. Customers are reminded that there may be applications of our products under patent protection, under which they have no rights.
	If any difficulties should arise, we will be happy to discuss them. Customers are encouraged to carry out their own tests prior to using any Biochemica product. Please read the label carefully.

Safety Data Sheet

Safety Data Sheet according to Regulation (EC) No. 1907/2006 (REACH)

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Substance name:	**Gas Oil**
Code:	**814649**
Unique Formula Identifier (UFI):	**T1XX-MRKK-FJ7T-DYMR**
MARPOL Annex I Category:	Gas Oils, Including Ship's Bunkers
REACH Registration Number:	Not applicable
Issue date:	18-Nov-2020

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:	Heating and fuel oil for industrial applications
Uses advised against:	Uses other than those covered by the exposure scenarios appended to this Safety Data Sheet are not supported.

1.3. Details of the supplier of the safety data sheet

Manufacturer/Supplier:	Phillips 66 Ltd, Humber Refinery South Killingholme, North Lincolnshire DN40 3DW UK
Customer Service:	+44 (0)1469 571572
SDS Information:	URL: www.Phillips66.com/SDS Email: ESDS@P66.com

1.4. Emergency telephone number

CHEMTREC Global +1 703 527 3887
CHEMTREC UK +(44)-870-8200418

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

CLP Classification (EC No 1272/2008)

H226 - Flammable liquids -- Category 3
H304 -- Aspiration Hazard -- Category 1
H315 -- Skin corrosion/irritation -- Category 2
H332 -- Acute toxicity, Inhalation -- Category 4
H350 -- Carcinogenicity -- Category 1B
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2 (Immune system/Liver)
H400 -- Hazardous to the aquatic environment, acute toxicity -- Category 1
H410 -- Hazardous to the aquatic environment, chronic toxicity -- Category 1

2.2. Label elements

DANGER

H226 - Flammable liquid and vapour
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H332 - Harmful if inhaled
H350 - May cause cancer

H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting

2.3. Other hazards

Electrostatic charge may be generated during pumping and other operations
Does not meet the criteria for persistent, bioaccumulative and toxic (PBT) or very persistent, very bioaccumulative (vPvB) substances.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Chemical Name	CASRN	EINECS	REACH Registration No	Concentration[1]	Classification[2]
Distillates, petroleum, light catalytic cracked	64741-59-9	265-060-4	01-2119489734-23	0-100	Flam. Liq. 3, H226 Asp. Tox. 1, H304 Skin Irrit. 2, H315 Acute Tox. 4, H332 Carc. 1B, H350 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Distillates, petroleum, hydrodesulfurized middle	64742-80-9	265-183-3	01-2119480406-37	0-100	Flam. Liq. 3, H226 Asp. Tox. 1, H304 Skin Irrit. 2, H315 Acute Tox. 4, H332 Carc. 1B, H350 STOT RE 2, H373 Aquatic Chronic 2, H411
Fuels, diesel	68334-30-5	269-822-7	01-2119484664-27	0-100	Flam. Liq. 3, H226 Asp. Tox. 1, H304 Skin Irrit. 2, H315 Acute Tox. 4, H332 Carc. 2, H351 STOT RE 2, H373 Aquatic Chronic 2, H411
Petroleum gas oil fraction, co-processed (catalytic cracking) with renewable hydrocarbons of plant and/or animal origin	RR-167902-3	945-893-6	01-2120737197-49	0-10	Flam. Liq. 3, H226 Asp. Tox. 1, H304 Skin Irrit. 2, H315 Acute Tox. 4, H332 Carc. 1B, H350 STOT RE 2, H373 Aquatic Chronic 1, H410
Fatty acids, C14-18 and C16-18-unsaturated, methyl esters	67762-26-9	267-007-0	01-2119471662-36	0-10	-
Fatty acids, C16-18 and C18-unsaturated, methyl esters	67762-38-3	267-015-4	01-2119471664-32	0-10	-
Naphthalene	91-20-3	202-049-5	-	<1	Acute Tox. 4, H302 Carc. 2, H351

					Aquatic Acute 1, H400 Aquatic Chronic 1, H410

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.
[2] Regulation EC 1272/2008.
See Section 11 for more information.

Total Sulphur: < 0.1 wt%

Gas oil for marine use contains <0.1% fatty acids, ME (FAME).

SECTION 4: First aid measures

4.1. Description of first aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation: If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

While significant vapour concentrations are not likely, high concentrations can cause minor respiratory irritation, headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Ingestion can cause irritation of the digestive tract, nausea, diarrhea, and vomiting. Prolonged or repeated contact may dry skin and cause irritation

4.3. Indication of any immediate medical attention and special treatment needed

Other Comments: None

SECTION 5: Firefighting measures

5.1. Extinguishing media

Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

5.2. Special hazards arising from the substance or mixture

Unusual Fire & Explosion Hazards: Flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe) Vapours may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapour/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapours are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulphur may also be formed.

5.3. Special protective actions for fire-fighters

For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapours and to protect personnel. Avoid spreading burning liquid with water used for cooling purposes. Cool equipment exposed to fire with water, if it can be done safely.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorised personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

6.2. Environmental precautions

Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorised drainage systems, and natural waterways. Use foam on spills to minimise vapours Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

6.3. Methods and material for containment and cleaning up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Use non-sparking tools. Use only outdoors or in a well-ventilated area. Do not breathe vapour or mist. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Flammable. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes for specific bonding/grounding requirements). Do not enter confined spaces such as tanks or pits without following proper entry procedures. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. May vaporize easily at ambient temperatures. The vapour is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas.

The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of incomplete combustion products (e.g. carbon monoxide, oxides of sulphur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

7.2. Conditions for safe storage, including any incompatibilities

Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to appropriate guidance pertaining to cleaning, repairing, welding, or other contemplated operations. Outdoor or detached storage is preferred. Indoor storage should meet Country or Committee standards and appropriate fire codes.

7.3. Specific end use(s)

Refer to supplemental exposure scenarios if attached.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational Exposure Limits:

Chemical Name	ACGIH	Ireland	United Kingdom	Phillips 66
Fuels, diesel	TWA-8hr: 100 mg/m^3 inhalable fraction and vapor Skin	TWA-8hr: 100 mg/m^3 STEL: 300 mg/m^3	---	TWA-8hr: 100 mg/m^3 Skin
Naphthalene	TWA-8hr: 10 ppm Skin	TWA-8hr: 10 ppm TWA-8hr: 50 mg/m^3 STEL: 30 ppm STEL: 150 mg/m^3	---	TWA-8hr: 10 ppm Skin

STEL = Short Term Exposure Limit (15 minutes); TWA = Time Weighted Average (8 hours); --- = No Occupational Exposure Limit. Local regulations may be more stringent than regional or national requirements.

Biological Limit Values:

Chemical Name	ACGIH	European Union	United Kingdom
Naphthalene	1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis in : , end of shift (nonquantitative, nonspecific)	---	---

Local regulations may be more stringent than regional or national requirements

Relevant DNEL and PNEC:

Worker Derived No-Effect Level (DNEL)
Inhalation: 27.3 mg/m^3
Dermal: 2.4 mg/kgbw/day

Consumer Derived No-Effect Level (DNEL)
Inhalation: Not applicable
Dermal: Not applicable
Ingestion: Not applicable

Environmental Predicted No-Effect Concentration (PNEC): No information available

8.2. Exposure controls

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds EN 166 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, close fitting eye protection and a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled that comply with EN 374 is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile rubber

Respiratory Protection: Where there is potential for airborne exposure above the exposure limit an approved air purifying respirator equipped with Type A, organic gases and vapour filters (as specified by the manufacturer) may be used.

A respiratory protection programme that follows recommendations for the selection, use, care and maintenance of respiratory protective devices in EN 529:2005 should be followed whenever workplace conditions warrant a respirator's use. Air purifying respirators provide limited protection and cannot be used in atmospheres that exceed the maximum use concentration (as directed by regulation or the manufacturer's instructions), in oxygen deficient (less than 19.5 percent oxygen) situations, or under conditions that are immediately dangerous to life and health.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Environmental Exposure Controls: Refer to Sections 6, 7, 12 and 13.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Data represent typical values and are not intended to be specifications. N/A = Not Applicable; N/D = Not Determined

Appearance:	Clear red
Physical form of product:	Liquid
Odour:	Diesel fuel
Odour threshold:	N/D
pH:	N/A
Melting / freezing point:	N/D
Initial boiling point and boiling range:	356 - 734 °F / 180 - 390 °C
Flash point:	> 55 °C; (Marine Gas Oil >60°C)
Method:	CC (closed cup)
Evaporation Rate (nBuAc=1):	N/D
Flammability (solid, gas):	N/A
Upper Explosive Limits (vol % in air):	5.0
Lower Explosive Limits (vol % in air):	0.5
Vapour pressure:	<0.3 kPa @20°C
Vapour density:	>1 (air = 1)
Relative density:	0.82-0.875 @ 60ºF (15.6ºC) (water = 1)
Solubility(ies):	Negligible
Partition coefficient n-octanol /water (log KOW):	N/D
Autoignition temperature:	250 °C
Decomposition temperature:	N/D
Viscosity:	4.8 mm²/s @ 20°C; 1.5-5.5 mm²/s @ 40°C
Explosive properties:	N/D
Oxidising properties:	N/D

9.2. Other information

Other information

Pour point:	-24 °C
Bulk Density::	N/D

SECTION 10: Stability and reactivity

10.1. Reactivity Not chemically reactive.

10.2. Chemical stability Stable under normal ambient and anticipated conditions of use.

10.3. Possibility of hazardous reactions Hazardous reactions not anticipated.

10.4. Conditions to avoid Avoid high temperatures and all sources of ignition. Prevent vapour accumulation.

10.5. Incompatible materials Avoid contact with strong oxidizing agents and strong reducing agents.

10.6. Hazardous decomposition products Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Harmful if inhaled		>4.1 mg/L (mist, estimated) (rat)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated) (rabbit)
Oral	Unlikely to be harmful		> 5 g/kg (estimated) (rat)

Likely Routes of Exposure: Inhalation, eye contact, skin contact

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitisation: Not expected to be a skin sensitizer.

Respiratory Sensitisation: No information available on the mixture, however none of the components have been classified for respiratory sensitisation (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Single Exposure): Not expected to cause organ effects from single exposure.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.
Carcinogenicity: May cause cancer.

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

11.2 Information on Hazardous Components

Distillates, petroleum, light catalytic cracked
Carcinogenicity: Repeated skin application of cracked gas oils has been shown to cause an increased incidence of skin tumours in mice.
Target Organ(s): Repeated dermal application of petroleum gas oils for 90 days resulted in decreased liver, thymus, and spleen weights, and altered bone marrow function. Microscopic alterations included liver hypertrophy and necrosis, decreased hematopoesis and lymphocyte depletion.
Target organs, tissues and biological systems: Liver, Immune system

Distillates, petroleum, hydrodesulfurized middle
Target Organ(s): Repeated dermal application of petroleum gas oils for 90 days resulted in decreased liver, thymus, and spleen weights, and altered bone marrow function. Microscopic alterations included liver hypertrophy and necrosis, decreased hematopoesis and lymphocyte depletion.
Target organs, tissues and biological systems: Liver, Immune system

Fuels, diesel
Carcinogenicity: Repeated application of residual aromatic extracts to mouse skin resulted in an increased incidence of skin tumours. They have been identified as a carcinogen by IARC.
Target Organ(s): Repeated dermal application of petroleum gas oils for 90 days resulted in decreased liver, thymus, and spleen weights, and altered bone marrow function. Microscopic alterations included liver hypertrophy and necrosis, decreased hematopoesis and lymphocyte depletion.
Target organs, tissues and biological systems: Liver, Immune system
Petroleum gas oil fraction, co-processed (catalytic cracking) with renewable hydrocarbons of plant and/or animal origin
Carcinogenicity: Repeated skin application of cracked gas oils has been shown to cause an increased incidence of skin tumours in mice.
Target Organ(s): Repeated dermal application of petroleum gas oils for 90 days resulted in decreased liver, thymus, and spleen weights, and altered bone marrow function. Microscopic alterations included liver hypertrophy and necrosis, decreased hematopoesis and lymphocyte depletion.
Target organs, tissues and biological systems: Liver, Immune system
Naphthalene
Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Programme (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

SECTION 12: Ecological information

12.1. Toxicity

Experimental studies of gas oils show that acute aquatic toxicity values are typically in the range 2-20 mg/L. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions. They should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment.

12.2. Persistence and degradability

Gas oils are complex combinations of individual hydrocarbon species. Based on the known or expected properties of individual constituents, category members are not predicted to be readily biodegradable. Some hydrocarbon constituents of gas oils are predicted to meet the criteria for persistence; on the other hand, some components can be easily degraded by microorganisms under aerobic conditions.

Persistence per IOPC Fund definition: Non-Persistent

12.3. Bioaccumulative potential

Gas oil components have measured or calculated Log Kow values in the range of 3.9 to 6 which indicates a high potential to bioaccumulate. Lower molecular weight compounds are readily metabolized and the actual bioaccumulation potential of higher molecular weight compounds is limited by the low water solubility and large molecular size.

12.4. Mobility in soil

Releases to water will result in a hydrocarbon film floating and spreading on the surface. For the lighter components, volatilisation is an important loss process and reduces the hazard to aquatic organisms. In air, the hydrocarbon vapours react readily with hydroxyl radicals with half-lives of less than one day. Photoxidation on the water surface is also a significant loss process particularly for polycyclic aromatic compounds. In water, the majority of components will be adsorbed on sediment. Adsorption is the most predominant physical process on release to soil. Adsorbed hydrocarbons will slowly degrade in both water and soil.

12.5. Results of PBT and vPvB assessment
Not a PBT or vPvB substance.

12.6. Other adverse effects
None anticipated.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

European Waste Code: 13 07 01* fuel oil and diesel

This material, if discarded as produced, would be considered as hazardous waste pursuant to Directive 2008/98/EC on hazardous waste, and subject to the provisions of that Directive unless Article 1(5) of that Directive applies.
This code has been assigned based upon the most common uses for this material and may not reflect contaminants resulting from actual use. Waste generators/producers are responsible for assessing the actual process used when generating the waste and it's contaminants in order to assign the proper waste disposal code.

Disposal must be in accordance with Directive 2008/98/EC and other applicable national or regional provisions, and based upon material characteristics at time of disposal. For incineration of waste, follow Directive 2000/76/EC. For landfill of waste, follow Directive 1999/31/EC. Product is suitable for burning in an enclosed controlled burner for fuel value if >5000 BTU, or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Follow Directive 2000/76/EC.

Empty Containers: Container contents should be completely used and containers emptied prior to discard. Empty drums should be properly sealed and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with applicable regulations.

SECTION 14: Transport information

14.1. UN number
UN1202

14.2. UN proper shipping name
Diesel fuel; Gas oil; Heating oil, light,

14.3. Transport hazard class(es)
3

14.4. Packing group
III

14.5. Environmental hazards
Marine pollutant - Environmentally Hazardous

14.6. Special precautions for user
If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EC 1272/2008 - Classification, labelling and packaging of substances and mixtures
EN166:2002 Eye Protection
EN 529:2005 Respiratory Protective devices
BS EN 374-1:2003 Protective gloves against chemicals and micro-organisms
Workplace Exposure Limits, EH40/2005, Control of Substances Hazardous to Health
Directive 2008/98/EC (Waste Framework Directive)
Directive 2000/76/EC on incineration of waste
Directive 1999/31/EC on landfill of waste

Export Rating: NLR (No Licence Required)

15.2. Chemical safety assessment

A chemical safety assessment has been carried out for the substance/mixture.

SECTION 16: Other information

Issue date	18-Nov-2020
Status:	FINAL
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Revised Sections or Basis for Revision:	Unique Formula Identifier (UFI) Toxicological (Section 11) Format change
Safety Data Sheet Number:	**814649**
Language:	BE

List of Relevant Hazard Statements:
H226 - Flammable liquid and vapour
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H332 - Harmful if inhaled
H350 - May cause cancer
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects

Regulatory Basis of Classification

CLP Classification (EC No 1272/2008)	Regulatory Basis
H226 - Flammable liquids -- Category 3	On basis of test data
H304 -- Aspiration Hazard -- Category 1	Based on component information.
H315 -- Skin corrosion/irritation -- Category 2	Based on component information.
H332 -- Acute toxicity, Inhalation -- Category 4	Based on component information.
H350 -- Carcinogenicity -- Category 1B	Based on component information.
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2 (Immune system/Liver)	Based on component information.
H400 -- Hazardous to the aquatic environment, acute toxicity -- Category 1	Based on component information.
H410 -- Hazardous to the aquatic environment, chronic toxicity -- Category 1	Based on component information.

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; ADR = Agreement on Dangerous Goods by Road; BMGV = Biological Monitoring Guidance Value; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA = [US] Environmental Protection Agency; Germany-TRGS = Technical Rules for Dangerous Substances; IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organisation / International Air Transport Association; INSHT = National Institute for Health and Safety at Work; IMDG = International Maritime Dangerous Goods; Irland-HSA = Ireland's National Health and Safety Authority; LEL = Lower Explosive Limit; MARPOL = Marine Pollution; N/A = Not Applicable; N/D = Not Determined; NTP = [US] National Toxicology Programme; PBT = Persistent, Bioaccumulative and Toxic; RID = Regulations Concerning the International Transport of Dangerous Goods by Rail; STEL = Short Term Exposure Limit; TLV = Threshold Limit Value; TRGS 903 = Technical rules for hazardous substances; TWA = Time Weighted Average; UEL = Upper Explosive Limit; UK-EH40 = United Kingdom EH40/2005 OEL; vPvB = very Persistent, very Bioaccumulative

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The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorisation is given nor implied to practice any patented invention without a licence.

1. Manufacture of substance - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Manufacture of substance
Use Descriptor	
Sector(s) of use	3, 8, 9
Process category(ies)	1, 2, 3, 4, 8a, 8b, 15
Environmental release category(ies)	1, 4
Specific Environmental Release Category	ESVOC SpERC 1.1.v1
Processes, tasks, activities covered	
Manufacture of the substance or use as a process chemical or extraction agent. Includes recycling/recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Operation is carried out at elevated temperature (>20°C above ambient temperature). Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Wear suitable gloves tested to EN374.
Process sampling	No other specific measures identified
bulk closed loading and unloading	Handle substance within a closed system Wear suitable gloves tested to EN374.
bulk open loading and unloading	Wear suitable gloves tested to EN374.
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or

	maintenance Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Laboratory activities	No other specific measures identified
Bulk product storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.8e7
Fraction of regional tonnage used locally	0.021

Frequency and duration of use
Continuous release.

Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-2
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-5
Release fraction to soil from process (initial release prior to RMM)	0.0001

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or recover from onsite wastewater.

Treat air emission to provide a typical removal efficiency of (%):	90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	90.3
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0

Organisation measures to prevent/limit release from site
Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	3.3e6
Assumed domestic sewage treatment plant flow (m^3/d):	10000

Conditions and measures related to external treatment of waste for disposal
During manufacturing no waste of the substance is generated.

Conditions and measures related to external recovery of waste
During manufacturing no waste of the substance is generated.

Section 3 Exposure Estimation

3.1 Health

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.
3.2 Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.
Section 4 Guidance to check compliance with the Exposure Scenario
4.1 Health
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.
4.2 Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf). Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file – "Site-Specific Production" worksheet.

2. Use of substance as an intermediate - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as an intermediate
Use Descriptor	
Sector(s) of use	3, 8, 9
Process category(ies)	1, 2, 3, 4, 8a, 8b, 15
Environmental release category(ies)	6a
Specific Environmental Release Category	ESVOC SpERC 6.1a.v1
Processes, tasks, activities covered	
Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Operation is carried out at elevated temperature (>20°C above ambient temperature). Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to

	EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Wear suitable gloves tested to EN374.
Process sampling	No other specific measures identified
bulk closed loading and unloading	Handle substance within a closed system Wear suitable gloves tested to EN374.
bulk open loading and unloading	Wear suitable gloves tested to EN374.
Equipment cleaning and maintenance	No other specific measures identified
Laboratory activities	No other specific measures identified
Bulk product storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	3.5e5
Fraction of regional tonnage used locally	0.043

Frequency and duration of use
Continuous release.

Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-5
Release fraction to soil from process (initial release prior to RMM)	0.001

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or recover from onsite wastewater.

Treat air emission to provide a typical removal efficiency of (%):	80
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	51.7
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0

Organisation measures to prevent/limit release from site
Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment	94.1

plant) RMMs (%):	
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	4.1e5
Assumed domestic sewage treatment plant flow (m³/d):	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and no waste of the substance is generated.	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

3. Distribution of substance - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Distribution of substance
Use Descriptor	
Sector(s) of use	3
Process category(ies)	1, 2, 3, 4, 8a, 8b, 9, 15
Environmental release category(ies)	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7
Specific Environmental Release Category	ESVOC SpERC 1.1b.v1
Processes, tasks, activities covered	
Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to

	minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Wear suitable gloves tested to EN374.
Process sampling	No other specific measures identified
Laboratory activities	No other specific measures identified
bulk closed loading and unloading	Handle substance within a closed system Wear suitable gloves tested to EN374.
bulk open loading and unloading	Wear suitable gloves tested to EN374.
Drum and small package filling	Wear suitable gloves tested to EN374.
Equipment cleaning and maintenance	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.8e7
Fraction of regional tonnage used locally	0.002

Frequency and duration of use
Continuous release.

Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-6
Release fraction to soil from process (initial release prior to RMM)	0.00001

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or recover from onsite wastewater.

Treat air emission to provide a typical removal efficiency of (%):	90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	9.6

If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0
Organisation measures to prevent/limit release from site Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	4.1e5
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
This substance is consumed during use and no waste of the substance is generated.	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

4. Formulation & (Re)packing of substance - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Formulation & (re)packing of substances and mixtures
Use Descriptor	
Sector(s) of use	3, 10
Process category(ies)	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15
Environmental release category(ies)	2
Specific Environmental Release Category	ESVOC SpERC 2.2.v1
Processes, tasks, activities covered	
Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	Specific Risk Management Measures & Operating Conditions
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Wear suitable gloves tested to EN374.
Process sampling	No other specific measures identified
Drum/batch transfers	Use drum pumps or carefully pour from container Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Bulk transfers	Handle substance within a closed system Wear suitable gloves tested to EN374.
Mixing operations (open systems)	Provide extract ventilation to points where emissions occur Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Production or preparation or articles by tabletting, compression, extrusion or pelletisation	Wear suitable gloves tested to EN374.
Drum/batch transfers	Wear suitable gloves tested to EN374.
Laboratory activities	No other specific measures identified
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Wear suitable gloves tested to EN374.
Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.8e7
Fraction of regional tonnage used locally	0.0011

Frequency and duration of use

Continuous release.	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0e-2
Release fraction to wastewater from process (initial release prior to RMM)	2.0e-5
Release fraction to soil from process (initial release prior to RMM)	0.0001
Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment. Prevent discharge of undissolved substance to or recover from onsite wastewater.	
Treat air emission to provide a typical removal efficiency of (%):	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	60.0
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0
Organisation measures to prevent/limit release from site Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	91.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	6.8e5
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

5. Use of substance in Metal working fluids / rolling oils - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Metal working fluids / rolling oils
Use Descriptor	
Sector(s) of use	3
Process category(ies)	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 17

Environmental release category(ies)	4
Specific Environmental Release Category	ESVOC SpERC 4.7a.v1
Processes, tasks, activities covered	
Covers the use in formulated MWFs/rolling oils including transfer operations, rolling and annealing activities, cutting/machining activities, automated and manual application of corrosion protections (including brushing, dipping and spraying), equipment maintenance, draining and disposal of waste oils.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
General exposures (closed systems)	Handle substance within a closed system
General exposures (open systems)	Provide extract ventilation to points where emissions occur
Bulk transfers	Handle substance within a closed system Wear suitable gloves tested to EN374.
Filling / preparation of equipment from drums or containers	Wear suitable gloves tested to EN374.
Process sampling	No other specific measures identified
Metal machining operations	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.
Treatment by dipping and pouring	Wear suitable gloves tested to EN374.
Spraying	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) Wear suitable gloves (tested to EN374), coverall and eye protection.
Manual Roller, spreader, flow application	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Automated metal rolling/forming	Handle substance within a predominantly closed system provided with extract ventilation
Semi-automated metal rolling/forming	Provide extract ventilation to points where emissions occur
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.0e4
Fraction of regional tonnage used locally	0.01

Frequency and duration of use
Continuous release.

Emission days (days/year)	20
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	0.02
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-6
Release fraction to soil from process (initial release prior to RMM)	0

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Treat air emission to provide a typical removal efficiency of (%):	70
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	8.3
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0

Organisation measures to prevent/limit release from site
Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	7.8e4
Assumed domestic sewage treatment plant flow (m^3/d):	2000

Conditions and measures related to external treatment of waste for disposal
External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste
External recovery and recycling of waste should comply with applicable local and/or national regulations.

Section 3 Exposure Estimation

3.1 Health
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

3.2 Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Section 4 Guidance to check compliance with the Exposure Scenario

4.1 Health
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.
4.2 Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).

6. Use of substance as Release agents or binders - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as binders and release agents
Use Descriptor	
Sector(s) of use	3
Process category(ies)	1, 2, 3, 4, 6, 7, 8b, 10, 13, 14
Environmental release category(ies)	4
Specific Environmental Release Category	ESVOC SpERC 4.10a.v1
Processes, tasks, activities covered	
Covers the use as binders and release agents including material transfers, mixing, application (including spraying and brushing), mold forming and casting, and handling of waste.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are

	likely to lead to substantial aerosol release, e.g. spraying
Bulk transfers	Handle substance within a closed system
Drum/batch transfers	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Mixing operations (closed systems)	No other specific measures identified
Mixing operations (open systems)	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Mould forming	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Casting operations (open systems)	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Wear suitable gloves tested to EN374.
Machine Spraying	Minimise exposure by extracted full enclosure for the operation or equipment. Wear suitable gloves tested to EN374.
Manual Spraying	Wear a full face respirator conforming to EN140 with Type A/P2 filter or better. Wear suitable gloves (tested to EN374), coverall and eye protection. Ensure operatives are trained to minimise exposures.
Manual Roller, spreader, flow application	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.
Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.4e4
Fraction of regional tonnage used locally	0.18

Frequency and duration of use
Continuous release.

Emission days (days/year)	100
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	1.0
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-7
Release fraction to soil from process (initial release prior to RMM)	0

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Treat air emission to provide a typical removal efficiency of (%):	80
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal	59.2

efficiency >= (%):	
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0
Organisation measures to prevent/limit release from site Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	1.7e5
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

7. Use of substance as Release agents or binders - Professional

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as binders and release agents
Use Descriptor	
Sector(s) of use	22
Process category(ies)	1, 2, 3, 4, 6, 8a, 8b, 10, 11, 14
Environmental release category(ies)	8a, 8d
Specific Environmental Release Category	ESVOC SpERC 8.10b.v1
Processes, tasks, activities covered	
Covers the use as binders and release agents including material transfers, mixing, application by spraying, brushing, and handling of waste.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	Specific Risk Management Measures & Operating Conditions
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Other skin protection measures such as impervious suits and face shields may be required during high dispersion activities which are likely to lead to substantial aerosol release, e.g. spraying
Material transfers (closed systems)	No other specific measures identified
Drum/batch transfers	Wear suitable gloves tested to EN374.
Mixing operations (closed systems)	No other specific measures identified
Mixing operations (open systems)	Wear suitable gloves tested to EN374.
Mould forming	Provide extract ventilation to points where emissions occur Wear suitable gloves tested to EN374.
Casting operations with local exhaust ventilation	Provide extract ventilation to points where emissions occur Wear suitable gloves tested to EN374.
Casting operations without local exhaust ventilation	Wear a respirator conforming to EN140 with Type A/P2 filter or better. Wear suitable gloves (tested to EN374), coverall and eye protection.
Spraying Manual without local exhaust ventilation	Carry out in a vented booth or extracted enclosure Wear suitable gloves (tested to EN374), coverall and eye protection. Ensure operatives are trained to minimise exposures.
Spraying Manual without local exhaust ventilation	Wear a full face respirator conforming to EN140 with Type A/P2 filter or better. Wear suitable gloves (tested to EN374), coverall and eye protection. Ensure operatives are trained to minimise exposures.
Manual Roller, spreader, flow application	Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Storage	Store substance within a closed system
Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to	

protect from these adverse effects.	
2.2 Control of environmental exposure	
Product characteristics Substance is complex UVCB. Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	2.9e3
Fraction of regional tonnage used locally	0.0005
Frequency and duration of use Continuous release.	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	0.95
Release fraction to wastewater from process (initial release prior to RMM)	0.025
Release fraction to soil from process (initial release prior to RMM)	0.025
Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.	
Treat air emission to provide a typical removal efficiency of (%):	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	8.3
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0
Organisation measures to prevent/limit release from site Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	6.2e1
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
External treatment and disposal of waste should comply with applicable local and/or national regulations.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

8. Use of substance as a Fuel - Industrial

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as a fuel
Use Descriptor	
Sector(s) of use	3
Process category(ies)	1, 2, 3, 8a, 8b, 16
Environmental release category(ies)	7
Specific Environmental Release Category	ESVOC SpERC 7.12a.v1
Processes, tasks, activities covered	
Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
Bulk transfers	Wear suitable gloves tested to EN374.
Drum/batch transfers	Wear suitable gloves tested to EN374.
Use as a fuel (closed systems)	No other specific measures identified
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.
Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived.

Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.	
2.2 Control of environmental exposure	
Product characteristics Substance is complex UVCB. Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	4.5e6
Fraction of regional tonnage used locally	0.34
Frequency and duration of use Continuous release.	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Release fraction to air from process (initial release prior to RMM)	5.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	0.00001
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.	
Treat air emission to provide a typical removal efficiency of (%):	95
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	97.7
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	60.4
Organisation measures to prevent/limit release from site Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	97.7
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	5.5e6
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
Combustion emissions considered in regional exposure assessment.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.	
4.2 Environment	
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to	

define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).

9. Use of substance as a Fuel - Professional

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as a fuel
Use Descriptor	
Sector(s) of use	22
Process category(ies)	1, 2, 3, 8a, 8b, 16
Environmental release category(ies)	9a, 9b
Specific Environmental Release Category	ESVOC SpERC 9.12b.v1
Processes, tasks, activities covered	
Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.	
Section 2 Operational conditions and risk management measures	
2.1 Control of worker exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other operational conditions affecting exposure	Assumes use at not more than 20°C above ambient temperature, unless stated differently. Assumes a good basic standard of occupational hygiene is implemented.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
General measures applicable to all activities	Control any potential exposure using measures such as contained or enclosed systems, properly designed and maintained facilities and a good standard of general ventilation. Drain down systems and transfer lines prior to breaking containment. Drain down and flush equipment where possible prior to maintenance.Where there is potential for exposure: Ensure relevant staff are informed of the nature of exposure and aware of basic actions to minimise exposures; ensure suitable personal protective equipment is available; clear up spills and dispose of waste in accordance with regulatory requirements; monitor effectiveness of control measures; consider the need for health surveillance; identify and implement corrective actions.
General measures (skin irritants)	Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.
Bulk transfers	Wear suitable gloves tested to EN374.
Drum/batch transfers	Use drum pumps or carefully pour from container Wear suitable gloves tested to EN374.
Refuelling	Wear suitable gloves tested to EN374.
Use as a fuel (closed systems)	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) or Ensure operation is undertaken outdoors
Equipment cleaning and maintenance	Drain down system prior to equipment break-in or maintenance Wear chemically resistant gloves (tested to EN374) in combination with ‘basic’ employee training.

Storage	Store substance within a closed system

Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.

2.2 Control of environmental exposure

Product characteristics
Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	6.7e6
Fraction of regional tonnage used locally	0.0005

Frequency and duration of use
Continuous release.

Emission days (days/year)	365

Environmental factors not influenced by risk management

Local freshwater dilution factor	10
Local marine water dilution factor	100

Other operational conditions of use affecting environmental exposure

Release fraction to air from process (initial release prior to RMM)	1.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	0.00001
Release fraction to soil from process (initial release prior to RMM)	0.00001

Technical conditions and measures at process level (source) to prevent release
Common practices vary across sites thus conservative process release estimates used.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Risk from environmental exposure is driven by freshwater sediment. If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.

Treat air emission to provide a typical removal efficiency of (%):	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency >= (%):	8.3
If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of >= (%):	0

Organisation measures to prevent/limit release from site
Prevent discharge of undissolved substance to or recover from onsite wastewater. Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to municipal sewage treatment plant

Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	1.4e5
Assumed domestic sewage treatment plant flow (m^3/d):	2000

Conditions and measures related to external treatment of waste for disposal
Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment.

Conditions and measures related to external recovery of waste
External recovery and recycling of waste should comply with applicable local and/or national regulations.

Section 3 Exposure Estimation

3.1 Health
The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

3.2 Environment
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Section 4 Guidance to check compliance with the Exposure Scenario
4.1 Health
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. Available hazard data does not enable the derivation of a DNEL for dermal irritant effects. Available hazard data does not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterization.
4.2 Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).

10. Use of substance as a Fuel - Consumer

Section 1 Exposure Scenario Vacuum or Hydrocracked Gas Oils and Distillate Fuels	
Title	Use as a fuel
Use Descriptor	
Sector(s) of use	21
Product category(ies)	13
Environmental release category(ies)	9a, 9b
Specific Environmental Release Category	ESVOC SpERC 9.12c.v1
Processes, tasks, activities covered	
Covers consumer uses in liquid fuels.	
Section 2 Operational conditions and risk management measures	
2.1 Control of consumer exposure	
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 Pa at STP
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently).
Frequency and duration of use	For each use event, covers use amounts up to (g): 37500 Covers skin contact area up to (cm2): 420
Other operational conditions affecting exposure	Covers use up to (times/day of use): 0.143. Covers exposure up to (hours/event): 2 hours per event.

Contributing Scenarios / Product Category	**Specific Risk Management Measures & Operating Conditions**
Liquid: Automotive Refuelling	Covers concentrations up to (%): 100%. Covers use up to (days/year): 52. Covers use up to (times/day of use): 1. Covers skin contact area up to (cm2): 210.00. For each use event, covers use amounts up to (g): 37500. Covers use in room size of (m^3): 100. Covers exposure up to (hours/event): 0.05. Covers outdoor use No specific risk management measure identified beyond those operational conditions stated
Liquid Garden Equipment - Use	Covers concentrations up to (%): 100%. Covers use up to (days/year): 26. Covers use up to (times/day of use): 1. For each use event, covers use amounts up to (g): 750. Covers outdoor use Covers use in room size of (m^3): 100. Covers exposure up to (hours/event): 2.00. No specific risk management measure identified beyond those operational conditions stated
Liquid: garden equipment - refuelling	Covers concentrations up to (%): 100%. Covers use up to (days/year): 26. Covers use up to (times/day of use): 1. Covers skin contact area up to (cm2): 420.00. For each use event, covers use amounts up to (g): 750. Covers use in a one car garage (34 m^3) under typical ventilation. Covers use in room size of (m^3): 34. Covers exposure up to (hours/event): 0.03. No specific risk management measure identified beyond those operational conditions

	stated
Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits acute inhalation toxicity and is classified R20 (Harmful by inhalation) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary / additional RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels exhibits irritation to the skin and is classified R38 (Irritating to skin) accordingly. The available data for this adverse effect do not provide quantitative dose-response information, but there exists toxicity data appropriate to allow a qualitative risk characterisation; please see section 2 of the SDS for the necessary RMMs. Vacuum or Hydrocracked Gas Oils and Distillate Fuels is classified R65 (Harmful: may cause lung damage if swallowed). The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aims to define the appropriate RMMs necessary to protect from this adverse effect. There is limited evidence of carcinogenic effects in Vacuum or Hydrocracked Gas Oils and Distillate Fuels and it is classified R40 (May cause cancer) accordingly. The available data for this adverse effect do not provide quantitative dose-response information for a D(M)NEL to be derived. Instead, the toxicity data triggers a qualitative risk characterisation and the RMMs in section 2 of the SDS aim to define the appropriate RMMs necessary to protect from these adverse effects.	
2.2 Control of environmental exposure	
Product characteristics Substance is complex UVCB. Predominantly hydrophobic.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tonnes/year)	1.6e7
Fraction of regional tonnage used locally	0.0005
Frequency and duration of use Continuous release.	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other operational conditions of use affecting environmental exposure	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%):	94.1
Maximum allowable site tonnage (Msafe) based on release following total wastewater treatment removal (kg/d):	3.5e5
Assumed domestic sewage treatment plant flow (m^3/d):	2000
Conditions and measures related to external treatment of waste for disposal	
Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment.	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations.	
Section 3 Exposure Estimation	
3.1 Health	
The ECETOC TRA tool has been used to estimate consumer exposures, consistent with the content of ECETOC report #107 and the Chapter R15 of the IR&CSA TGD. Where exposure determinants differ to these sources, then they are indicated.	
3.2 Environment	
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.	
Section 4 Guidance to check compliance with the Exposure Scenario	
4.1 Health	
Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented. Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.	
4.2 Environment	
Further details on scaling and control technologies are provided in SpERC factsheet (https://cefic.org/app/uploads/2019/01/SPERCs-Specific-Envirnonmental-Release-Classes-REACHImpl-ES-CSA-CSR.pdf).	

1. Identification

Product identifier used on the label

Zetag® 8185

Recommended use of the chemical and restriction on use
Recommended use*: flocculation agent

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification
Chemical family: polyacrylamide, cationic

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

No need for classification according to GHS criteria for this product.

Label elements

The product does not require a hazard warning label in accordance with GHS criteria.

Hazards not otherwise classified

Very slippery when wet.
This type of product has a tendency to create dust if roughly handled. The product does not burn readily but as with many organic powders, flammable dust clouds may be formed in air. The product is under certain conditions capable of dust explosion.

Labeling of special preparations (GHS):
This product is not combustible in the form in which it is shipped by the manufacturer, but may form a combustible dust through downstream activities (e.g. grinding, pulverizing) that reduce its particle size.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

CAS Number	Weight %	Chemical name
124-04-9	1.0 - 5.0%	adipic acid

4. First-Aid Measures

Description of first aid measures

General advice:
Remove contaminated clothing.

If inhaled:
Keep patient calm, remove to fresh air, seek medical attention.

If on skin:
Wash thoroughly with soap and water.

If irritation develops, seek medical attention.

If in eyes:
Wash affected eyes for at least 15 minutes under running water with eyelids held open.

Seek medical attention.

If swallowed:
Rinse mouth and then drink plenty of water. Do not induce vomiting. Immediate medical attention required.

Most important symptoms and effects, both acute and delayed

Symptoms: No significant symptoms are expected due to the non-classification of the product.
Hazards: No hazard is expected under intended use and appropriate handling.

Indication of any immediate medical attention and special treatment needed

Note to physician

Treatment:	Treat according to symptoms (decontamination, vital functions), no known specific antidote.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
dry powder, foam

Unsuitable extinguishing media for safety reasons:
water jet, carbon dioxide

Additional information:
If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
carbon oxides, nitrogen oxides
The substances/groups of substances mentioned can be released in case of fire. Very slippery when wet.

Advice for fire-fighters

Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus.

Further information:
The degree of risk is governed by the burning substance and the fire conditions. Contaminated extinguishing water must be disposed of in accordance with official regulations.

Dusty conditions may ignite explosively in the presence of an ignition source causing flash fire.

6. Accidental release measures

Further accidental release measures:
Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Avoid the formation and build-up of dust - danger of dust explosion. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Forms slippery surfaces with water.

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with suitable appliance and dispose of.
For large amounts: Contain with dust binding material and dispose of.
Avoid raising dust.

Nonsparking tools should be used.

7. Handling and Storage

Precautions for safe handling

Breathing must be protected when large quantities are decanted without local exhaust ventilation. Handle in accordance with good industrial hygiene and safety practice. Forms slippery surfaces with water.

Protection against fire and explosion:
Avoid dust formation. Dust in sufficient concentration can result in an explosive mixture in air. Handle to minimize dusting and eliminate open flame and other sources of ignition. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids (2013 Edition) for safe handling.

Conditions for safe storage, including any incompatibilities

Further information on storage conditions: Store in unopened original containers in a cool and dry place. Avoid wet, damp or humid conditions, temperature extremes and ignition sources.

Storage stability:
Avoid extreme heat.

8. Exposure Controls/Personal Protection

Components with occupational exposure limits

adipic acid

ACGIH TLV TWA value 5 mg/m3 ;

Advice on system design:
It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Personal protective equipment

Respiratory protection:
Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

Hand protection:
Chemical resistant protective gloves

Eye protection:
Safety glasses with side-shields.

Body protection:
No body protection required if used for intended purpose and satisfying generally accepted industrial hygiene rules.

General safety and hygiene measures:
Wear protective clothing as necessary to minimize contact. Handle in accordance with good industrial hygiene and safety practice. No eating, drinking, smoking or tobacco use at the place of work.

9. Physical and Chemical Properties

Form:	powder
Odour:	odourless
Odour threshold:	No data available.
Colour:	off-white
pH value:	3.5 - 4.5 (10 g/l)
Melting point:	The substance / product decomposes therefore not determined.
Boiling point:	not applicable
Sublimation point:	No data available.
Flash point:	not applicable
Flammability:	not highly flammable
Lower explosion limit:	For solids not relevant for classification and labelling.
Upper explosion limit:	For solids not relevant for classification and labelling.
Autoignition:	No data available.
Vapour pressure:	The product has not been tested.
Relative density:	No data available.
Bulk density:	approx. 700 kg/m3
Vapour density:	No data available.
Partitioning coefficient n-octanol/water (log Pow):	Study scientifically not justified.
Self-ignition temperature:	not self-igniting
Thermal decomposition:	No decomposition if stored and handled as prescribed/indicated.
Viscosity, dynamic:	not determined
% volatiles:	not determined
Solubility in water:	Forms a viscous solution.
Solubility (quantitative):	No data available.
Solubility (qualitative):	No data available.
Evaporation rate:	The product is a non-volatile solid.
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.

10. Stability and Reactivity

Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:
No corrosive effect on metal.

Oxidizing properties:
not fire-propagating

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.

Conditions to avoid
Avoid extreme temperatures. Avoid humidity.
Avoid electro-static discharge. Avoid dust formation.

Incompatible materials
strong acids, strong bases, strong oxidizing agents

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products: No hazardous decomposition products if stored and handled as prescribed/indicated.

Thermal decomposition:
No decomposition if stored and handled as prescribed/indicated.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity
Assessment of acute toxicity: Virtually nontoxic after a single ingestion.

Oral
Type of value: LD50
Species: rat
Value: > 5,000 mg/kg (OECD Guideline 401)

Irritation / corrosion
Assessment of irritating effects: Not irritating to eyes and skin.

Skin
Species: rabbit
Result: non-irritant
Method: OECD Guideline 404

Eye
Species: rabbit
Result: non-irritant

Sensitization
Assessment of sensitization: Based on the ingredients, there is no suspicion of a skin-sensitizing potential.

Aspiration Hazard
No aspiration hazard expected.

Chronic Toxicity/Effects

Repeated dose toxicity

Assessment of repeated dose toxicity: Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses. The product has not been tested. The statement has been derived from the properties of the individual components.

Genetic toxicity
Assessment of mutagenicity: Based on the ingredients, there is no suspicion of a mutagenic effect.

Carcinogenicity
Assessment of carcinogenicity: The whole of the information assessable provides no indication of a carcinogenic effect.

Reproductive toxicity
Assessment of reproduction toxicity: Based on the ingredients, there is no suspicion of a toxic effect on reproduction.

Teratogenicity
Assessment of teratogenicity: No teratogenic effects reported.

Other Information
The product has not been tested. The statements on toxicology have been derived from products of a similar structure and composition.

Symptoms of Exposure

No significant symptoms are expected due to the non-classification of the product.

12. Ecological Information

Toxicity

Aquatic toxicity
Assessment of aquatic toxicity:
Acute effects on aquatic organisms are due to the cationic charge of the polymer, which is quickly neutralised in natural water courses by irreversible adsorption onto particles, hydrolysis and dissolved organic carbon. Fish toxicity and aquatic toxicity are drastically reduced by rapid irreversible adsorption onto suspended and/or dissolved organic matter. The hydrolysis products are not acutely harmful to aquatic organisms. Tested was a substance with a high cationic charge density. As the acute effects are associated with the charge density, substances with a lower charge density are expected to have a lower toxicity.

Toxicity to fish
LC50 (96 h) 1 - 10 mg/l, Fish (static)

Aquatic invertebrates
EC50 (48 h) 10 - 100 mg/l, daphnia

Persistence and degradability

Assessment biodegradation and elimination (H2O)
Not readily biodegradable (by OECD criteria).

Information on Stability in Water (Hydrolysis)
> 70 % (28 d) (pH value > 6)
In contact with water the substance will hydrolyse rapidly.

Bioaccumulative potential

Assessment bioaccumulation potential
Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.

Mobility in soil

Assessment transport between environmental compartments
No data available.

Information on: cationic polyacrylamide

Adsorption to solid soil phase is expected.

Additional information

Other ecotoxicological advice:
Must not be discharged into the environment. The product has not been tested. The statement has been derived from substances/products of a similar structure or composition.

13. Disposal considerations

Waste disposal of substance:
Dispose of in accordance with national, state and local regulations.

Container disposal:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:
Not a hazardous waste under RCRA (40 CFR 261).

14. Transport Information

Land transport
USDOT

Not classified as a dangerous good under transport regulations

Sea transport
IMDG

Not classified as a dangerous good under transport regulations

Air transport
IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory Information

VOC content:

not determined

Federal Regulations

Registration status:
Chemical TSCA, US released / listed

EPCRA 311/312 (Hazard categories): Refer to SDS section 2 for GHS hazard classes applicable for this product.

State regulations

State RTK	CAS Number	Chemical name
NJ	124-04-9	adipic acid
PA	124-04-9	adipic acid

Safe Drinking Water & Toxic Enforcement Act, CA Prop. 65:

WARNING: This product can expose you to chemicals including ACRYLAMIDE, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

NFPA Hazard codes:
Health: 1 Fire: 1 Reactivity: 0 Special:

HMIS III rating
Health: 1 Flammability: 1 Physical hazard: 0 (Essentially no hazard)

16. Other Information

SDS Prepared by:
BASF NA Product Regulations
SDS Prepared on: 2018/07/17

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our operations on society and the environment during production, storage, transport, use and disposal of our products.

A PART OF OUR TERMS AND CONDITIONS OF SALE. FURTHER, YOU EXPRESSLY UNDERSTAND AND AGREE THAT THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY OUR COMPANY HEREUNDER ARE GIVEN GRATIS AND WE ASSUME NO OBLIGATION OR LIABILITY FOR THE DESCRIPTION, DESIGNS, DATA AND INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT YOUR RISK.
END OF DATA SHEET

SAFETY DATA SHEET

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name or designation of the mixture	HYDREX 1368
Registration number	-
Synonyms	None.
Issue date	19-December-2017
Version number	01

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Boiler Water Treatment
Uses advised against	None known.

1.3. Details of the supplier of the safety data sheet

Supplier	VWS UK Ltd T/A Veolia Water Technologies
Address	Windsor Court Kingsmead Business Park High Wycombe-HP11 1JU - United Kingdom
Contact person	Hydrex Product Manager
Telephone	+44 1628 897 000
Fax	+44 1628 897 001
e-mail	hydrex.watertech@veolia.com
National Emergency Number	+44 1628 897 295
Global Emergency Contact	1-760-476-3961 (code: 333239)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

The mixture has been assessed and/or tested for its physical, health and environmental hazards and the following classificatior applies.

Classification according to Regulation (EC) No 1272/2008 as amended

Health hazards

Acute toxicity, oral	Category 4	H302 - Harmful if swallowed.
Acute toxicity, dermal	Category 4	H312 - Harmful in contact with skin.

Hazard summary Causes severe skin burns and eye damage. May cause irritation to the respiratory system. May cause an allergic skin reaction. Occupational exposure to the substance or mixture may cause adverse health effects.

2.2. Label elements

Label according to Regulation (EC) No. 1272/2008 as amended

Contains: Maleic acid, Potassium hydroxide, Sodium sulfite

Hazard pictograms

Signal word Danger

Hazard statements

H312	Harmful in contact with skin.
H302	Harmful if swallowed.

Precautionary statements

Prevention

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P270	Do not eat, drink or smoke when using this product.

P262 Do not get in eyes, on skin, or on clothing.

Response

P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P301 + P310 If swallowed: Immediately call a poison centre/doctor/.

P330 Rinse mouth.

P352 Wash with plenty of soap and water.

Storage

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

Disposal

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Supplemental label information None.

2.3. Other hazards None known.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

General information

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	INDEX No.	Notes
Sodium sulfite	10 - < 30	7757-83-7 231-821-4	-	-	
Classification:	Acute Tox. 4;H302				
Maleic acid	1< 10	110-16-7 203-742-5	-	607-095-00-3	
Classification:	Acute Tox. 4;H302, Acute Tox. 4;H312, Skin Irrit. 2;H315, Skin Sens. 1;H317, Eye Irrit. 2;H319, STOT SE 3;H335, Aquatic Chronic 2;H411				
Potassium hydroxide	1 - < 10	1310-58-3 215-181-3	01-2119487136-33-XXXX	019-002-00-8	
Classification:	Met. Corr. 1;H290, Acute Tox. 4;H302, Skin Corr. 1A;H314				
Polymaleic Acid, Aqueous	1 - < 5	26099-09-2 -	-	-	
Classification:	Met. Corr. 1;H290, Eye Irrit. 2;H319				
Other components below reportable levels	70 - < 90				

List of abbreviations and symbols that may be used above

#: This substance has been assigned Union workplace exposure limit(s).
M: M-factor
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.
All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Composition comments The full text for all H-statements is displayed in section 16.

SECTION 4: First aid measures

General information If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

4.1. Description of first aid measures

Inhalation Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTRE or doctor/physician if you feel unwell.

Skin contact Remove contaminated clothing immediately and wash skin with soap and water. Call a physician or poison control centre immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control centre immediately.

Ingestion Call a physician or poison control centre immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

4.2. Most important symptoms and effects, both acute and delayed	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation.
4.3. Indication of any immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.

SECTION 5: Firefighting measures

General fire hazards	No unusual fire or explosion hazards noted.
5.1. Extinguishing media	
Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Not available.
5.2. Special hazards arising from the substance or mixture	During fire, gases hazardous to health may be formed.
5.3. Advice for firefighters	
Special protective equipment for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Special fire fighting procedures	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapour. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained.
For emergency responders	Keep unnecessary personnel away.
6.2. Environmental precautions	Avoid discharge into drains, water courses or onto the ground.
6.3. Methods and material for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use.
6.4. Reference to other sections	Not available.

SECTION 7: Handling and storage

7.1. Precautions for safe handling	Avoid forming spray/aerosol mists. Do not breathe mist or vapour. Do not get in eyes, on skin, or on clothing. Avoid prolonged exposure. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices.
7.2. Conditions for safe storage, including any incompatibilities	Protect from sunlight. Store in original tightly closed container. Store in cool, dry place.
7.3. Specific end use(s)	Not available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

UK. EH40 Workplace Exposure Limits (WELs)

Components	Type	Value
Potassium hydroxide (CAS 1310-58-3)	STEL	2 mg/m3

Biological limit values	No biological exposure limits noted for the ingredient(s).
Recommended monitoring procedures	Follow standard monitoring procedures.
Derived no effect levels (DNELs)	Not available.
Predicted no effect concentrations (PNECs)	Not available.

8.2. Exposure controls

Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

General information	Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.
Eye/face protection	Before any handling, wear protective glasses side-shields complying with the NF EN 166.
Skin protection	
- Hand protection	Chemical resistant gloves. Suitable gloves can be recommended by the glove supplier. Wear protective gloves which comply with the NF EN 374.
- Other	Wear appropriate chemical resistant clothing. Chemical resistant gloves.
Respiratory protection	In case of insufficient ventilation, wear suitable respiratory equipment. Avoid forming spray/aerosol mists.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
Hygiene measures	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Contaminated work clothing should not be allowed out of the workplace.
Environmental exposure controls	Environmental manager must be informed of all major releases.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Liquid.
Colour	Brown
Odour	Not available.
pH	10 - 12
Melting point/freezing point	Not available.
Initial boiling point and boiling range	Not available.
Flash point	Not available.
Flammability (solid, gas)	Not applicable.
Vapour pressure	Not available.
Solubility(ies)	
Solubility (water)	Not available.
Solubility (other)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Viscosity	Not available.
Explosive properties	Not explosive.
Oxidising properties	Not oxidising.

9.2. Other information

Density	1.16 - 1.20 g/cm³ (16°C)

SECTION 10: Stability and reactivity

10.1. Reactivity The product is stable and non-reactive under normal conditions of use, storage and transport.

10.2. Chemical stability Material is stable under normal conditions.

10.3. Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.

10.4. Conditions to avoid Contact with incompatible materials.

10.5. Incompatible materials Strong oxidising agents. Strong acids.

10.6. Hazardous decomposition products Irritating and/or toxic fumes and gases may be emitted upon the product's decomposition.

SECTION 11: Toxicological information

General information Occupational exposure to the substance or mixture may cause adverse effects.

Information on likely routes of exposure

Inhalation May cause irritation to the respiratory system. Prolonged inhalation may be harmful.

Skin contact Causes severe skin burns. May cause an allergic skin reaction.

Eye contact Causes serious eye damage.

Ingestion Causes digestive tract burns.

Symptoms Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. May cause respiratory irritation.

11.1. Information on toxicological effects

Acute toxicity May cause respiratory irritation. May cause an allergic skin reaction.

Product	Species	Test results
HYDREX 1368		
Acute		
Dermal		
LD50	Rabbit	60604 mg/kg estimated
	Rat	42 g/kg Calculated
Oral		
LD50	Mouse	5763 mg/kg Calculated
	Rat	3846 mg/kg Calculated

Components	Species	Test results
Maleic acid (CAS 110-16-7)		
Acute		
Dermal		
LD50	Rabbit	1560 mg/kg
Oral		
LD50	Rat	708 mg/kg
Potassium hydroxide (CAS 1310-58-3)		
Acute		
Oral		
LD50	Rat	273 mg/kg
Sodium sulfite (CAS 7757-83-7)		
Acute		
Dermal		
LD50	Rabbit	10000 mg/kg
Oral		
LD50	Mouse	820 mg/kg
	Rat	3650 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory sensitisation Due to partial or complete lack of data the classification is not possible.

Skin sensitisation May cause an allergic skin reaction.

Germ cell mutagenicity Due to partial or complete lack of data the classification is not possible.

Carcinogenicity Due to partial or complete lack of data the classification is not possible.

IARC Monographs. Overall Evaluation of Carcinogenicity

Sodium sulfite (CAS 7757-83-7) 3 Not classifiable as to carcinogenicity to humans.

Reproductive toxicity Due to partial or complete lack of data the classification is not possible.

Specific target organ toxicity - single exposure May cause respiratory irritation.

Specific target organ toxicity - repeated exposure Due to partial or complete lack of data the classification is not possible.

Aspiration hazard Due to partial or complete lack of data the classification is not possible.

Mixture versus substance information No information available.

Other information Not available.

SECTION 12: Ecological information

12.1. Toxicity Based on available data, the classification criteria are not met for hazardous to the aquatic environment.

Product		Species	Test results
HYDREX 1368			
Aquatic			
Fish	LC50	Fish	751 mg/l, 96 hours Calculated
Acute			
Crustacea	EC50	Daphnia	2033 mg/l, 48 hours Calculated

Components		Species	Test results
Maleic acid (CAS 110-16-7)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	250 - 400 mg/l, 48 hours
Fish	LC50	Fathead minnow (Pimephales promelas)	5 mg/l, 96 hours
Potassium hydroxide (CAS 1310-58-3)			
Aquatic			
Acute			
Crustacea	EC50	Daphnia	60 mg/l, 48 hours
Fish	LC50	Western mosquitofish (Gambusia affinis)	80 mg/l, 96 hours
Sodium sulfite (CAS 7757-83-7)			
Aquatic			
Crustacea	LC50	Water flea (Daphnia magna)	273 mg/l, 50 hours
Fish	LC50	Western mosquitofish (Gambusia affinis)	660 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

12.2. Persistence and degradability No data is available on the degradability of this product.

12.3. Bioaccumulative potential

Partition coefficient n-octanol/water (log Kow)

Maleic acid -0.48

Bioconcentration factor (BCF) Not available.

12.4. Mobility in soil No data available.

12.5. Results of PBT and vPvB assessment Not available.

12.6. Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Residual waste	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.
EU waste code	The Waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Disposal methods/information	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Dispose of contents/container in accordance with local/regional/national/international regulations.
Special precautions	Dispose in accordance with all applicable regulations.

SECTION 14: Transport information

ADR

14.1. - 14.6.: Not regulated as dangerous goods.

RID

14.1. - 14.6.: Not regulated as dangerous goods.

ADN

14.1. - 14.6.: Not regulated as dangerous goods.

IATA

14.1. - 14.6.: Not regulated as dangerous goods.

IMDG

14.1. - 14.6.: Not regulated as dangerous goods.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code	Not established.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and II, as amended

Not listed.

Regulation (EC) No. 850/2004 On persistent organic pollutants, Annex I as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 1 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 2 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 3 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex V as amended

Not listed.

Regulation (EC) No. 166/2006 Annex II Pollutant Release and Transfer Registry, as amended

Not listed.

Regulation (EC) No. 1907/2006, REACH Article 59(10) Candidate List as currently published by ECHA

Not listed.

Authorisations

Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorization, as amended

Not listed.

Restrictions on use

Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended

Not listed.

Directive 2004/37/EC: on the protection of workers from the risks related to exposure to carcinogens and mutagens at work, as amended.

Not listed.

Other EU regulations

Directive 2012/18/EU on major accident hazards involving dangerous substances, as amended

Not listed.

Other regulations	This Safety Data Sheet complies with the requirements of Regulation (EC) No 1907/2006, as amended.
National regulations	Follow national regulation for work with chemical agents. Young people under 18 years old are not allowed to work with this product according to EU Directive 94/33/EC on the protection of young people at work, as amended.
15.2. Chemical safety assessment	No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

List of abbreviations	Not available.
References	Not available.
Information on evaluation method leading to the classification of mixture	The classification for health and environmental hazards is derived by a combination of calculatior methods and test data, if available.
Full text of any H-statements not written out in full under Sections 2 to 15	H290 May be corrosive to metals. H302 Harmful if swallowed. H312 Harmful in contact with skin. H314 Causes severe skin burns and eye damage. H315 Causes skin irritation. H317 May cause an allergic skin reaction. H319 Causes serious eye irritation. H335 May cause respiratory irritation. H411 Toxic to aquatic life with long lasting effects.
Revision information	None.
Training information	Follow training instructions when handling this material.
Disclaimer	Veolia Water Technologies is not able to anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use and or non respect of Veolia Water Technologies' requirement.

SAFETY DATA SHEET
CORRSHIELD NT4293

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name or designation of the mixture	CORRSHIELD NT4293
Version number	10.5
Revision date	13/04/2021
Supersedes date	07/01/2020

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses	Closed system corrosion inhibitor
Uses advised against	None known.

1.3. Details of the supplier of the safety data sheet

SUEZ Water Technologies & Solutions (UK) Limited Partnership
Hydro House
Newcombe Way
Orton Southgate
Peterborough
PE2 6SE
Tel.: +44 (0)1733 385444, Fax : 01733 391775
e-mail : emea.productregulatory.wts@suez.com

1.4. Emergency telephone number

Multilingual emergency number (24/7)

Europe, Middle East, Africa, Israel (Europe and English language speaking countries):
+44(0)1235 239670
Middle East & Africa (speaking Arabic):
+44(0)1235 239671

National Poisons Information Centre
NHS Direct on 111
Or a doctor

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

The mixture has been assessed and/or tested for its physical, health and environmental hazards and the following classification applies.

Classification according to Regulation (EC) No 1272/2008 as amended

Physical hazards		
Corrosive to metals	Category 1	H290 - May be corrosive to metals.
Health hazards		
Acute toxicity, oral	Category 4	H302 - Harmful if swallowed.
Skin corrosion/irritation	Category 1B	H314 - Causes severe skin burns and eye damage.
Serious eye damage/eye irritation	Category 1	H318 - Causes serious eye damage.
Environmental hazards		
Hazardous to the aquatic environment, long-term aquatic hazard	Category 3	H412 - Harmful to aquatic life with long lasting effects.

SAFETY DATA SHEET

CORRSHIELD NT4293

Hazard summary May be corrosive to metals. Causes severe skin burns and eye damage. Harmful if swallowed. Prolonged exposure may cause chronic effects. Dangerous for the environment if discharged into watercourses. Occupational exposure to the substance or mixture may cause adverse health effects.

2.2. Label elements

Label according to Regulation (EC) No. 1272/2008 as amended

Contains: Sodium hydroxide, Sodium nitrite

Hazard pictograms

Signal word Danger

Hazard statements

H290	May be corrosive to metals.
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H412	Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention

P273	Avoid release to the environment.

Response

P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTRE/doctor.

Storage

P406	Store in a corrosion resistant container with a resistant inner liner.

Disposal Not available.

Supplemental label information EUH208 - Contains Sodium mercaptobenzothiazole. May produce an allergic reaction.

2.3. Other hazards Not a PBT or vPvB substance or mixture.

SECTION 3: Composition/information on ingredients

Mixtures

Chemical description Aqueous alkaline solution of inorganic salts

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	Index No.	Notes
Sodium nitrite	10 - < 20	7632-00-0 231-555-9	01-2119471836-27	007-010-00-4	
Classification:	Ox. Sol. 3;H272, Acute Tox. 3;H301, Eye Irrit. 2;H319, Aquatic Acute 1;H400				
Sodium nitrate	5 - < 10	7631-99-4 231-554-3	01-2119488221-41	-	
Classification:	Ox. Sol. 2;H272, Eye Irrit. 2;H319				
Sodium hydroxide	2 - < 5	1310-73-2 215-185-5	01-2119457892-27	011-002-00-6	
Classification:	Met. Corr. 1;H290, Skin Corr. 1A;H314				
Boric acid,disodium salt,pentahydrate	< 6,5	12179-04-3 215-540-4	01-2119490790-32	005-011-02-9	
Classification:	Eye Irrit. 2;H319, Repr. 1B;H360D, Repr. 1B;H360F				

SAFETY DATA SHEET
CORRSHIELD NT4293

Chemical name	%	CAS-No. / EC No.	REACH Registration No.	Index No.	Notes
Sodium silicate (MR>3.2)	1 - < 3	1344-09-8 215-687-4	01-2119448725-31	-	
Classification:	Skin Irrit. 2;H315, Eye Irrit. 2;H319, STOT SE 3;H335				
Sodium mercaptobenzothiazole	< 1	2492-26-4 219-660-8	01-2119493018-35	-	
Classification:	Met. Corr. 1;H290, Skin Corr. 1B;H314, Skin Sens. 1;H317, Aquatic Acute 1;H400, Aquatic Chronic 1;H410				
phenolphthalein	<= 0,2	77-09-8 201-004-7	-	604-076-00-1	
Classification:	Muta. 2;H341, Carc. 1B;H350, Repr. 2;H361f				

List of abbreviations and symbols that may be used above

#: This substance has been assigned Union workplace exposure limit(s).
M: M-factor
PBT: persistent, bioaccumulative and toxic substance.
vPvB: very persistent and very bioaccumulative substance.
All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

The full text for all H-statements is displayed in section 16.

SECTION 4: First aid measures

General information Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

4.1. Description of first aid measures

Inhalation Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control centre immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control centre immediately.

Ingestion Call a physician or poison control centre immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

4.2. Most important symptoms and effects, both acute and delayed Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.

4.3. Indication of any immediate medical attention and special treatment needed Provide general supportive measures and treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

5.2. Special hazards arising from the substance or mixture During fire, gases hazardous to health may be formed.

5.3. Advice for firefighters

Special protective equipment for firefighters Self-contained breathing apparatus and full protective clothing must be worn in case of fire. (CEN : EN 469)

Special fire fighting procedures Move containers from fire area if you can do so without risk.
Prevent spillage and fire-fighting water from entering in public sewers or the immediate environment.

SAFETY DATA SHEET
CORRSHIELD NT4293

Specific methods Use standard firefighting procedures and consider the hazards of other involved materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapour. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ensure adequate ventilation. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

For emergency responders Keep unnecessary personnel away. Use personal protection recommended in Section 8 of the SDS.

6.2. Environmental precautions Avoid release to the environment. Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

6.3. Methods and material for containment and cleaning up Prevent entry into waterways, sewer, basements or confined areas.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb spillage to prevent material damage. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

6.4. Reference to other sections For personal protection, see section 8 of the SDS. For waste disposal, see section 13 of the SDS.

SECTION 7: Handling and storage

7.1. Precautions for safe handling Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Avoid prolonged exposure. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Avoid release to the environment. Observe good industrial hygiene practices.

7.2. Conditions for safe storage, including any incompatibilities Store locked up. Store in a cool, dry place out of direct sunlight. Store in corrosive resistant container with a resistant inner liner. Store in tightly closed container. Keep only in the original container. Store away from incompatible materials (see Section 10 of the SDS).

7.3. Specific end use(s) Only for industrial users

Shelf life 720 Days

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits

UK. EH40 Workplace Exposure Limits (WELs)

Components	Type	Value
Boric acid,disodium salt,pentahydrate (CAS 12179-04-3)	TWA	1 mg/m3
Sodium hydroxide (CAS 1310-73-2)	STEL	2 mg/m3

Biological limit values No biological exposure limits noted for the ingredient(s).

Recommended monitoring procedures Follow standard monitoring procedures.

Derived no effect levels (DNELs)

Workers

Components	Value	Assessment factor	Notes
Boric acid,disodium salt,pentahydrate (CAS 12179-04-3)			
Long-term, Local, Inhalation	17,04 mg/m3		
Long-term, Systemic, Dermal	316,4 mg/kg bw/day	30	

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Long-term, Systemic, Inhalation	6,7 mg/m3	12.5	Repeated dose toxicity
Short-term, Local, Inhalation	17,04 mg/m3		
Sodium hydroxide (CAS 1310-73-2)			
Long-term, Local, Inhalation	1 mg/m3	1	
Short-term, Local, Dermal	2 mg/kg/day		
Short-term, Local, Inhalation	2 mg/m3		
Sodium mercaptobenzothiazole (CAS 2492-26-4)			
Long-term, Local, Inhalation	1 mg/m3		
Long-term, Systemic, Dermal	2,8 mg/kg bw/day		
Long-term, Systemic, Inhalation	10 mg/m3		
Short-term, Local, Inhalation	1 mg/m3		
Short-term, Systemic, Dermal	2,8 mg/kg bw/day		
Short-term, Systemic, Inhalation	10 mg/m3		
Sodium nitrate (CAS 7631-99-4)			
Long-term, Systemic, Dermal	20,8 mg/kg	72	
Long-term, Systemic, Inhalation	36,7 mg/m3	72	
Sodium nitrite (CAS 7632-00-0)			
Long-term, Systemic, Inhalation	2 mg/m3	500	
Short-term, Systemic, Inhalation	2 mg/m3	500	
Sodium silicate (MR>3.2) (CAS 1344-09-8)			
Long-term, Systemic, Dermal	1,59 mg/kg	100	
Long-term, Systemic, Inhalation	5,61 mg/m3	25	

Predicted no effect concentrations (PNECs)

Components	Value	Assessment factor	Notes
Boric acid,disodium salt,pentahydrate (CAS 12179-04-3)			
Freshwater	2,9 mg/l	2	
Intermittent releases	13,7 mg/l		
Marine water	2,9 mg/l	2	
Soil	5,7 mg/kg	2	
STP	10 mg/l	1	
Sodium mercaptobenzothiazole (CAS 2492-26-4)			
Freshwater	0,004 mg/l	10	
Intermittent releases	5 µg/l		
Marine water	410 ng/l	100	
Sediment (freshwater)	0,147 mg/kg		
Sediment (marine water)	0,015 mg/kg		
Soil	0,027 mg/kg		
STP	0,3 mg/l	10	
Sodium nitrate (CAS 7631-99-4)			
Freshwater	0,45 mg/l	1000	
Intermittent releases	4,5 mg/l	100	
Marine water	0,045 mg/l	10000	
STP	18 mg/l	10	
Sodium nitrite (CAS 7632-00-0)			
Freshwater	5,4 µg/l	100	
Intermittent releases	5,4 µg/l	100	
Marine water	6,16 µg/l	1000	
Sediment (freshwater)	19,5 µg/kg		
Sediment (marine water)	22,3 µg/kg		
Soil	0,000733 mg/kg		
STP	21 mg/l	10	
Sodium silicate (MR>3.2) (CAS 1344-09-8)			
Freshwater	7,5 mg/l		
Intermittent releases	7,5 mg/l		
Marine water	1 mg/l		
STP	348 mg/l	1	

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8.2. Exposure controls

Appropriate engineering controls	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

General information	Use personal protective equipment as required. Personal protection equipment should be chosen according to the CEN standards and in discussion with the supplier of the personal protective equipment.
Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield. CEN : EN 166
Skin protection	
- Hand protection	Gauntlet type neoprene gloves (Protection against unintentional short-term contact) Gauntlet type nitrile gloves (Protection against unintentional short-term contact) Gauntlet type rubber gloves (Protection against unintentional short-term contact) Coating thickness: > 0.7 mm Penetration time: > 480 min CEN : EN 374-1/2/3/4; EN 420
- Other	Wear appropriate chemical resistant clothing. CEN : EN ISO 13688; EN ISO 6530; EN ISO 6529; EN 14605
Respiratory protection	In case of insufficient ventilation, use a breathing mask with filter type: A2-P2 CEN : EN 140; EN 14387
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
Hygiene measures	Keep away from food and drink. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.
Environmental exposure controls	Inform appropriate managerial or supervisory personnel of all environmental releases. Prevent from entering in public sewers or the immediate environment. Do not empty into drains, dispose of this material and its container to hazardous or special waste collection point.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	
Colour	Red-purple
Physical state	Liquid
Odour	Mild
Odour threshold	Not available.
pH (concentrated product)	> 12 Neat
pH in aqueous solution	Not available.
Melting point/freezing point	-4 °C
Initial boiling point and boiling range	100 °C
Flash point	Not applicable.
Evaporation rate	Slower than Ether
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Vapour pressure	18 mmHg
Vapour pressure temp.	21 °C
Vapour density	< 1

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Relative density	1,24
Relative density temperature	21 °C
Solubility	
Solubility (water)	100 %
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not applicable.
Decomposition temperature	Not available.
Viscosity	12 mPa.s
Viscosity temperature	21 °C
Explosive properties	Not explosive.
Oxidising properties	Not oxidising.
9.2. Other information	
Shelf life	720 Days
VOC	0 % Calculated

SECTION 10: Stability and reactivity

10.1. Reactivity	May be corrosive to metals.
10.2. Chemical stability	Material is stable under normal conditions.
10.3. Possibility of hazardous reactions	Hazardous polymerisation does not occur.
10.4. Conditions to avoid	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.
10.5. Incompatible materials	Strong oxidising agents. Metals. Avoid contact with combustible materials. Avoid all contact with reducing agents, oils, greases, organics and acids.
10.6. Hazardous decomposition products	Thermal decomposition above 200°C releases oxides of nitrogen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Product	**Test Results**
CORRSHIELD NT4293 (Mixture)	Acute Dermal LD50 Rabbit: > 5000 mg/kg (Calculated according to GHS additivity formula)
	Acute Oral LD50 Rat: 660 mg/kg (Calculated according to GHS additivity formula (Category 4))
Components	**Test Results**
Boric acid,disodium salt,pentahydrate (12179-04-3)	Acute Dermal LD50 Rabbit: > 2000 mg/kg
	Acute Oral LD50 Rat: 2550 mg/kg
Sodium hydroxide (1310-73-2)	Acute Dermal LD50 Rabbit: 1350 mg/kg
	Acute Oral LD50 Rabbit: > 500 mg/kg
Sodium silicate (MR>3.2) (1344-09-8)	Acute Dermal LD50 Rabbit: > 5000 mg/kg
	Acute Oral LD50 Rat: 3400 mg/kg
Sodium mercaptobenzothiazole (2492-26-4)	Acute Dermal LD50 Rabbit: > 7940 mg/kg
	Acute Oral LD50 Rat: 4350 mg/kg
Sodium nitrate (7631-99-4)	Acute Dermal LD50 Rabbit: > 5000 mg/kg
	Acute Oral LD50 Rat: 3236 mg/kg
Sodium nitrite (7632-00-0)	Acute Oral LD50 Rat: 180 mg/kg

Acute toxicity	Harmful if swallowed.
Skin corrosion/irritation	Causes severe skin burns and eye damage.
Serious eye damage/irritation	Causes serious eye damage.

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Respiratory or skin sensitisation	Based on available data, the classification criteria are not met.
Specific target organ toxicity - repeated exposure	Based on available data, the classification criteria are not met.
Specific target organ toxicity - single exposure	Based on available data, the classification criteria are not met.
Carcinogenicity	Risk of cancer cannot be excluded with prolonged exposure.
Germ cell mutagenicity	Based on available data, the classification criteria are not met.
Reproductive toxicity	Based on available data, the classification criteria are not met.
General information	Occupational exposure to the substance or mixture may cause adverse effects.

Information on likely routes of exposure

Ingestion	Causes digestive tract burns. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Harmful if swallowed.
Inhalation	May cause irritation to the respiratory system.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Symptoms	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.
Aspiration hazard	Based on available data, the classification criteria are not met.
Mixture versus substance information	No information available.
Other information	May cause allergic respiratory and skin reactions.

SECTION 12: Ecological information

12.1. Toxicity Harmful to aquatic life with long lasting effects.

Components		Species	Test Results
Sodium nitrite (CAS 7632-00-0)			
Aquatic			
Fish	LC50	Fish	0,56 - 1,78 mg/l, 96 hour

12.2. Persistence and degradability

No data is available on the degradability of this product.

- COD (mgO2/g)	35
- TOC (mg C/g)	2,6

12.3. Bioaccumulative potential

Partition coefficient n-octanol/water (log Kow)	
phenolphthalein	2,41
Bioconcentration factor (BCF)	Not available.
12.4. Mobility in soil	No data available.
12.5. Results of PBT and vPvB assessment	Not a PBT or vPvB substance or mixture.
12.6. Other adverse effects	Nutrients: N = 32,7 mg/g Heavy metals: Zn = 0,00096 mg/g

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Residual waste	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

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Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal. According to Hazardous Waste Regulations. EWC (European Waste Code) recommendation : 15 01 10 15 Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified. 15 01 Packaging (including separately collected municipal packaging waste). 15 01 10 Packaging containing residues of or contaminated by dangerous substances. Depending on the origin and state of the waste, other EWC numbers may be applicable too.
Disposal methods/information	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations. According to Hazardous Waste Regulations. EWC (European Waste Code) recommendation : 16 03 03 16 Wastes not otherwise specified in the list. 16 03 Off-specification batches and unused products. 16 03 03 Inorganic wastes containing dangerous substances. Depending on the origin and state of the waste, other EWC numbers may be applicable too.
Special precautions	Dispose in accordance with all applicable regulations.

SECTION 14: Transport information

ADR

14.1. UN number	UN3266
14.2. UN proper shipping name	Corrosive liquid, basic, inorganic, n.o.s. (Sodium hydroxide, Mixture)
14.3. Transport hazard class(es)	
Class	8
Subsidiary risk	-
Tunnel restriction code	(E)
14.4. Packing group	II
14.5. Environmental hazards	No.
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

RID

14.1. UN number	UN3266
14.2. UN proper shipping name	Corrosive liquid, basic, inorganic, n.o.s. (Sodium hydroxide, Mixture)
14.3. Transport hazard class(es)	
Class	8
Subsidiary risk	-
14.4. Packing group	II
14.5. Environmental hazards	No.
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

ADN

14.1. UN number	UN3266
14.2. UN proper shipping name	Corrosive liquid, basic, inorganic, n.o.s. (Sodium hydroxide, Mixture)
14.3. Transport hazard class(es)	
Class	8
Subsidiary risk	-
14.4. Packing group	II
14.5. Environmental hazards	No.
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

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IATA

14.1. UN number	UN3266
14.2. UN proper shipping name	Corrosive liquid, basic, inorganic, n.o.s. (Sodium hydroxide, Mixture)
14.3. Transport hazard class(es)	
Class	8
Subsidiary risk	-
14.4. Packing group	II
14.5. Environmental hazards	No.
ERG Code	Not available.
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

14.1. UN number	UN3266
14.2. UN proper shipping name	Corrosive liquid, basic, inorganic, n.o.s. (Sodium hydroxide, Mixture)
14.3. Transport hazard class(es)	
Class	8
Subsidiary risk	-
14.4. Packing group	II
14.5. Environmental hazards	
Marine pollutant	No.
EmS	F-A, S-B
14.6. Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code	Not established.

ADN; ADR; IATA; IMDG; RID

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and II, as amended

Not listed.

Regulation (EC) No. 850/2004 On persistent organic pollutants, Annex I as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 1 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 2 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex I, Part 3 as amended

Not listed.

Regulation (EU) No. 649/2012 concerning the export and import of dangerous chemicals, Annex V as amended

Not listed.

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Regulation (EC) No. 166/2006 Annex II Pollutant Release and Transfer Registry, as amended

Not listed.

Regulation (EC) No. 1907/2006, REACH Article 59(10) Candidate List as currently published by ECHA

Boric acid,disodium salt,pentahydrate (CAS 12179-04-3)
phenolphthalein (CAS 77-09-8)

Authorisations

Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorization, as amended

Not listed.

Restrictions on use

Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended

Boric acid,disodium salt,pentahydrate (CAS 12179-04-3) 30
phenolphthalein (CAS 77-09-8) 28

Directive 2004/37/EC: on the protection of workers from the risks related to exposure to carcinogens and mutagens at work, as amended.

phenolphthalein (CAS 77-09-8)

Other EU regulations

Directive 2012/18/EU on major accident hazards involving dangerous substances, as amended

Sodium nitrite (CAS 7632-00-0)

Other regulations	The product is classified and labelled in accordance with Regulation (EC) 1272/2008 (CLP Regulation) as amended. This Safety Data Sheet complies with the requirements of Regulation (EC) No 1907/2006, as amended.
National regulations	Not available.
15.2. Chemical safety assessment	No Chemical Safety Assessment has been carried out.
NSF Registered and/or meets USDA (according to 1998 guidelines):	Registration No. – 141180 Category Code(s): G5 Cooling and retort water treatment products G7 Boiler, steam line treatment products – nonfood contact

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

SECTION 16: Other information

List of abbreviations

EC-No: European Commission Number
COD: Chemical Oxygen Demand
IATA: International Air Transport Association
CAS: Chemical Abstract Service.
CLP: Classification, Labeling and Packaging REGULATION (EC) No 1272/2008 on classification, labeling and packaging of substances and mixtures.
CEN: European Committee for Standardization (Comité Européen de Normalisation).
TWA: Time Weighted Average.
STEL: Short-term Exposure Limit.
LD50: Lethal Dose 50%.
LC50: Lethal Concentration 50%.
EC50: Effective Concentration 50%.
NOEL: No observed effect level.
BOD: Biochemical oxygen demand.
TOC: Total Organic Carbon.
ADR: European agreement concerning the international carriage of dangerous goods by road (Accord européen relatif transport des merchandises dangereuses par route).

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	ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (Accord européen relatif au transport international des marchandises dangereuses par voies de navigation intérieures). IMDG Code: International Maritime Dangerous Goods Code. RID: Regulations concerning the international carriage of dangerous goods by rail (Règlement International concernant le transport de marchandises dangereuses par chemin de fer).
References	Safety data sheets of raw materials.
Information on evaluation method leading to the classification of mixture	The physical, health and environmental hazards of this mixture are assessed by applying the classification criteria for each hazard class or differentiation in Parts 2 to 5 of Annex I to Regulation (EC) No 1272/2008 (CLP). The classification for health and environmental hazards is derived by a combination of calculation methods and test data, if available.
Full text of any H-statements not written out in full under Sections 2 to 15	H272 May intensify fire; oxidiser. H290 May be corrosive to metals. H301 Toxic if swallowed. H314 Causes severe skin burns and eye damage. H315 Causes skin irritation. H317 May cause an allergic skin reaction. H319 Causes serious eye irritation. H335 May cause respiratory irritation. H341 Suspected of causing genetic defects. H350 May cause cancer. H360D May damage the unborn child. H360F May damage fertility. H361f Suspected of damaging fertility. H400 Very toxic to aquatic life. H410 Very toxic to aquatic life with long lasting effects.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.
Training information	Provide training on safe handling while considering the type of application and exposure scenarios. Follow training instructions when handling this material.
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Based on EC Directive / Regulations	(EC) No 1907/2006 (REACH) (EU) 2015/830 (EC) No 1272/2008 (EU) No 1357/2014
Further information	Correction in Section: 2,3,4,5,6,7,8,10,11,12,13,15,16

Appendix L: Installation Emissions Monitoring SOP

DRAFT STANDARD OPERATING PROCEDURE

INSTALLATION EMISSIONS MONITORING

1. Purpose

1.1 This Standard Operating Procedure (SOP) details the operating requirements, practices and supports the process required to assess emission monitoring as per the environmental permit requirements.

1.2 The purpose of this SOP is to ensure that all relevant personnel are provided with the appropriate information to enable them to monitor, record and assess emissions in a safe, consistent, optimum and compliant manner.

2. Scope

2.1 This SOP applies to all sites where waste and installation permit (formerly PPC permits) activities require point source emission monitoring and testing within the Environmental Permitting Regulations 2016/18 (as amended).

3. Definitions

Emissions Monitoring

3.1 The relevant site permit will specify the parameters and frequency of monitoring.

3.2 A point source emission is localised and emission points are listed in the Environmental Permit (refer to relevant tables). There shall be no other point source emissions than those listed.

3.3 Emission values specified in the Permit must be met.

4. Procedure

Health and Safety

4.1 All the relevant United Utilities Safe Systems of Works and Health & Safety Procedures must be applied and the required PPE worn at all times.

4.2 Before operating, inspecting or cleaning equipment all personnel must have received appropriate training in the operation of the membrane and the relevant Safe Systems of Works and Health & Safety Procedures.

These instructions and procedures may include:-

- SSW 4 Mechanical Handling Equipment
- SSW 10 Portable Access Equipment
- SSW 12 Isolation of Plant and Machinery
- H&S Procedure No. 220 Management of Confined Space Entry
- H&S Procedure No. 223 Manual Handling
- Restricted Ops/Hygiene Procedures

4.3 All other local procedures must be applied prior to any maintenance taking place, and full risk assessment of all actions taken place.

4.4 Where appropriate periodic visual and olfactory assessments should be made to ensure that all final releases to air are essentially colourless free from persistent trailing mist or fume and free from droplets and odour.

4.5 All monitoring points are identified and labelled. Access shall be maintained and available at any time.

4.6 Monitoring must be performed at the point source emission points as listed in Schedule of emission & monitoring in the Permit.

4.7 Permanent access must be provided to enable sampling and monitoring of emission points as specified in the Environmental Permit.

4.8 Monitoring equipment and techniques, personnel and organisations employed for the emissions monitoring programme shall have either MCERTS certification or MCERTS accreditation.

4.9 Emissions can only be made from identified emission points; emissions from any uncontrolled point source emissions which are from unidentified points are not permitted or are in breach of permit conditions.

4.10 If during monitoring there are any breaches of the specified permit limits contact your local ERA. Refer to SOP WwP/S/001/01/14 Incident Reporting.

5. Record Keeping

5.1 Reporting must be completed as specified in Schedule 5 (Reporting) of the Permit. Emission point and monitoring information is listed in tables of the Permit.

5.2 Records of all monitoring must be maintained; this includes records of the sample taken, the analysis of the sample, instrument measurements (periodic and continual), calibrations, examinations tests and surveys and any assessment or evaluation made on the basis of such data.

5.3 All records taken relating to the permit/emissions shall be retained on site and shall be available at any time for inspection by the EA. All records to be made available on request within a maximum of 14 days. Records shall be legible and retained for at least 6 years. Any amendments should ensure that the original entry remains legible. Any monitoring data used for the annual EA submission shall be in electronic format and shall not be overwritten.

5.4 Reliable Monitoring data as specified in the Permit shall be recorded electronically and submitted to the WW Operations Technical Team. This shall be submitted quarterly/annually on an agreed date within the permit.

6. Assessment of Monitoring Results

6.1 Following receipt of monitoring results from third party contractors the Environmental Compliance Team (ECT) will cross reference with the specific sites permit emission limits.

6.2 The ECT may also consult internal specialists eg odour, to verify monitoring results.
6.3 If monitoring is undertaken in house then the results will be shared with the ECT who will assess with site specific permit emission limits.
6.4 Non compliant emission monitoring will be highlighted and reported as per any permit requirements.
6.5 Non compliant monitoring will be raised on the relevant internal systems for further investigation and action by the ECT.
6.6 Specific monitoring guidance will also be consulted to verify the correct standards have been applied dependant on the monitoring type.

7. Human Senses Tour

7.1 The routine inspection of an installation, known as a Human Senses Tour, is required. This is to monitor for unusual occurrences and signs which may indicate the deterioration and/or potential failure of plant and equipment. This may include:-

- Vibration
- Heat
- Noise
- Smell
- Leakage
- Power
- Pressure

8. References

8.1 The Environmental Permitting Regulations 2018 (as amended)
8.2 Environmental permit (site specific)
8.3 Environmental Permit ('How to comply with your permit' – EA Guidance Document')
8.4 Monitoring stack emissions for Environmental permits (formerly M2 guidance)
8.5 SOP WwP/S/001/01/14 Incident Reporting

Appendix M: UU UKAS Accreditation Certificate

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

1494

Accredited to ISO/IEC 17025:2017

United Utilities Water Ltd operating as United Utilities Scientific Services

Issue No: 099 **Issue date:** 03 May 2022

Lingley Mere Laboratory
PO Box 458
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

Contact: Mr J Perry
Tel: +44 (0)1925 677077
Fax: +44 (0)1925 678933
E-Mail: jeff.perry@uuplc.co.uk

Testing performed by the Organisation at the locations specified below

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details	Activity	Location code
Address Lingley Mere Laboratory PO Box 458 Lingley Green Avenue Great Sankey Warrington WA5 3LP **Local contact** Mr J Perry Tel: +44 (0)1925 677077 Fax: +44 (0)1925 678933 E-Mail: jeff.perry@uuplc.co.uk	Environmental Analysis	A

Site activities performed away from the locations listed above:

Location details	Activity	Location code
Waste Water Treatment Works (WWTW) Water Treatment Works (WTW) Service Reservoirs and Domestic Premises Ground and Surface Water Sources	Sampling and on-site testing	B
All locations suitable for the activities listed	Sampling and Testing of Bituminous materials	C

1494 Accredited to ISO/IEC 17025:2017	**Schedule of Accreditation** **issued by** **United Kingdom Accreditation Service** 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK
	United Utilities Water plc **operating as United Utilities Scientific Services** **Issue No:** 099 **Issue date:** 03 May 2022
Testing performed by the Organisation at the locations specified	

This schedule is ordered as follows:

Section 1
ISO 17025 + DWTS
Inorganic Chemistry
Organic Chemistry
Sensory
Radiochemistry
Microbiology and Cryptosporidium
Sampling

Section 2
ISO 17025 + MCERTS (waters)
Inorganic Chemistry
Organic Chemistry
Sampling

Section 3
ISO 17025 only
Inorganic Chemistry Waters
Organic Chemistry Waters
Inorganic Chemistry Sludges and Soils
Microbiology

Section 4
Flexible scopes

Note: accreditation to MCERTS (waters) and DWTS automatically confers an equivalent accreditation to ISO/IEC 17025:2017

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 1			
WATERS Raw (surface water and groundwater), and drinking waters	Analysis for the purpose of enforcement of "The Water Supply (Water Quality)" (England) Regulations	Methodology meeting the requirements of The Drinking Water Testing Specification	
	<u>Chemical Tests</u>	Documented In-House Methods:	
	Ammonia Chloride Nitrate (by calculation) Nitrite Total Oxidised Nitrogen	QI 231/62 by Quattro Continuous flow analyser	A
	Alkalinity	QI231/64 by Robotic Titrator	A
	Total Organic Carbon	QI 231/15 using persulphate oxidation by non-dispersive infra-red detector	A
	pH	QI 230/28 using pH Meter	A
	Turbidity, Electrical Conductivity and Colour	QI231/77 using robotic system	A
	Total Cyanide	QI 231/53 using SFA and colorimetry	A
	Mercury	QI 231/50 using Cold Vapour Atomic Fluorescence Spectroscopy	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd) Raw (surface water and groundwater), drinking waters and bottled waters	<u>Chemical Tests</u> (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
	Elements including: Antimony Arsenic Cadmium Chromium Copper Lead Nickel Selenium Silver Zinc Uranium	QI 231/73 by ICP-MS	A
	Elements including: Antimony Arsenic Cadmium Chromium Copper Lead Nickel Selenium Silver Zinc	QI 231/16 by ICP MS	A
	Elements including: Aluminium Manganese Iron Phosphorus Sodium Calcium Magnesium Potassium Barium Boron Total Hardness (as Calcium Carbonate)	QI 231/80 By ICP-OES	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd) Raw (surface water and groundwater), drinking waters and bottled waters	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
	Sulphate Fluoride Bromide	QI 231/54 by ion chromatography	A
Raw (groundwater) and drinking waters	Hexavalent Chromium	QI 231/74 by Ion chromatography	A
Drinking, surface and Groundwaters	Bromate	QI 231/70 by Ion chromatography	A
Drinking, surface and Groundwaters	Chlorate Chlorite	QI 231/72 by Ion chromatography	A
Drinking, surface and Groundwaters (cont'd)	Halogenated Hydrocarbons including THM: Elements including: Trichloromethane° Bromodichloromethane° Dibromochloromethane° Tribromomethane° Tetrachloromethane Trichloroethene[1] Tetrachloroethene[1] Total THM (total of 4 THMs marked °) Total CHC (total of 2 CHCs marked [1])	QI 260/11 using Headspace - Gas Chromatography with electron Capture Detector (Headspace - GC-ECD)	A
	Polyaromatic Hydrocarbons: Elements including: Benzo(b)fluoranthene* Benzo(k)fluoranthene* Indeno(1,2,3-cd)pyrene* Benzo(g,h,i)perylene* Benzo(a)pyrene Fluoranthene Total PAH (total of 4 PAHs marked *)	QI 260/03 using solvent extraction followed by HPLC with fluorescence detection	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw (surface water and groundwater), drinking waters	Glyphosate AMPA Glufonisate-Ammonium	QI 260/69 Using LC-MS-MS	A
Raw (surface and groundwater) drinking waters	Asulam Metaldehyde	QI260/78 using LC MS-MS	A
Raw (surface and groundwater) drinking waters	Geosmin 2-Methyl isoborneol	QI260/71 using GCMS	A
Raw (surface and groundwater) drinking waters	Geosmin 2-Methylisoborneol 2,4,6-Trichloroanisole	QI260/99 using DiLLME-GCMS	A
Raw (surface water and groundwater) and drinking water	Clopyralid Dicamba Fluroxypyr Bromoxynil 2,4-D MCPA Trichlopyr Ioxynil Dichlorprop 2,4,5-T Mecoprop 2,4-DB MCPB Pentachlorophenol Bentazone	QI 260/92 by direct injection LC-MS-MS	A
Raw (surface water and groundwater) and drinking water	BTEX: Benzene 1,2- Dichlorethane MTBE Toluene Ethylbenzene m/p-Xylene o-Xylene Total Xylene	QI 260/52 by Headspace GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw (surface water and groundwater) and drinking water	Haloacetic Acids: Monochloroacetic Acid Dichloroacetic Acid Trichloroacetic Acid Monobromoacetic Acid Dibromoacetic Acid Tribromoacetic Acid Bromochloroacetic Acid Bromodichloroacetic Acid Dibromochloroacetic Acid	QI 260/05 by LC-MS/MS	A
Raw (surface water and groundwater) and drinking water	Herbicides and Pesticides: Chlorotoluron Metazachlor Isoproturon Diuron Linuron Carbetamide Metribuzin Simazine Atrazine Propyzamide Diazinon	QI 260/73 by LCMS-MS	A
Raw (surface water and groundwater) and drinking water	Polycyclic Aromatic Hydrocarbons Benzo (b) fluoranthene Benzo (k) fluoranthene Benzo (a) pyrene Benzo (g,h,i) perylene Indeno (1,2,3-cd) pyrene Fluoranthene	QI 260/40 by GCMS/MS	A
	Sensory Tests		
Raw and drinking water	Quantitative Odour Quantitative Taste	QI 233/02 using assessed panel – SCA blue book: determination of taste and odour in drinking water (2014)	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (Cont'd)	Radiochemical Tests	Methodology meeting the requirements of The Drinking Water Testing Specification	
Raw and drinking water	Gross alpha	QI 232/10 using α/B multi-detector based on ISO9696:2007	A
Raw and drinking water	Gross beta	QI 232/10 using α/B multi-detector based on ISO9697:2008	A
Drinking Water	Gamma emitting radionuclides Range 59-2000keV	QI 232/04 by Gamma Spectrometry	A
Drinking and Raw Waters	Radon 222 Range 1-120Bq/l	QI 232/05 determined from Bi-214 and Pb-214 in secular equilibrium by Gamma Spectrometry	A
WATERS (cont'd)	Microbiological Tests	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	
	Enumeration of:		
Drinking Water, Ground water and surface water	Colony count at 22 °C and 37 °C	QI 240/11 using manual pour plate method based on MODW 2012 Part 7	A
	Isolation and enumeration and confirmation of: total coliforms and *Escherichia coli*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2016 Part 4	A
	Isolation and enumeration and confirmation of *Enterococci*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2012 Part 5	A
	Isolation, enumeration and confirmation of *Clostridium perfringens*	QI 240/02 manual method using membrane filtration and QI240/05 based on MODW 2015 Part 6	A
	Speciation of *Enterobacteriaceae* & Intestinal *Enterococci*	QI 240/19 using vitek system based on in house metjod	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Microbiological Tests (cont'd)	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	
Drinking Water, Ground water and surface water	Cryptosporidium	QI 243/01 - using Filta-Max xpress, Dynal IMS procedure Staining, examination and identification based on MODW 2010 Part 14	A
Drinking water	Legionella	QI 241/15 by membrane filtration based on ISO 11731-2:2008 (withdrawn)	A
Surface water	Isolation and enumeration and confirmation of *Salmonella* spp (excluding *Salmonella typhi*)	QI 241/01 membrane filtration using selective enrichment and MPN based on MORW 2016 Part 8	A
Drinking and Groundwater	Enumeration/Confirmation *Escherichia coli* Total Coliforms	QI240/54 using defined substrate MPN method and Colilert – 18 Quanti- tray based on MODW 2016 Part 4	A
Transport Swabs	Recovery of Coliform Organisms after upto 24 hours refridgeration	Method QI240/30 based on in house method	A
Microscopically confirmed Cryptosporidium spp oocysts from treated and raw water sources on slides	Cryptosporidium oocyst speciation and identification	Documented in-house methods QI 243/05 and 243/06, Extraction, PCR amplification of oocyst DNA and sequencing using SeqStudio Analyser	A
Drinking Water (Surface and Ground)	Detection and Enumeration of *Pseudomonas aeruginosa*	QI 240/15 using IDEXX Pseudalert Reagent and Quantitray based on MODW 2015 Part 8	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Drinking, ground and surface waters	For the purpose of enforcement of The Water Supply (Water Quality) Regulations 2000 (SI 2000/3184)	Where applicable the methodology meeting the requirements of The Drinking Water Testing Specification	
From: Consumer taps Standpipes Service reservoirs Water treatment works	Sampling: For Chemical and Microbiological Testing ((including cryptosporidium)	Documented In-house Procedures QI638/01	B
Raw waters including: Surface Waters: impounding reservoirs, canals, lakes Groundwater: boreholes	<u>On-site Testing</u>	Documented In-House Methods:	
Raw (groundwater and surface water) and Drinking Water	pH	Method QI640/01	B
Raw (groundwater) and Drinking Water	Free Residual Chlorine Total Residual Chlorine	Method QI510/17	B
Drinking Water only	Qualitative Taste and Odour	Method QI626/01 based on SCA determination of taste and odour in drinking waters (2014)	B

END OF SECTION 1

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 2			
WASTE WATERS	Chemical Testing	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Trade Effluents	Ammonia Total Oxidised Nitrogen	QI251/44 using Skalar Analyser	A
Untreated sewage Treated sewage effluent Trade effluent	Total nitrogen	QI 251/39 using Formacs total N analyser	A
Untreated sewage Treated sewage effluent Trade effluent	Chloride Phosphate	QI 251/45 using continuous flow analyser	A
Untreated sewage, Treated sewage effluent Trade effluent	Suspended solids	QI 250/12 by gravimetry	A
Treated sewage effluent	Anionic Surfactants	QI 251/06 by sealed tube	A
Treated sewage effluent	Ammonia –low level Orthophosphate Total Oxidised Nitrogen (TON)	QI250/46 using Quattro analyser	A
Untreated Sewage Treated sewage effluent Trade effluent (to controlled water)	Mercury	QI 251/42 by AFS	A
Untreated sewage Treated sewage effluent Trade Effluent	Biochemical Oxygen Demand (BOD)	QI 251/17 based on 5-day biochemical oxygen demand, semi-automated, 2nd edition, HMSO 1998	A
Untreated sewage Trade effluent	Chemical Oxygen Demand	QI251/19 high range by sealed tube automated and manual Readback	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Treated sewage effluent	Chemical Oxygen Demand	QI251/19 low range by sealed tube	A
Treated sewage effluent Trade effluent	Metals:		
Treated Sewage Effluent, Untreated Sewage and Trade Effluents	Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Nickel Molybdenum Selenium Thallium Zinc	QI 231/40 using ICP-MS	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Aluminium Calcium Cobalt Iron Magnesium Manganese Phosphorus Potassium Sodium Vanadium	QI 231/75 using ICP-OES	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Untreated Sewage Treated Sewage Trade effluent to controlled waters Trade effluent to sewer	Antimony, Arsenic Beryllium Cadmium Chromium Copper Lead Molybdenum Nickel Phosphorus Selenium Thallium zinc	QI 231/79 By ICP-MS	A
Untreated Sewage Treated Sewage Effluent	OrthoPhosphate High level Ammonia Total Oxidised Nitrogen (TON)	QI251/51 using Skalar analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Total Nitrogen	QI 251/41	A
Treated Sewage Effluent	Chemical oxygen demand	QI 251/54 by automated equipment.	A
Treated sewage effluent Untreated Sewage Trade Effluent	Organotin Compounds: Tributyltin Triphenyltin	QI 260/29 by Iso-octane extraction and derivatisation and analysis by GC-MS	A
Trade Effluent	Cadmium Chromium Copper Lead Nickel Zinc	QI 231/76 by ICP-OES	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Chemical Testing (cont'd)	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Untreated Sewage, Treated Sewage and Trade Effluent	VOC's: Elements including: Dichloromethane Chloroform Carbon Tetrachloride 1,2 Dichloroethane Trichloroethene Tetrachloroethene Toluene o-xylene m+p-xylene 1,2,3 trichlorobenzene 1,2,4 trichlorobenzene 1,3,5 trichlorobenzene Bromoform Benzene MTBE n-hexane 1,1,1 trichloroethane 1,1,2 trichloroethane Dicyclopentadiene Hexachloro-1,3-butadiene	QI 260/09 by GC-MS	A
Treated sewage effluent	On-site measurement of: pH	Documented in-house methods: QI 640/01 using pH meter	B
Trade effluent	Total residual chlorine	Documented in-house method QI 510/17 using hand held	B

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WASTE WATERS (cont'd)	Sampling	Documented In-House Method to meet the requirements of the Environment Agency MCERTS Performance Standard - sampling and chemical testing of untreated sewage, sewage effluent and trade effluent	
Treated sewage effluent Trade effluent to controlled waters	For chemical testing	Method QI 510/05 using manual spot sampling	B

END OF SECTION 2

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SECTION 3			
WATERS	<u>Chemical Tests</u>		
Untreated Sewage Trade Effluent	Chemical oxygen demand	QI 251/19 by sealed tube method High Range	A
Treated Sewage Effluent	Chemical oxygen demand	QI 251/19 by sealed tube method Low Range automated and manual Readback	A
Untreated Sewage Trade Effluent Treated Sewage Effluent	Free and easily liberated cyanide	QI 251/53	A
Untreated Sewage Treated Sewage Effluent Mixed liquor	Suspended solids	QI 250/12 based on HMSO 1980 using gravimetric technique	A
Untreated sewage Mixed liquor	Suspended solids, volatile material and ash	QI 250/12 based on HMSO 1980	A
Untreated (Crude) Sewage Treated Sewage Effluent Raw Surface Water	Total organic carbon LOD – 25 mg/L	QI 251/40 using Formacs H analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Total Nitrogen	QI 251/39 using Formacs Analyser	A
Trade Effluents Treated Sewage Effluent	Ammonia Nitrate Nitrite Total Oxidised Nitrogen	QI251/44 using Skalar Analyser	A
Treated Sewage Effluent Trade Effluent	Nitrite	QI251/48 using Skalar Analyser	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Chloride Phosphate	QI 251/45 using continuous flow analyser	A
Treated Sewage Effluent	Ammonia –low level Orthophosphate Total Oxidised Nitrogen (TON)	QI250/46 using Quattro analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Treated Sewage Effluent Trade Effluent	Fluoride	QI251/35 using Ion Selective Electrode	A
Untreated Sewage Treated Sewage Effluent Trade Effluent (to controlled water)	Mercury	QI 251/42 by AFS	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Mercury	QI 251/55 using Cold Vapour Atomic Absorption Spectroscopy	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Alkalinity	QI251/47 using robotic potentiometric titration	A
Treated Sewage Effluent	Anionic Surfactants	QI 251/06 by sealed tube	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	Separable oils and grease	QI 251/10 based on suspended settleable and total dissolved solids in waters and effluents HMSO 1980	A
Untreated Sewage Treated Sewage Effluent Trade Effluent Surface Water	Biochemical oxygen demand (BOD)	QI 251/17 based on 5-day biochemical oxygen demand, semi-automated, 2nd edition, HMSO 1988	A
Untreated Sewage Trade Effluents	Total Sulphide	QI251/33 by air segmented flow analyser	A
Treated and Untreated Sewage, Trade Effluent	Sulphate	QI251/52 by continuous flow analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Untreated Sewage Treated Sewage Effluent Trade Effluent	Organotin Compounds: Tributyltin Triphenyltin	QI 260/29 by Iso-octane extraction and derivatisation and analysis by GC-MS	A
Trade Effluent Treated Sewage Effluent	Elements including: 2-chlorophenol 4-chlorophenol 3,5-dimethylphenol 4-chloro-3-methylphenol Phenol 2-methylphenol 3 and 4-methylphenol 4-chloro-3,5-dimethylphenol 2,4-dichloro-3,5-dimethylphenol 2,4-dichlorophenol	QI 260/24 using GC-FID	A
Landfill Leachate Trade Effluent Surface Water	Methane	QI 260/75 using Gas Chromatography with Flame Ionisation Detector (GC-FID)	A
Untreated Sewage Treated Sewage Effluent Trade Effluent	VOC's: Elements including: Dichloromethane Chloroform Carbon Tetrachloride 1,2 Dichloroethane Trichloroethene Tetrachloroethene Toluene o-xylene m/p-xylene 1,2,3 trichlorobenzene 1,2,4 trichlorobenzene 1,3,5 trichlorobenzene Bromoform Benzene Naphthalene MTBE n-hexane 1,1,1 trichloroethane 1,1,2 trichloroethane Dicyclopentadiene Hexachloro-1,3-butadiene	QI 260/09 by GC-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Trade effluents, Treated Sewage Effluents Crude Sewage	Chlorobenzene Ethylbenzene Styrene 4-chlorotoluene 2-chlorotoluene 3-chlorotoluene 2-ethylhexanol 1,2-diclorobenzene	QI 260/95 by GC-MS	A
	Chemical Tests	Documented In-House Methods	
SOILS only	Extractable phosphate	QI 252/14 using segmented continuous flow analyser	A
SLUDGE only	pH	QI 252/07 using pH electrode	A
Sludge Only	Dry solids at 105 °C Organic and volatile matter at 700 °C	QI252/19 using thermogravimetric analyser	A
Sludge Only	Fluoride	QI251/35 using Ion Selective Electrode	A
Sludge	Ammonia	QI251/51 using Skalar Analyser	A
Sludge and sludge filtrate	Alkalinity	QI251/47 using robotic potentiometric titration	A
Mixed Liquor (sludge)	Suspended Solids	QI250/12 using gravimetric technique	A
Filtered Sludge Liquor	Sulphate	QI251/52 by continuous flow analyser	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
WATERS (cont'd)	Chemical Tests (cont'd)		
Raw Sewage Sludge Digested Sludge Sludge Cake Sludge Limed Cake Soils	Aluminium Arsenic Cadmium Chromium Copper Iron Lead Magnesium Mercury Molybdenum Nickel Phosphorous Potassium Selenium Zinc	QI231/78 by Aqua Regia Digestion followed by ICP-MS	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
PROCESS WATERS, BATHING WATERS, SEWAGE AND WASTE WATERS	Microbiological Tests	Documented In-House Methods based on The Microbiology of Drinking Water 2002 and their subsequent updates - Methods for the Examination of Waters and Associated Materials. A report by the Environment Agency (EA).	A
Treated sewage	Isolation, enumeration and confirmation of Coliforms and *Escherichia coli*	QI 240/02 manual method using membrane filtration & QI 240/05 based on MORW 2016 Part 3	A
Untreated sewage and treated sewage	Isolation, enumeration and confirmation of *enterococci*	QI 240/02 manual method using membrane filtration & QI 240/05 based on MORW 2015 Part 4	A
Untreated sewage, treated sewage and sewage sludge	Isolation and enumeration and confirmation of *Salmonella* spp (excluding *Salmonella typhi*)	QI 241/01 membrane filtration using selective enrichment and MPN based on MOSS 2004 Part 4 and MORW 2016 Part 8	A
Surface water	Identification of Algal spp	QI 242/01 by membrane filtration and optical microscopy based on Blue Book 139 1990	A
Surface Water	Chlorophyll a	QI242/02 by Fluorimeter based on Blue Book 65, 1980	A
Groundwater, Man-made Recreational Water and Drinking (Non regulatory)	Enumeration/Confirmation *Escherichia coli* Total Coliforms	QI240/54 using defined substrate MPN method and Colilert – 18 Quanti- tray based on MODW 2016 Part 4	A
Sewage sludge	*Isolation, enumeration and confirmation of Escherichia coli*	QI 241/29 using Colillert based on MOSS 2003 Part 3	A
Sewage sludge	Isolation and enumeration of *Escherichia coli*	QI 241/29 manual method using membrane filtration based on MOSS 2003 Part 3	A
Recreational Waters	Detection and Enumeration of *Pseudomonas aeruginosa*	QI 240/15 using IDEXX Pseudalert Reagent and Quantitray based on MODW 2015 Part 8	A

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Reinstatement Of Opening In Highways	<u>Pavement Construction</u>	Methods of test required for the New Roads and Street Works Act (1991) (Specification for the Reinstatement of Openings in Highways) using data from the test methods detailed below:	
	Sampling of laid and compacted materials by coring	BSEN 12697-27: 2017	C
	Determination of the thickness of a bituminous pavement - destructive measurement	BSEN 12697-36:2003	C
	Bulk density - sealed specimen (wax)	BSEN 12697-6:2020	C
	Maximum density - volumetric procedure	BSEN 12697-5:2018	C
	Air void content	BSEN 12697-8:2018	C

END OF SECTION 3

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
Section 4			
As listed on fixed scope	<u>Chemical Tests</u> The laboratory holds a flexible scope of accreditation for chemistry test methods at the Lingley Mere Site covering the following: • Incorporation of additional determinands or matrices covered by fixed scope to existing accredited methods. • Authorising the use of replacement equipment for existing methods. • Development of new methods for matrix types and using techniques and instruments that appear on the fixed scope. Please contact the laboratory for details of the individual determinands and matrices that can be analysed.	Meeting the requirements of The Drinking Water Testing Specification (DWTS) where applicable Meeting the requirements of Environment Agency MCERTS Performance Standard for Chemical Testing of Water where applicable Documented In house generic protocol QI 275//04 for analysis using analytical techniques included in this schedule	A A
END			