 United Utilities Water for the North West	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
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1. Purpose

- 1.1 This Site Specific Instruction describes the methods applied to locating, identifying and mitigating against fugitive emissions to air as part of the Environmental Permitting Regulations requirements. As well as protecting the environment the benefits of this plan include the safety protection of site staff and increased productivity of the process. To comply with IGEM regulation UP/1 "The route of a pipeline will be surveyed at pre-defined intervals to confirm the integrity of the system"

2. Scope

- 2.1 This Site Specific Instruction is applicable to Anaerobic Digestion (AD) sites which produce biogas for consumption in the Combined Heat and Power (CHP) engines and generate a source of electricity. It details the maintenance requirements to identify fugitive biogas emissions from seals, flanges, valves, pumps, pipework and tanks.
- 2.2 Note – Emissions of sludge to the environment are minimal due to site surfacing and regular operator site tour inspections therefore not included in this plan.


3. Responsibility

- 3.1 The Production Manager for the AD site is responsible for ensuring environmental permit conditions are complied with. The Statutory Maintenance Team are responsible for planning a third party contractor to undertake the optical gas imaging survey. The stewards of the reports store them on the statutory sharepoint library:
<https://uusp/engdel/OpEng/OE/MS/Gas%20Camera%20Survey%20Reports/Form/s/AllItems.aspx>
Any defects on the reports are to be escalated and proactive / reactive work orders are to be raised for any remedial work required.

4. Asset Monitoring Schedule

The following assets are scheduled for routine proactive inspection by Optimal Gas imaging camera on an annual basis. This asset list is based on the potential for biogas leakage at each specific location.

The below assets are also monitored daily as part of the operator's site tour and monthly Environmental Regulatory Advisors compliance inspection which whilst not identifying

	Wastewater Treatment	Reference: WWP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		

individual assets on a schedule use human senses to detect leakage which are reported centrally and a work order raised for repair by the appropriately skilled operative.


If the source of the emission is unknown during the daily and monthly human senses tour then the use of Optical Gas Imaging will be requested to attend site and undertake an assessment to locate the source.

Zone 1. Digester

Location	Description / Observation
Top of Digester No1	Inspection window
-	PRV
-	Gas main. Various assets
-	Purge points
-	Purge point and meter
-	Inspection window
Ground Level Digester	Vertical gas pipe. Single flange
-	Vertical gas pipe. Single flange
-	Perimeter gas pipe to engines and boilers. Single flange
-	Perimeter gas pipe to engines and boilers. Single flange
-	Perimeter gas pipe to engines and boilers. Single flange
-	Perimeter gas pipe to engines and boilers. Single flange
-	Purge Point.

Zone 2 CHP


Location	Description / Observation
Engine and Boiler	Gas pipe to Gas Dehumidifier setup. Various assets
-	Gas Dehumidifier setup TOP. Various assets
-	Gas Dehumidifier setup BOTTOM. Various assets
-	Primary carbon filters. TOP
-	Primary carbon filters. BOTTOM
-	Primary carbon filters. TOP
-	Primary carbon filters. BOTTOM

 United Utilities Water for the North West	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		


	Base of carbon filters manifold. Condensate pots and various assets.
-	Gas main to engines. Single flange
-	Gas main to engines. Double flange
-	Gas main to engines. Single flange
-	Gas pipe branch to Engine No1. Valve
-	Gas pipe branch to Engine No1. Meter and flanges
-	Main connection to Engine No1 TOP. Various assets
	Main connection to Engine No1 BOTTOM. Various assets
-	Gas pipe branch to Engine No2. Valve
-	Gas pipe branch to Engine No2. Meter and flanges
-	Main connection to Engine No2 TOP. Various assets
	Main connection to Engine No2 BOTTOM. Various assets

Zone 3 Gas Bag and Flare

Gas Bag and Flare Stack	Gas bag main F&R pipe bridge. Double flange
-	Gas bag main F&R pipe bridge. Various assets
-	Gas bag main F&R pipe bridge. Double flange
	Gas bag main F&R pipe bridge. Double flange
	Gas bag main F&R pipe bridge. Single flange
	Branch to Gas condensate chamber. Valve
	Gas condensate chamber. Various assets
	Gas condensate chamber. Various assets
	Main gas branch into Gas condensate chamber. Double valves
	Gas main to Boosters 1&2. Single flange
	Gas main to Boosters 1&2. Single flange
	Gas main to Boosters 1&2. Single flange
	Gas Booster No1 setup TOP. Various assets
	Gas Booster No1 setup BOTTOM. Various assets
	Gas Booster No2 setup TOP. Various assets

	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		

	Gas Booster No2 setup BOTTOM. Various assets
	Gas Holder Outer PRV and compressor 1G&2 setup
	Gas Holder PRV. BOTTOM
	Gas Holder PRV. TOP.
	Flare Stack Gas Booster 1&2. TOP. Various assets
	Flare Stack Gas Booster 1&2. BOTTOM. Various assets
	Flare Stack Gas Booster 1&2. BOTTOM. Various assets
	Gas pipe bridge to Flare Stack. Single flange
	Gas pipe bridge to Flare Stack. Single flange
	Gas pipe bridge to Flare Stack. Single flange
	Gas pipe bridge to Flare Stack. Single flange
	Gas pipe bridge to Flare Stack. Single flange
	Condensate pot and various assets with Flare Stack Enclosure
	Main pipe connection to Flare Stack. Various assets
	Main pipe connection to Flare Stack. Various assets
	Main pipe connection to Flare Stack. Main valve

 United Utilities Water for the North West	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		

Identifying assets – the above assets are all uniquely identified within the table.

Monitoring – The sequence of events when monitoring assets on site are outlined in Appendix B. EPA Guidance (Method 21 – Determination of Volatile Organic Compound Leaks) is the generally accepted method of monitoring being followed.

Leak Repair – On detection of a gas leak the monitoring operative will inform the Site Manager/Controller who is responsible for raising work order to enable the work to be scheduled to an appropriate Field Service Engineer for repair and an audit trail is available.


Recordkeeping –Third party reports are stored on the statutory maintenance share point. See Appendix A for extract of typical report.

Type & Quantity of Emission – All combusted biogas is emitted to air via a point source emission point directly from the combustion unit therefore any likely fugitive emission will be of non-combusted biogas as this accounts for the majority of stored gas with a composition of Methane (60-70%) and Hydrogen Sulphide (50- <100ppm). The quantity emitted will be variable dependant on, the location of the emission source i.e. a hole in a gas storage vessel has the potential to release a large quantity in comparison to an isolated pipework length, when the leakage was detected and the pressure of the contained gas.

5. Key Personnel

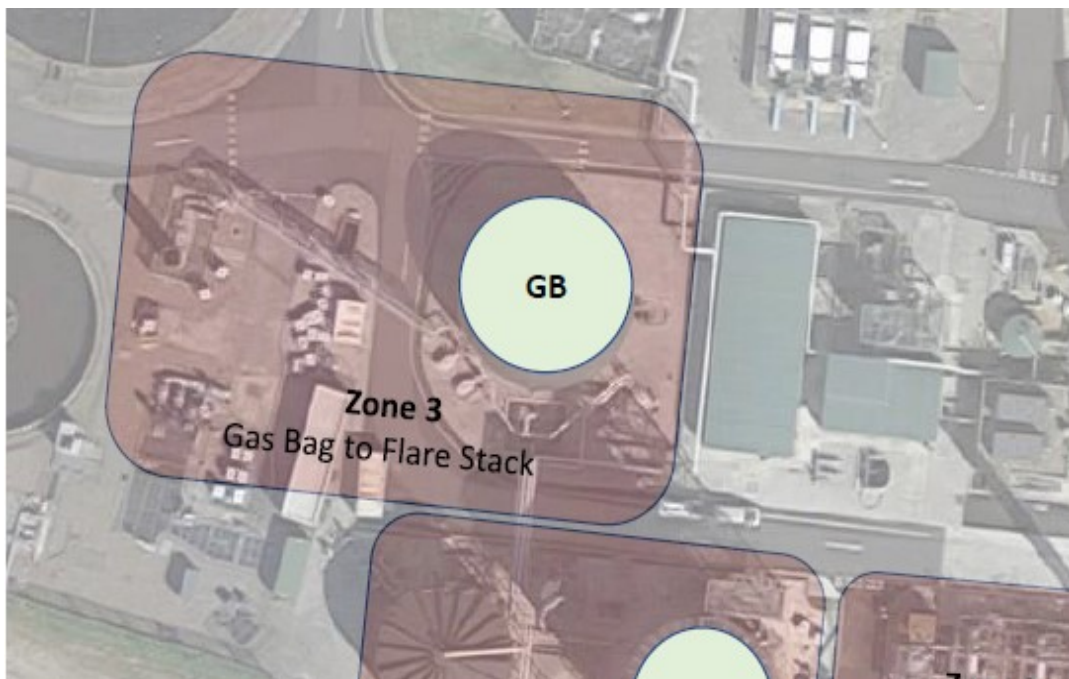
Responsibilities for implementation of the LDAR plan are outlined in Section 3. A more detailed list is shown in the below table.


Title	Responsibility
Site Production Manager	Ensuring the LDAR is implemented on site and any asset repairs are undertaken in a timely manner. Responsible for Health & Safety of site personnel.
Statutory Maintenance Manager	Overall management of the Statutory maintenance team including work completion
Statutory maintenance Team Leader	Day to day management of the

	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSIs are published in UU's QA System. If this document is printed please check it is the current version.</i>		

	Thermography contract including escalating risk and H&S requirements
Thermography Engineer (Contractor)	Undertaking the site based leakage monitoring to the required standards and raising any leakage via the relevant processes
Production Engineer	Technical specialist in relation to the biogas system and to be made aware of any leakage detected
Environmental Regulatory Advisor	Company contact with the local EA officer. Responsible for assessing and reporting permit non-compliance. Undertakes monthly site inspection which may detect leakage
Site Operational Staff	Operation of the site assets. Detection and reporting of leakage if discovered during site tours

6. Asset Location Plan



	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		

7. Planned Leakage Detection Process

The third party contractor in Infrared advanced gas detection will attend site and follow the requirements of the 'Safety Method Statement' ensuring all site access and safety requirements are being met.

All biogas assets (as listed) in the schedule are monitored for leakage using Optical Gas Imaging as they are the most likely points of gas escape due to pipework and tank joins. The relevant asset are located within the permit boundary as shown in the Asset Location Plan. Monitoring is undertaken in this area due to the location of the assets containing biogas. Any detection of leakage should be escalated using the 'Gas Leak Detection Form'.

8. Reactive Leakage Detection Process

Reactive requests to monitor for biogas emissions may also be directed to the team for example when new assets are installed and leakage checks are required before putting back into operation. The same processes as above are followed for monitoring and escalation.

9. Training & Calibration


Personnel involved in undertaking leak detection using specific equipment are trained in the use of that equipment and all relevant Health & Safety requirements e.g. DSEAR awareness before attending sites.

Equipment such as the thermal imaging camera are calibrated as per the manufacturer's recommendations.

10. References

[Best Available Techniques \(BAT\) Reference Document for Waste Treatment; Conclusion 14](#)

EPA Leak Detection & Repair Plan – A Best Practice Guide

 United Utilities Water for the North West	Wastewater Treatment	Reference: WWP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		

Appendix A



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Site Visit Summary

An Optical Gas Imaging (OGI) survey was conducted to investigate for any fugitive methane gas leaks from within the site waste processing system.


A record of each asset inspected is attached with accompanying still images. Where gas leaks have been identified, the record is annotated with a RAG rating and a short video of each affected asset is presented on a separate page.

Survey
Site Induction – update
/
Camera Equip
Calib
<u>Thermogr</u>



RAG Rating	
	Immediate Investigation recommended
	Check at next routine inspection
	No further action required

Air temperatur
Cloud cover
Wind speed & Dir:
Precipitatio

 United Utilities Water for the North West	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSI's are published in UU's QA System. If this document is printed please check it is the current version.</i>		



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Zone 1 : Digester train.

Location	Description / Observation
Digester No 1.	Incoming Gas Hatch.
-	Incoming Gas Pipe Train. Two Flange
-	Inspection Window.
-	Purge Point.
-	Inspection Hatch.
	Old Inspection Window



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A



Image ID: IR_15616.jpg

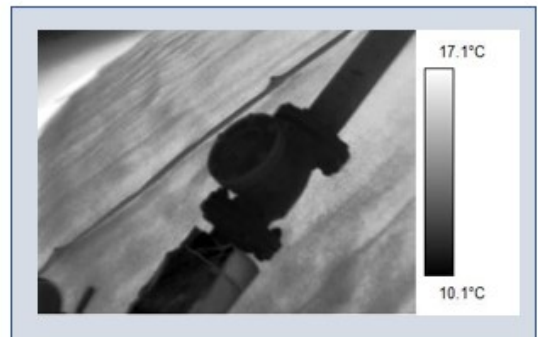
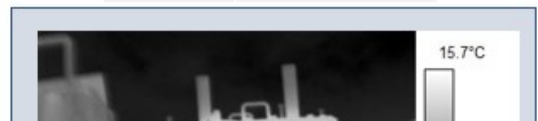
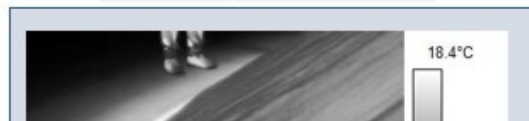



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 United Utilities Water for the North West	Wastewater Treatment	Reference: WwP/I/3033/30/24
	Site Specific Instruction (SSI)	Version: 01 Issue date: 11/10/2023 Expiry date: 11/10/2024
	Leak Detection Repair Plan Leigh WwTW	
<i>SSIs are published in UU's QA System. If this document is printed please check it is the current version.</i>		

Appendix B

Typical Third Party Sequence of Events

First Visit

1. Meet designated site representative during operational hours
2. Pre-survey meeting to discuss risk assessments, limitations of access (D.S.E.A.R), first aid and safety procedures
3. Site tour to familiarise layout, potential dangers and access routes. If appropriate, digital photos are also taken at this stage to assist with report analysis.
4. Survey / Inspection Tours
4. On arrival, sign in or report to security. Outline intentions and obtain update for any site safety or operational changes
5. Ensure generic United Utilities Passport is valid and in date. Ensure date specific work permit is issued covering the day or estimated time on site. Note: This is to be a N.D.T (Non-Destructive Test). Therefore, the engineer / thermographer will not actually touch any of the assets under investigation
6. Obtain a local site induction and check that the planned route is suitable
7. Switch on thermal imaging camera and allow it to acclimatise for approximately 10 – 20 minutes
8. Check all equipment to be carried around site
9. Record environmental and weather conditions
10. Setup camera and tripod for landscape imaging, or prepare camera with isotherms for scanning, or input settings for individual thermograms. Capture and record findings as appropriate
11. Record environmental and weather conditions at the end of survey
12. Sign out and leave site