

## Local Operating Procedure (LOP)

<b>Site</b>	Strongford STF
<b>Title</b>	Leak Detection and Repair Plan (LDAR)

<b>Purpose</b>	This Local operating procedure 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.
<b>Who</b>	Site operators and managers at Strongford.

### **Must Have (H&S, Quality, Quantity, Environment, Training, Resources)**

*Enter the main must haves before the requirements of this LOP are carried out, e.g must have a Blue Card; Must be trained in..... If none required, then just add 'N/A'*

- Understanding of Gas Detection and Risks.
- Understanding of Environmental Permit requirements.
- Appropriate training in Personal Gas Monitor and DSEAR awareness.

**Remember – ‘Stop, Think, Take 20’**

### **Summary Must Do**

*Enter here no more than 10 key points / requirements of this LOP..... If none required, then just add 'N/A'*

<ol style="list-style-type: none"> <li>1. Check Environmental Permit requirements.</li> <li>2. Refer to Site Plan for location of assets in scope.</li> <li>3. Understand detection and reporting processes.</li> <li>4. Understand Schedule 5 notification process.</li> <li>5. Maintain records.</li> </ol>	<ol style="list-style-type: none"> <li>6. Close out corrective actions.</li> <li>7. Refer to Methane Find and Fix SOP</li> <li>8.</li> <li>9.</li> </ol>
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**LOP****1. Scope**

This Local Operating Procedure is applicable to Strongford AD site, for the Leak Detection and Repair procedure and Process and also gas injection into the gas to grid network.

**2. Responsibility**

The Bioresources Manager for the AD site is responsible for ensuring environmental permit conditions are complied with. The Maintenance and operational Team are responsible for undertaking the monitoring and reporting any defects for repair through the Bioresources operations App.

The site manager or senior tech is responsible for scheduling the required repairs and ensuring they are completed.

**Fugitive Methane Detection**

The monitoring team use the Bioresources Operations App to record the results of the survey and any resulting leaks and defects. This data then feeds into an internal SharePoint page which then feeds into a Power Bi dashboard. It then creates a job on the CMMS (Computerised Maintenance Management System). These are then used to track the progress to completion.

*Table 1: Key Personnel*

Title	Responsibility
Bio-resources Manager/Senior Tech	Ensuring the LDAR is implemented, and site and repairs are carried out in time manner by onsite maintenance team. Responsible for reporting issues to appropriate authorities.
Site Operators	Operation of site assets, detection and reporting of leakage if discovered while carrying out site duties.
Thermographic Engineer	Undertake site-based leakage monitoring and raising any leaks to site management team.

**3. Asset Monitoring Schedule**

The following assets in Table 1 are continually monitored 24 hours a day via a Quantum Gas LDARLDAR Camera this camera is located outside and monitors assets in range. As well as the QGL camera there are routine proactive inspections via a OGI (Optical Gas Imaging) Handheld Camera and LDARLDAR Drone on a 12 monthly 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 daily site duties. Methane detectible Personal gas monitors are worn which alongside human senses can detect leakage which are then reported. If the source of the emission is unknown during the daily duties monitoring and human senses, then the use of Optical Gas Imaging will be requested to attend site and undertake an assessment to locate the source.

A works order is raised for repair by the appropriately skilled operatives. Works and issues are tracked and documented using the Bioresources operations App. Then this is put on an internal SharePoint page which feeds into a Power Bi Dashboard. Once these repairs are complete, daily checks will continue, and the process scientists will re-visit to ensure the leak has been rectified effectively.

*Table 2: Assets in scope*

Asset	Method of Monitoring	Frequency	Priority	Priority Rational
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Digestors	QGL camera (24hr), LDAR Drone, OGI camera, Personal gas monitors	Monitors daily, QGL camera (24/7) OGI camera and Drone 12 monthly.	High	Volume of contained gas and level detection
Flare Stack	QGL camera (24hr) LDAR Drone, OGI Camera, Personal gas monitors, Annual inspection	Monitors daily, QGL camera (24/7) OGI Camera, Drone, and external inspections 12 monthly	Medium	Frequency of use for emergency use or excess gas production
CHP Engines	QGL camera (24hr), LDAR Drone, OGI Camera, Personal gas monitors and Inspection servicing	Monitors daily, QGL camera (24/7), OGI Camera and Drone 12 monthly, inspection (Service)	High	Frequency of use and volume of gas
Boilers	OGI Camera, Personal & fixed gas monitors	Monitors personal and fixed-daily and OGI Camera 12 monthly	Medium	Dependant on fuel source and housed in building
Gas Booster Compressors	OGI Camera, Personal gas monitors	Monitors daily and OGI camera 12 monthly	Medium	Differing gas pressures
Gas Bags	QGL camera (24hr) LDAR Drone. OGI Camera, Personal & fixed gas monitors	Monitors personal and fixed daily, LDAR Drone and OGI Camera 12 monthly	High	Contained gas volume
Emergency shut off Valve	QGL camera (24hr) LDAR Drone. Gas thermographic camera, Personal & fixed gas monitors	QGL camera (24/7), OGI Camera and Drone 12 monthly.	Medium	Operation and Maintenance task
Pressure Relief Valve (PRV)	QGL camera (24hr) LDAR Drone. OGI camera, Personal & fixed gas monitors	Monitors daily. LDAR Drone and OGI camera 12 monthly	Medium	Operation and Maintenance task
General Gas Pipework	QGL camera (24hr) LDAR Drone. OGI camera, Personal & fixed gas monitors	Monitors daily and LDAR Drone and OGI camera 12 monthly – visual checks	Medium	Gas volume contained – Look for degradation of pipework
Gas to Grid Conditioning plant	QGL camera (24hr) LDAR Drone. OGI camera, Personal & fixed gas monitors	Monitors daily and LDAR Drone and OGI camera 12 monthly and visual checks	High	Operation and Maintenance task
Odour Control Units	QGL camera (24hr) LDAR Drone, Personal & fixed gas monitors	Monitors daily and LDAR Drone and camera 12 monthly.	Medium	Operation and Maintenance task
Elovac Unit	monitoring needs to be assessed as part of commissioning/HAZOP, and added here			

**Specific asset areas surveyed during OGI Camera monitoring.**

**\*Please note that not all sites are the same and some assets may not be present:**

- **Digestion**
  - o Digester safety devices (Whessoe valves or similar)
  - o Gas mixing assets, ancillaries and pipework
  - o Gas pipe work and valves
  - o Digester body including roof where possible
  - o Limpet Boxes on Digesters ‘Bell mouths’

- **Site wide**
  - Pipe work and valves
  - Gas receivers
  - Gas boost fans
- **Boiler house**
  - Pipe work and valves up to the building
  - Internal pipe work if access is granted by the site and it is safe to do so
  - Gas boost fans
- **Gas Holder**
  - Gas holder or bag
  - Pipe work and valves
  - Blowers/baffles/non-return valves
  - Safety valve/devices
- **CHP – Combined Heat and Power**
  - Pipe work and valves up to the CHP container – Internal surveys done by the Renewables team
  - Gas conditioning plant. For example, Chillers, Siloxane plant, etc.
  - Gas receivers
  - Gas boost fans
- **Flare Stack**
  - Pipe work and valves up to the flare and vent stack
  - Please note that during the survey, this may not be operational. However, still survey the assets to ensure valves have sealed off the gas correctly
- **Gas to Grid plant**
  - Pipe work and valves up to injection into the grid or equivalent
  - Gas conditioning plant including reactors and filters
  - Gas compression plant
  - Gas upgrading plant
- **Elovac unit**
  - To be assessed

#### 4. Identifying assets

The above assets are all uniquely identified with ID numbers therefore are easily identifiable by the person undertaking the leak detection monitoring. This enables the assets to be scheduled for inspection and identified for repair if necessary. All new or replacement assets go through an asset tagging process to ensure an accurate site list is maintained within SAP.

#### 5. Monitoring

At the Strongford site they have a fixed 24-hour QGL camera (Quantum Gas LDAR), Strongford was seen as a site which would benefit from the installation of a 24-hour gas monitoring camera due to its size, asset capacity and proximity to receptors. It is also undergoing site improvements and investment to becoming a 'Net Zero Hub'. Emissions monitoring and reduction is a major part of what the site is trying to achieve and moving forward to becoming net zero by 2030.

The camera is designed to scan the sensitive assets using DIAL, TDLAS and TCSPC monitoring methods in accordance with the appropriate measures. The cameras technology counts gas molecules in the air and looks for emissions.

The use of Personal gas monitors and visual checks of assets are done by site operatives daily. The monitoring team carry out Drone surveys and OGI Camera surveys on an annual basis as part of their routine monitoring schedule. If leaks are detected from the drone survey these can be pinpointed by using the handheld OGI camera (Optical Gas Imaging). This means the source of the leak can be

identified to an exact location and finding the source of the emission and the mitigation and repair process can commence.

The annual Drone surveys produce a report in which alarms are triggered when a Methane leak is detected over 50ppm/m. These alarms are then recorded, and all associated information is stored. As the site covers a large area, the flights are separated into asset sub- areas, and a thorough inspection of the asset is carried out. The report gives exact GPS locations of each alarm so it can be further investigated. The Drone flight reports record all required information as follows-

- serial number and device type.
- unique inspector/ approved thermographer identification number carrying out the monitoring.
- flight duration
- flight start and finish time (includes start location and end location)
- wind speed and direction
- Latitude and longitude GPS reading of exact position of detected emissions. (Drone alarms over 50ppm/m of Methane)
- Time of each alarm detected.
- exact ppm reading of each alarm.
- readings shown in graph format.

Drone flights can only be done in suitable flying conditions. Flights will be re-attempted when suitable conditions are available. Prior to the Drone flights the Drone pilot and/ or Drone team carrying out the monitoring will inform site operational managers and carry out pre-flight checks. Such as informing local aviation services in the area.

Personal gas monitors are worn and used in line with the training requirements outlined via our external 'Gas Monitor Training' carried out by an external certified contractor to STW.

Alongside this Local Operating Procedure there is a Standard Operating Procedure (Methane Find and Fix SOP) which outlines the specific Monitoring procedures that must be followed when carrying out the OGI Camera monitoring.

- **Leak Repair**

On detection of a leak through the emissions monitoring methods stated above it is then entered into the Bioresources Operations App which automatically raises a job. Severe leaks will be reported on the day and best endeavours will be to isolate when safe to do so. (See process above).

Once repairs have been made, as well as routine daily checks there will be a revisit of site and another drone survey or OGI Camera survey will be carried out to ensure repairs were successful. This will be discussed in the maintenance and planning meetings.

- **Recordkeeping**

Surveys are recorded on the Bioresources Operations App, then onto SharePoint, alongside the SharePoint document, a visual representation of that information is put onto an internal Power Bi dashboard. This dashboard can then be included in 'Comm cell' discussions and for tracking and reviews. If a site is monitored and no emissions are found, this is recorded as 'no fugitive emissions found on site' and required information recorded i.e. date and time of survey.

When an annual Drone flight is carried out, a pdf report is created. This report details the area or asset that has been monitored and the emissions that are detected during the flight. It then creates a detailed map of the detected emissions.

All gas assets are uniquely identified, and an electronic site register is available and kept up to date (SAP). Leak detection is scheduled to the appropriately trained person using the site asset list.

Following inspection an electronic record is made of the checks and put onto the internal SharePoint page.

Example below of the **Bioresources Operational App** to record each survey.

Asset Health Status

### Netheridge

By Asset Area and Type
▼

LDAR Only
▼

Whole Site Check
▼

Show All

Netheridge

Asset is NOT long term isolated
  Repeat Last Inspection : No

Not inspected
▼

Inspection Short Text - 40 characters max

Additional SAP Long Text - 50 characters max

Last Inspection : 07/04/2025 11:45 M - Maintained  
 Days ago : 58  
 Last Comments : No fugitive emission found

Check Data

See example below of the **Power Bi Dashboard (DIMPf- Design, Installation, Maintained, Potential Failure, Functional failure)** this gives an overview of all associated assets in scope and their status.

DIMPF - Asset Health Overview Bioresources

Region  
 Region 1 Region 4  
 Region 2 Region 5  
 Region 3 Region 6

3043  
Total Assets

2611  
Assets Inspected in Last 90 Days

89.8%  
Assets Inspected in Last 90 Days %

295  
Assets Not Inspected in Last 90 Days

137  
Assets Long Term Isolated

272  
Assets Due Inspection in next 7 Days

Site  
 Select all  
 Affleton  
 Bamhurst  
 Brancote  
 Claymills  
 Coalport  
 Coleshill  
 Derby  
 Finsam  
 Haydon  
 Kidderminster

#### Assets Inspected and Functional Failure Trend

#### Last Inspection Status in Last 90 Days

Note: Excludes any asset long term isolated

#### Number of assets not inspected in last 90 days

DIMPf Code	DIMPf Description
D - Design	The asset design does not match the needs of the site. This may be undersized, used incorrectly, not fit for purpose, etc.
I - Installation	The asset has not been installed within the recommended specification or that the environment is having a detrimental effect on the assets condition
M - Maintained	After installation, all that is required is to follow routine maintenance practices'
P - Potential Failure	A metric designed to indicate asset health has changed
F - Functional Failure	Asset no longer able to function as designed.

**Type & Quantity of Emission & Reporting**

### Fugitive Emissions

This is covered by the above LDAR Programme.

We use an Opgal Camera and fixed QLM cameras on selected sites are used to quantify methane. We will notify the Environment Agency through a Schedule 5 notification when we find any fault that is causing or may cause significant pollution.

### Process Emissions

This is currently part of the ongoing IED compliance work.

See example below of the recorded surveys in which a Leak Rate from the camera is inputted and uncertainty is calculated when leaks are found and then quantified. This also records the leak repair date if applicable and whether it required the asset to be isolated.

↶ **LDAR Data Update**

**Hayden**      Potential

**CHP Engine**

Leak rate from Camera

Uncertainty Rate

Fix Date  📅

**LDAR Only**

**Hayden**

Comments

💾

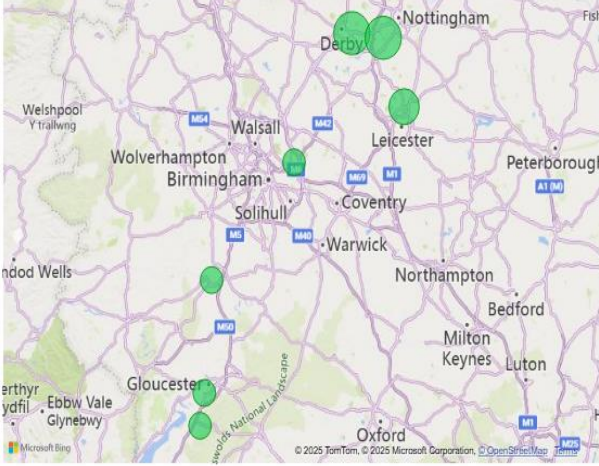
**Save**

📄 **All LDAR Records**
Bioresources

<b>Site Name</b>	<b>Created Date</b>	<b>LDAR Status</b>	<b>DIMPF Status</b>	<b>Area</b>	<b>AssetType</b>	<b>Asset</b>	<b>Created By</b>
All	Last 90 Days <small>📅 07/03/2025 - 04/06/2025</small>	All	All	All	All	All	All

Site Name	Area	AssetType	Asset	Status	Job Comments	Created By	Created	Leak Rate (g/h)	Uncertainty Rate (g/h)	Leak Repair Date	LDAR Comments	LDAR Status
Stoke Bardolph	LDAR Only	Whole Site Check	Stoke Bardolph	M - Maintained	No fugitive emissions.	Alan Butcher	02/06/2025 10:32:39	0	0			Closed
Finham	LDAR Only	Whole Site Check	Finham	M - Maintained	Nothing found no fugitive emission found	Palbinder Chal	30/05/2025 12:11:35	0	0			Closed
Newthorpe	LDAR Only	Whole Site Check	Newthorpe	M - Maintained	No fugitive emissions found	Leah Challis	20/05/2025 10:05:44	0	0			Closed
Ailthron	LDAR Only	Whole Site Check	Ailthron	M - Maintained	No fugitive emissions found	Leah Challis	20/05/2025 08:48:37	0	0			Closed
Roundhill	LDAR Only	Whole Site Check	Roundhill	M - Maintained	No fugitive emissions found	Palbinder Chal	09/05/2025 10:40:50	0	0			Closed
Spernal	LDAR Only	Whole Site Check	Spernal	M - Maintained	Nothing found no fugitive emissions	Palbinder Chal	25/04/2025 09:05:09	0	0			Closed
Worcester	LDAR Only	Whole Site Check	Worcester	M - Maintained	Nothing found no fugitive emissions	Palbinder Chal	15/04/2025 11:16:21	0	0			Closed
Hayden	LDAR Only	Whole Site Check	Hayden	M - Maintained	Nothing found no fugitive emissions found	Palbinder Chal	15/04/2025 11:12:55	0	0			Closed
Netheridge	LDAR Only	Whole Site Check	Netheridge	M - Maintained	No fugitive emission found	Palbinder Chal	07/04/2025 10:45:47	0	0			Closed
Stanley Downton	LDAR Only	Whole Site Check	Stanley Downton	M - Maintained	No fugitive emissions found	Palbinder Chal	07/04/2025 10:44:38	0	0			Closed
Kidderminster	LDAR Only	Whole Site Check	Kidderminster	M - Maintained	No fugitive emissions	Palbinder Chal	04/04/2025 09:14:16	0	0			Closed
Netheridge	LDAR Only	Whole Site Check	Netheridge	M - Maintained	No fugitive emissions found	Alan Butcher	31/03/2025 14:25:33	0	0			Closed
Hayden	LDAR Only	Whole Site Check	Hayden	M - Maintained	No fugitive emissions found	Alan Butcher	31/03/2025 14:24:35	0	0			Closed
Hayden	LDAR Only	CHP Engine	Hayden	P - Potential Failure	CHP rotork 1 failing	Stephen Richards	20/03/2025 09:57:13	0	0			Open

If any leaks are found, they are reported, and the severity is categorised.



**Site Name**

 DERBY  
 MINWORTH  
 NETHERIDGE  
 STANLEY DOWNTON  
 STRONGFORD  
 TOTON  
 WANLIP  
 WORCESTER

**Leak Severity**

 Defect  
 Emission  
 Leak  
 Venting  
 Weep

**Repaired**

 Yes

Site Name	Year	Month	Asset Type	Leak Severity	Asset ID	Comment	Repaired
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**Drone Report Example-**

Below is an example of the Drone Report that is created.

## a ONE Inspection Report

Creation time: 14 Jun 2024 at 16:21:22

**Line1: Inspection Overview**

**Device type:**U10  
**Serial Number:**U10-215006  
**Alarms Num:**0 (0★)  
**Notes Num:**0  
**Time Length:**15min:24s  
**Distance:**2.95km  
**Start time:**  
 12 Jun 2024 at 14:44:58  
**Start location:**  
 Acquisition Location Failed  
**End Time:**  
 12 Jun 2024 at 15:00:22  
**End location:**  
 Acquisition Location Failed  
**Inspector:**derbyjune2024



- Reactive Leakage Detection Process**

Reactive requests to monitor for biogas emissions are also directed to the monitoring 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.

- Training & Calibration**

The Drone monitoring is carried out by a trained drone pilot; the equipment is calibrated before every flight. The OGI camera is used by a trained Thermographer. When the OGI Standard ISO18436-9 is available we will follow this standard.

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 OGI camera are calibrated as per the manufacturer’s recommendations.

**OGI Camera Details**

Opgal EyeCGas

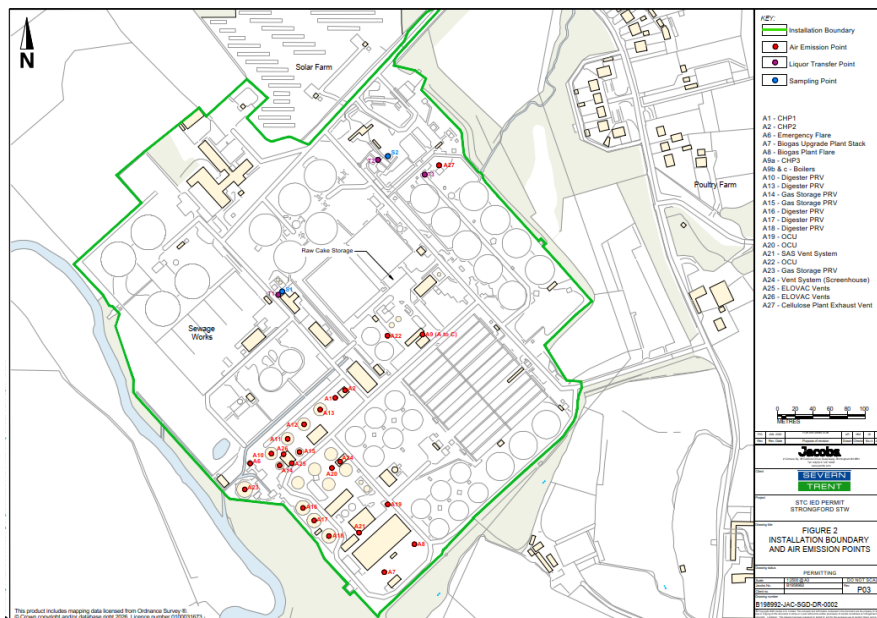
Serial Number TGC24116728

Calibration is done by the camera, and external calibration is not required with this camera.

**EyeCGas 2.0 – Long Range**

- **Detection Capabilities:** Methane, CO<sub>2</sub>, CO, and over 400 VOCs
- **Optics:** Long-range telephoto lens with 7.5° Field of View
- **Filters:** Multi-spectral interchangeable filters for enhanced detection
- **Thermographic Imaging:** Includes temperature measurement and color palettes
- **Connectivity:** Built-in Wi-Fi, GPS, hotspot, and Bluetooth
- **Certifications:** Intrinsically safe (IECEx, ANSI, CSA)
- **Software:** EyeCSite QOGI for gas quantification
- **Durability:** Rugged and sealed for harsh environments
- **Compliance:** Meets EPA OOOOa/b/c regulations
- **Warranty:** 4 years
- **Multi-Spectral Filters:** EyeCGas Multi is the only OGI camera that offers three operator replaceable filters; for VOC gases 3.2µm to 3.4µm, for heavier alkanes (better for long-range detection) 3.3µm to 3.5µm and for CO<sub>2</sub> 4.2µm to 4.4µm.

**Site Plan**



**Records, Appendices & References**

A ONE Drone inspection report.  
 Waste Treatment BRef - Best Available Techniques (BAT)

Bioresources LDAR Power BI
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<b>Document Control &amp; Governance:</b>						
<b>Owners Name</b>		<i>Andrew Perry</i>				
<b>Owners Role</b>		<i>Permit Compliance Advisor</i>				
<b>Date of Next Review</b>		<u><i>20/08/27</i></u>				
<b>Version</b>	<b>Date</b>	<b>Reviewer's names</b>	<b>Approvers names</b>	<b>Reason for Review</b>	<b>Supported doc changes</b>	<b>Communications</b>
1.0	18/05/22	Joanne Chapman	Simon Farris	First Issue	N/A	Bioresources Ops
2.0	20/8/24			Updated BAT		
3.0	20/08/25	Andrew Perry	Alan Butcher	EA Review and Guidance	Methane Find and Fix SOP	Bioresources Ops
4.0	29/01/26	Andrew Perry	Joanne Chapman	Permit variation application		
<b>Summary of changes</b>						
1.0	Document Created for IED permit application					
2.0	Updated monitoring techniques and BAT.					
3.0	EA Review and Guidance					
4.0	EA Review and Guidance					
<p><b>The only valid version of this LOP is the electronic version held in Waterpedia. If printed, it is uncontrolled. Ensure the printed version matches the Revision History details in Waterpedia. If not, 'DO NOT USE' and contact your line manager for the new version</b></p>						