WASTE 4 GENERATION

THE SOLUTION FOR FUTURE GENERATIONS

ODOUR MANAGEMENT PLAN 2023

Waste4Generation Corby

Treatment Methodology & Risk Minimisation

Waste4Generation Ltd

Earlstrees Road Odour Management Plan 10-03-2023

Section 1: Introduction

This document presents the odour management plan for the Waste4Generation high-rate anaerobic digestion research facility based at 12B Earlstrees Road, Corby. The site includes a bespoke feedstock blending facility, where low quality waste streams are processed, optimised and blended to create a well-balanced highly desirable feedstock for anaerobic digestion for off-site plants. The proposed annual operational capacity of the plant is 109,500 tonnes (based on 300 tonnes daily). The plant design and its existing operation all incorporate measures to reduce and remove any potential impact on local receptors.

Objectives

The site is designed to be a low odour hazard, utilising enclosed high-rate anaerobic digestion vessels to treat liquid wastes which are all situated in the yard area at the rear of the property. All other tanks situated within the yard area are enclosed and are capable to having their off-gases treated either via carbon scrubber or the centralised nano-bubble scrubbing system.

All incoming liquid wastes are either received within sealed intact IBCs or directly pumped off from bulk tankers into enclosed sealed tanks via tanker coupling. The IBCs are to be stored within the warehouse. All bulk liquid wastes are to be received into storage tanks through one of the reception points outside. The off gases of all tankers can be treated via our centralised scrubbing system which prevents any odours from tanker discharge.

Within the warehouse there is a patent pending pre-treatment plant which will receive fats, oils & greases (FOG), and hydrolyse them for further feedstock. This waste would normally be sent to landfill for disposal. FOG will be directly received into the FOG reception tank, receiving the waste via RT1 reception pump and transferred into sealed vessels, with odour abatement, keeps the risk of potential odour to a minimum. Additionally, within the warehouse is proposed to be a number of enclosed storage tanks, which are able to receive liquid waste (from the R1 pumping station), and their potential off-gases again connected to the centralised scrubbing system. By utilising a number of individually bunded and sealed storage tanks, this enables the targeted and specific blending of individual wastes and products to help to create bespoke feedstock for off-site AD plants.

The FOG waste which arrives in tankers for the pre-treatment process and the Synthomer Still 5 waste, which is delivered within IBCs, and hydrolysed via another patented pre-treatment process to produce a liquid for the plant. Both wastes are stored and pre-treated within the warehouse.

Included within the permit variation application, is a proposed solids reception bay, to be located alongside the outside wall of the warehouse between the two roller shutter doors. This is planned to be an enclosed shed, with roller shutter doors, with odour scrubbing.

The odour management plan for this site has been prepared with EA H4 guidance and as a proposed installation the abatement system is designed to comply with required BAT regulations. Odour abatement technology is in place to minimise the risk of odour, minimise potential intensity of odour as well as preventing odour from being detected by local receptors beyond the site boundary.

Guide to Waste Process throughout Site (Step by Step)

The following provides a step-by-step process flow on how waste is moved throughout the process and how odour is managed at each stage. The Waste Decision Diagram (attached) is situated on site to assist staff with any decision-making requirements, and as a training guide.

Waste Treatment Process (Step by Step)

The following provides a step by step process flow on how waste is moved throughout the process and how odour is managed at each stage (Process Flow Diagram attached):

1. A waste / product is fully characterised prior to its acceptance on to site by undergoing pre-acceptance testing and checks. On completion of these checks, it is able to be characterised as one of the following
    a. Waste streams for onsite effluent treatment & high-rate AD.
    b. Waste streams which can be incorporated into feedstock.
    c. Products
2. Depending on how these waste streams / products are identified will determine their course through the site.
3. When the vehicle containing the waste arrives on site, it is inspected prior to being guided into site. Highly contaminated vehicles are to be rejected offsite. On guiding on to site, the vehicle is to be weighed in. On leaving the site all vehicles are to be weighed out. All waste & products are to be weighed in & out of site.
4. On arrival of the waste onsite, acceptance testing determines if the feedstock/waste stream complies with pre-acceptance results, and whether or not it is to continue down its pre-destined pathway through site, be characterised differently as product, feedstock or AD, alternatively the waste can be rejected.
5. Any waste streams / products on acceptance testing, where their odour is suspected to be unmanageable will be rejected and not off-loaded.
6. Once the destination for the waste / product onsite has been determined, the vehicle is to be escorted and monitored throughout offloading by a member of Waste4Generation personnel. Any vehicle is not to left unattended at any point.
7. On reception of sealed IBCs, these are to be offloaded following analysis into the warehouse, in to designated storage area. Any damaged or contaminated IBCs are to be rejected. All lids on the IBCs are to be correctly sealed, and all taps free from leaks.
8. Should solid wastes be received in skips, these are to be tipped/unloaded into the solids bay. For reception into the solids bay, the vehicle is to be backed up to solids bay. Only then, are the roller shutter doors to be opened. The solids are then to be tipped into the enclosed bay, and staff are to ensure that the material is situated within the bay fully. The telehandler is to be used to ensure all product is within the sealed shed. Once completed, the doors are to be shut again. Wash down of surrounding areas.
9. For liquid wastes/sludges these can be offloaded via RT1 and RT2, all through sealed pipework, and into enclosed sealed tanks:
    a. Liquid wastes/feedstock into the warehouse storage tanks, are connected to the pumping (and pumping station) situated at RT1. All pipes & tanker hoses are to be inspected prior to connection to the reception pipework. Hoses not to be used if there is visible damage. Any

offloading is to be ceased should a leak occur. Warehouse storage tank to be selected, and tanker to be offloaded via RT1 reception pump. The tanker off gases can be connected to the central scrubbing system should the tanker pump be required to offload waste. Any spillages are to be immediately cleaned up and the area disinfected.

b. Liquid wastes/feedstocks can be received into RT1, directly pumped off into a sealed tank, with treatment for off-gases. All hoses to be inspected prior to connecting and offloading. Any spillages to be cleared up and disinfected immediately.
c. Liquid wastes for AD can be received into RT2, a horizontal double bunded tank. Tankers can be pumped off by using the reception pump. Off gases to be treated by carbon scrubber (Carbon Scrubber 4).
d. Liquid wastes for feedstock can be received into gold, white & grey feedstock tanks. These are sealed and material can either be pumped off by tanker or our pumping system. Treatment for off-gases through scrubber. Tank vented gases to also be treated.

10. After the waste/feedstock has been received to these various locations, it can begin to undertake the various different processes on site.
11. All the pipework systems on site are sealed, so should not form a source of odour as liquid feedstock/waste/products are pumped around site.
12. For wastes that require pre-processing, these can be pumped through the pumping manifold to either the drum screening for coarse solids removal, or the DAF for settlement and separation of fats, oils & greases. Both of these treatment methods have screens, and the DAF is covered, and where the screen solids are recovered into tanks. The processed effluent then moves onto another sealed tank.
13. For the blending of feedstocks, the grey, white and gold tanks (all sealed) can be individually mixed or mixed as a combination of all of the three tanks. Any liquid wastes within the warehouse can be pumped via the manifold into these three feedstocks blending tanks (without or without pre-processing). All the tanks are connected to the centralised scrubbing system to treat any off gases.
14. On filling tankers with feedstock destined for off-site AD plants, these tankers connect to the grey, gold & white tanks directly connected via sealed pipework.
15. Where solids are required to be added to the feedstock, these are added by onsite telehandler with bucket to be fed into the x-ripper hopper and conveyed into feedstock facility. Any spillages are to be immediately cleaned up as per cleaning procedures.
16. For feeding of the high-rate AD plant, the waste received into RT2 is then pumped forward from the sealed tank, to the DAF system, and then onto the ABP & MB tanks. These sealed tanks (with attached odour scrubbers for treatment of the displaced air) are where the waste is stored, analysed and then batch fed on to the digesters. All transfers are completed via a sealed pumping system.
17. The influent is then pumped via a sealed pumping system to one, all or a combination of reactors.
18. The reactors are a sealed system with internal water trap to prevent any gases escaping, all gases are collected via a main as header where the biogas is treated via a biogas scrubber. As the digesters form a sealed airtight system, there should be no escape of odour in general operation.
19. The treated effluent is then transferred via gravity to the one main break tank. The displaced air/off gases are treated by carbon scrubber (Carbon Scrubber 2). The break tank forms part of the recirculation loop of the high-rate anaerobic digesters, however anywhere throughout the system where there is an over-flow as a fail-safe, there is odour control measures.
20. The biogas produced from the top of the reactors, is contained within the sealed gas line, pulled through the biogas scrubber towards both the flares and the CHP unit. These are both monitored for emissions but also monitored for odours.

21. The treated effluent from the digesters is subject to further polishing via secondary DAF unit and through R1 nano-bubble / flash aeration treatment.
22. Following tertiary and quaternary polishing, the treated effluent is discharged via sealed pipework to our trade effluent discharge point.
23. As part of our process of optimising feedstock, the R6 sealed vessel is designed to allow dewatering of low-quality feedstocks, where the water decanted back into RT2 which then can be fed towards the high-rate AD. The settled sludge can be removed via the reception pump (from sealed tank to sealed tank) into the feedstock tanks.
24. The centralised odour scrubber unit receives the off gases for the vessels onsite and neutralises them with chemical correction via a blower and trickle filter supplemented with ozone & nano-bubble technology of the effluent which is sprayed over the filter media which the off-gases pass through.
25. Within the warehouse, the pre-treatment processing of synthomer, FOG or other bespoke wastes through patent pending hydrolysis processes takes place within sealed tanks treated via carbon scrubber (Carbon scrubbers 6 & 7) and also connected to the centralised odour abatement system.

The key goal of this odour management plan is to monitor and manage the site's operations and undertake appropriate methods to:

- Control & minimise odour.
- Protect against accidental release or nuisance.
- Protect against fugitive emissions.
- At all times prevent against any unacceptable odour pollution.
- Reduce any risk of odour releasing, through the anticipation and mitigation of all scenarios that could result in potential any incidents or accidents

Assessment of Odour

To determine if the potential odour from the site, the potential odour has been assessed utilise the FIDOR acronym as recommended in EA H4 Odour Guidance:

- **F**requency of Detection
- **I**ntensity as Perceived
- **D**uration of Exposure
- **O**ffensiveness
- **R**eceptor Sensitivity

These have all been detailed below both in the inventory and in the following assessment (Section 4: Releases & Odour Risk Assessment), with summary tables below. An H1 emissions assessment as well as environmental risk assessment has also been conducted.

Frequency of Detection & Duration of Exposure

As both standard operation and emergency operation/accidental release have been assessed in section 4 with individual patterns of release assessed. The duration of an exposure is dependent on the type and nature of release. For instance, spills are to be cleaned up immediately as per Site Cleaning Procedures.

Intensity as Perceived

Intensity of the odour has been assessed using VDA 3882 Part 1. For the odour assessment, this varies between 0 – 1 typically. The same parameters are to be used on the sniff testing on site, so that results are comparable.

Intensity

0. No odour
1. Very faint odour
2. Faint odour
3. Distinct Odour
4. Strong Odour
5. Very strong odour
6. Extremely strong odour

Offensiveness

The offensiveness of the odour is dependent on source. The pre-acceptance requirements prevent any highly odourous wastes from being received by the site, as does the acceptance procedure and tanker sampling. Due to the retention time of our process, and the turnover of feedstock for offsite AD plants, wastes should have a typical residence time of 24-48 hours, and therefore should not typically be able to deteriorate or degrade. In the case of some purchased products may have a residence on site for a longer duration, however these would be assessed prior to their storage on site and monitored for signs of decay.

As waste is typically considered odourous, the process has odour abatement techniques to ensure that any potentially offensive odours do not reach local receptors.

Receptor Sensitivity

The site is located within an industrial estate, with a public footpath at the front of the building. Whilst the public footpath is considered low in receptor sensitivity, with the surrounding industrial estate classed as medium sensitivity (all bar one property, which is a diner with outdoor seating, which we consider to be high sensitivity).

The closest residential property considered high sensitivity is 420 metres to the west. In addition to this, we have a number of offices and other businesses within 250 m of our site, and as such are treated as sensitive receptors. The abatement techniques are not only designed to reduce odour risk to the nearest receptors but also reduce risk to the most sensitive (albeit furthest away).

On-site Assessment of Intensity

The general site odour is to be recorded daily in the site diary. The sniff testing exercise utilises human assessors (site personnel) who use their sense of smell to "sniff" odours detectable in the vicinity of the site and identify their sources.

The person(s) undertaking the assessment will be trained in this procedure and a record of this training is kept in the site office. The understanding and competence of the assessor will be reviewed prior to the testing being carried out. The assessor will be a non-smoker, avoid food or drinks (except water) for at least half an hour before undertaking the assessment. Strongly scented toiletries should be avoided by the assessor. As colds, sinusitis or sore throat can affect the sense of smell, planned assessments should be re-scheduled if possible or undertaken by someone else.

To ensure that assessors are not suffering from odour fatigue and will be sensitive to anaerobic digestion & waste odours, on the day of the assessment they will not be subject to anaerobic digestion & waste odours prior to conducting the assessment.

A record is made of the meteorological conditions prevalent during the assessment, and any relevant installation-specific information is recorded (such as activities being undertaken, deliveries made, process operating parameters, any departures from "normal" operating conditions or activities). Note is also made of any activities conducted at, or odours noted from, any agricultural or industrial sources in the area in which the observations are being made.

The exact locations for monitoring will be dependent on the meteorological conditions in the day, but in general terms the following sequence of assessment is followed, with areas of weaker strength inspected prior to stronger.

Observations are made over a standard time of 5 minutes per location. During this time the nature of any odours detectable (in terms of detectability/intensity, extent/persistence and sensitivity of location – see below) are noted and recorded.

Data collection and recording

At each location scores are allocated against the following parameters:

INTENSITY (0 – 5) as above

Sensitivity of receptor where odour detected (assuming detectable, if not then 0)

- Low (e.g., footpath, road)
- Medium (e.g., industrial or commercial workplaces)
- High (e.g., housing, pub/hotel etc.)

Results are recorded on the Sniff Testing Report form.

Section 2: Summary of Source Inventory

Site Inventory

The proposed total throughput of the plant is 109,500 tonnes annually, average daily volume of up to 100 tonnes.

The total storage capacity on-site, including waste, feedstock, AD plant & treated effluent etc is calculated as:

Total Storage Capacity Onsite			
Tank/Storage	Capacity (m^3)	Tank/Storage	Capacity (m^3)
RT1	30	R1	60
RT2	70	R2	60
Main Break Tank	10	R3	60
ABP Tank	50	R4	60
Main Balance Tank	50	R5	60
Silver Tank	20	R6	60
DAF Unit	5	Polishing Tank A	10
DAF Break Tank	3	Polishing Tank B	7
DAF Sludge Tank	8	Polishing Tank C	7
FE DAF	10	80^oC Hot Water Tank	2
FE DAF Break Tank	3	50^oC Hot Water Tank	2
Rotary Screen Break Tank	2	Kerosene Tank	2
Rotary Screen Overflow Tank	1	FE/ Nano Bubble O_3 Polishing Tank	10
Methane Scrubber	1	Caustic IBC	(X)
Drum Screen (Pumping Station)	5	Onsite Pumping Station	1
Chemical Storage Tank	15	White Feedstock Tank	40
FE DAF Sludge Tank	5	Gold Feedstock Tank	50

Feedstock Storage (1)	30	Grey Feedstock Tank	50
Feedstock Storage (2)	30	Waste Feedstock (1)	30
Feedstock Storage (3)	30	Waste Feedstock (2)	30
Product Feedstock (1)	30	Waste Feedstock (3)	30
Product Feedstock (2)	30	Complex Waste Reception (1)	30
Product Feedstock (3)	30	Complex Waste Reception (2)	30
Nano Bubble Injection Tank (1)	30	Still 5 IBC Storage	45
Nano Bubble Injection Tank (2)	30	Still 5 Processing	3
R&D Break Tank (1)	2	Indoor Caustic IBC	1
R&D Break Tank (2)	2	60^{o}C Hot Water Tank	1
R&D DAF Unit	5	Kerosene Tank	1
R&D DAF Break Tank	10	Reverse Osmosis Break Tank	10
Fine Screen Break Tank	2	Solids Bay (1)	50
Ceramic Break Tank	2	**TOTAL:**	**1353**

Waste Types, Quantities & Source

The site was originally designed to conduct research & development into novel waste streams for anaerobic digestion, and since then we have developed sustainable solutions for a number of types of waste streams. Since we conducted our initial line of development, we have undertaken considerable research of developing the optimum feed blend for an AD plant, having worked with many plants across the UK and Ireland, and coaxed them back to bacterial health and feed balance. With the generation of optimal feedstock blends, this opens up the type of wastes, products and feedstocks that we will look to bring in (and in part send out). Notable types of investigation include:

- Our work with Thames Water as well as other Utilities and Waste Producers enables us to develop techniques and optimised anaerobic digestion systems for onsite use. This typically entails importing waste over a number of weeks or even months to provide data and optimise processing conditions, including brown FOGs & Synthomer Still 5.

- Offer an intermediate solution to clients providing a short-term sustainable solution until their on-site treatment is completed.
- Waste streams to be investigated, both novel and existing biodegradable wastes (within permitted EWC codes).
- Optimising of low-quality waste streams to prevent water from being transported across the country and concentrating key fractions to be utilised.
- Optimising & blending waste streams and products to provide a high-quality feedstock.
- Investigating waste streams which can be treated via nano bubble technology for widespread implementation.
- Investigation into trace nutrient and macro nutrient optimisation.

Key Wastes for Waste4Generation Corby (Approx.)			
Waste Type	*Annual Quantity (Est.)*	*Example EWC Code*	*Description*
Whey	5,000	02.05.01	Local dairy cheese production, both salted and sweet whey fractions.
FOG	5,000	19.08.09	Fats, Oils & Greases for pre-treatment
FOG	5,000	20.03.05	Fats, Oils & Greases for pre-treatment
Synthomer – Polyvinyl Acetate	500	07.02.08*	Liquid & sludge like organic based vinyl acetate for hydrolysis.
Fruit Solid Wastes	5,000	Various	Fruit Peelings or Solid Fruit Wastes
Other Solid Wastes	5,000	Various	Grains, Vegetables, Chicken Litter etc
Biodiesel Wastes	5,000	19.02.10	Glycerol water mixtures
Leachate	5,000	19.07.03	Non-hazardous landfill leachate
Industrial Effluent	5,000	Various	Including 16.10.02 & non-hazardous glycol
Brewery Waste	10,000	02.07.01	Wastes from Beer Production / Brewing
Brewery Waste	5,000	02.07.04	Wastes from Beer Production / Brewing
Bakery Waste	10,000	02.06.01	Local Bakery Waste Production
Dairy Wastes	10,000	02.05.01	Dairy washings
Food Production Wastes	10,000	02.02.04	Variety of Food Production Wastes
Yeast	10,000	02.03.04	Waste Yeast from food production
Fruit Juices	10,000	02.07.04	Waste fruit juice effluent
Edible Oils & Flavourings & Other FOGs	4,000	02.02.03	From food production

All the above is subject to change on availability, performance through the plant, potential customer pipeline and location for example. The EWC code list of all wastes to be imported has been supplied in the original EMS, amended following discussions and novel waste application submitted. Waste codes on the list are to be treated up to annual capacity throughout the year.

Rejected waste, as stated in acceptance procedures, is stored within a reject waste tank (one of the balance tanks is to be used in the case of rejected waste, the other used for feeding the plant), with ABP waste separately stored. Reject tanks are completely sealed, fitted with carbon scrubbers for displaced gases and aerated.

Section 3: Inventory of Potential Sources

Each potential source of odour onsite is detailed within an inventory (attached), with a summary of the sources detailed below.

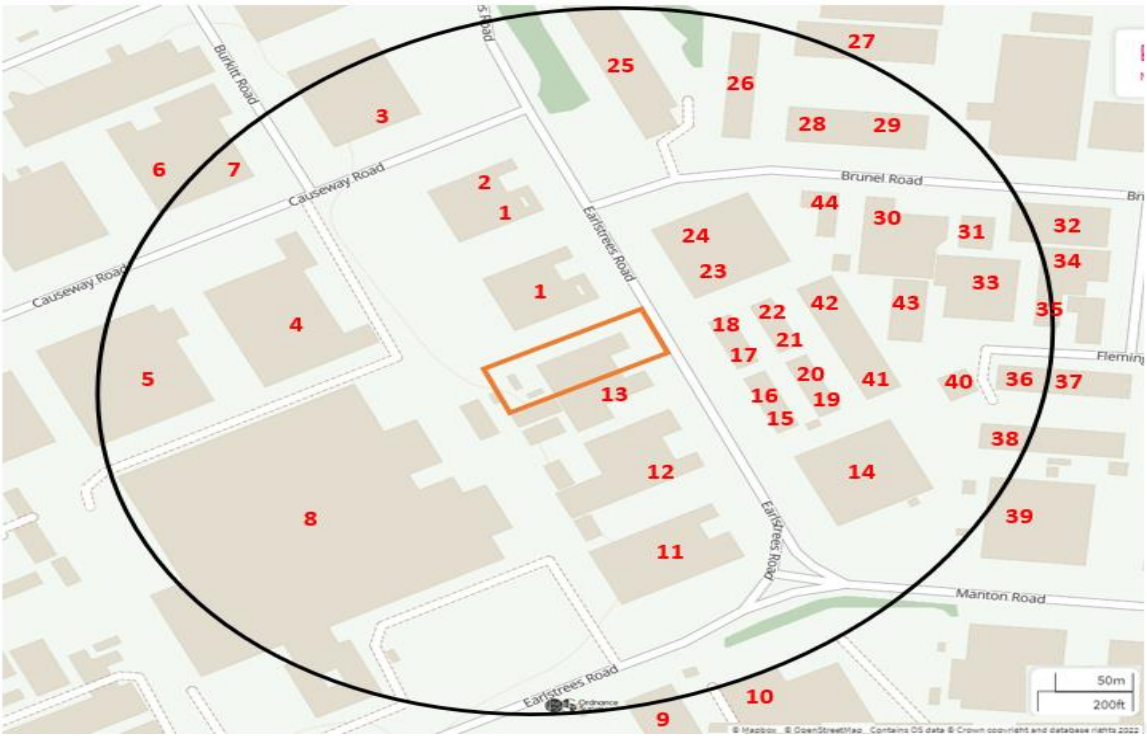
Summary of Potential Sources		
Point Identifying Number (ID)	*Source Name*	*Source Location*
1	Roller Shutter Doors (1)	Warehouse
2	Solids Bay (1)	Outside Warehouse
3	RT 1 Loading Bay	Outside Warehouse
4	Roller Shutter Doors (2)	Warehouse
5	Onsite Pumping Stations	Lower Yard
6	Odour Scrubber	Lower Yard
7	Feedstock Reception	Warehouse
8	RT2 Reception	Top Yard
9	Flares	Top Yard
10	CHP	Top Yard
11	ABP / MBT	Top Yard
12	Main Break Tank	Top Yard
13	Reactor 1 (Nano Bubble Treatment)	Top Yard
14	Reactor 6 Feedstock Storage	Top Yard
15	Grey Feedstock Tank	Top Yard
16	Gold Feedstock Tank	Top Yard
17	White Feedstock Tank	Top Yard
18	R&D Plant for Leachate, Complex Wastes, FOGs.	Warehouse
19 – 22	Reactor PRVs	Top Yard
23 – 28	Reactor Overflows	Top Yard

29	Inlet DAF	Top Yard
30	DAF Break Tank (1)	Top Yard
31	Effluent DAF (2)	Top Yard
32	Complex DAF (3)	Warehouse
33	FOG Storage Tank	Warehouse
34	DAF 3 Break Tank	Top Yard
35	Heating Oil Double Bunded Storage Tank	Top Yard
36	200 kW Boiler	Top Yard
37	TF1 Tank Farm	Warehouse
38	TF9 Tank Farm	Warehouse

The nature of release, potential duration and intensity have been assessed (Assessment of Risk & Inventory of Sources attached). The site has been subject to an odour risk assessment as well as a bioaerosol assessment (Attached) which sources of emissions and mitigations were assessed and found to be compliant.

Section 4: Potential Receptors

The site is located within a well-established industrial estate where there are existing waste management and anaerobic digestion facilities, as well as numerous sources of both odour and potential waste streams. The properties on either side of the proposed site are both fabrication & polymer processing companies and are the most likely receptors to be affected by the plant operations. The closest residential property is situated more than 420 metres to the west, however there are numerous sensitive receptors within 250m of the site.



Map Location	Business	- **Low (e.g., footpath, road)** - **Medium (e.g., industrial or commercial workplaces)** - **High (e.g., housing, pub/hotel etc)**
1	Saint Gobain, HPM Tape Solutions	Medium
2	Northamptonshire Pallets	Medium
3	Tablecraft	Medium
4	Taste Original Food Concepts Puredrive Fine Foods	Medium
5	Quantum Windows	Medium
6	SKG CRP Display Corby	Medium
7	Cartell-UK	Medium
8	Avon	Medium
9	Robinsons auto logistics	Medium
10	Weetabix Corby 2	Medium
11	AJB Group	Medium
12	Astrabridge Ltd	Medium
13	Indian Hub	Medium
14	HC Forklifts UK/Impact Cat	Medium
15	ULV Sanitise	Medium
16	Shuttercraft Northants	Medium
17	TBC	
18	ECS electricals compliance & safety	Medium
19	Intrinsic Systems	Medium
20	AVUS Consulting	Medium
21	The Chartered Institute of Logistics and Transport	Medium
22	The Chartered Institute of Logistics and Transport	Medium
23	J M J Bulk Packaging	Medium
24	Impact Handling	Medium
25	○ Mida's Autos ○ Geddington Service Station ○ Retro Ford ○ Paula's Diner ○ Scuffs 'n' Buffs ○ County Powder Coaters	Medium Medium Medium High Medium Medium
26	○ Valour Performance Technology ○ Architle	Medium Medium
27	SR MOT and Service Centre	Medium
28	EPM Engineering Group	Medium
29	Agenta Education	Medium
30	Impact Fork Trucks	Medium
31	Made Interiors	Medium
32	Foodmaker	Medium
33	Corby Gymnastics Academy	Medium
34	Blinds Outlet	Medium
35	4Sure	Medium
36	MIKs Garage	Medium
37	Apex Glass	Medium

38	Waterworks Window Cleaning	Medium
39	Orchard House Factory 5	Medium
40	North Northamptonshire Council	Medium
41	Premier Roofing Systems/Draper Group	Medium
42	Advantage Cover Fabrications	Medium
43	Impact Fork Trucks	Medium
44	Chemi-Supply Ltd	Medium

The area is within close proximity to an already operational AD plant as well as numerous waste management facilities as well as waste & odour generating activities.

Since the site's re-opening in May 2021, the site has been undertaking substantial upgrade works and re-commissioning works. One of the key aspects of the upgrade works being undertaken is to upgrade our odour abatement systems to BAT requirements and reduce potential odour nuisance to our neighbours and receptors.

Section 5: Releases & Odour Risk Assessment

Each of the individual sources detailed within the inventory has been individually assessed for their odour potential and their likely and potential risk. Our internal odour risk assessment found that any potential odours could be suitably managed by the technology implemented.

The external odour risk assessment and bio-aerosol risk assessment Waste4Generation have undertaken found that there would be minimal risk from the operation and proposed upgrades. (Both attached).

Summary of Overall Risk from Potential Sources					
Source	**Risk (Standard Op)**	**Risk (Incident)**	**Source**	**Risk (Standard Op)**	**Risk (Incident)**
1	**Low**	**Low**	**2**	**Low**	**Low**
3	**Low**	**Low**	**4**	**Low**	**Low**
5	**Low - Medium**	**Low - Medium**	**6**	**Low**	**Low**
7	**Low**	**Low**	**8**	**Low - Medium**	**Medium**
9	**Low**	**Low**	**10**	**Low**	**Low**
11	**Low - Medium**	**Low - Medium**	**12**	**Low – Medium**	**Low**
13	**Low**	**Low**	**14**	**Low**	**Low**
15	**Low**	**Low**	**16**	**Low**	**Low**
17	**Low**	**Low**	**18**	**Low – Medium**	**Low - Medium**
19	**Low**	**Low**	**20**	**Low**	**Low**
21	**Low**	**Low**	**22**	**Low**	**Low**
23	**Low**	**Low**	**24**	**Low**	**Low**
25	**Low**	**Low**	**26**	**Low**	**Low**
27	**Low**	**Low**	**28**	**Low**	**Low**
29	**Low**	**Low**	**30**	**Low**	**Low**
31	**Low**	**Low**	**32**	**Low**	**Low**
33	**Low**	**Low**	**34**	**Low**	**Low**
35	**Low**	**Low**	**36**	**Low**	**Low**
37	**Low**	**Low**	**38**	**Low**	**Low**

Section 6: Primary Control Methods

Containment & Treatment

The majority of potential odour releases on the site can be contained and treated through the use of extraction and the centralised odour scrubber as well as the associated carbon filters. Each potential point of release either chemical treatment in the form of carbon scrubbers or sodium hypochlorite additions, nano-bubble or ozone. Additionally, odour is controlled & mitigated through process parameters and procedures in order to minimise potential odour release. (Activated Carbon Scrubber Location Attached). Both the specification of the activated carbon used, and the frequency of the changes has been calculated. The maintenance and optimisation of the centralised scrubbing unit is to be monitored and followed.

The biogas line contains both carbon scrubbers on the Pressure Relief Valves, and a dry media H_2S scrubber prior to the CHP & Flare. These have all been specified to treat up to 100m^3/hour of biogas. (Please see attachment for calculation of H_2S removal, media change frequency and attachments for specification of dry media and scrubber).

Rigorous monitoring of biogas quality both pre- and post-carbon scrubbers will be carried out. This will check the efficiency of removal of the activated carbon media and indicate when a media change is required to maintain optimum odour removal. This will be backed up with a sniff test which is included in the daily site checks. Gas monitoring is also to be used, as H_2S has an undetectable odour above a set concentration.

A diligent and effectively controlled routine of discharging the liquid waste into the reception tanks has been determined and will be closely monitored by operators throughout waste reception. The onsite pumps are to be used on any load that has the likelihood of causing a potential odour issue. Should we be unable to use our onsite pump due to the composition or viscosity of the waste material, the tanker pump can be used as long as the displaced air from the tanker is connected to the centralised odour abatement system. The monitoring of the tankers unloading allows for any remediation or cleaning requirements to take place immediately after the disconnection of the tanker coupling.

The potential odour of each tanker (both the tanker itself and the waste stream it contains) is assessed by the operator at acceptance (as part of the waste tracking system). As standard operation, all wastes are to be automatically pumped off via our reception pumps (and therefore no production of off-gases). If the waste cannot be pumped off using reception pumps, all wastes then require to be connected to the centralised odour abatement system. Should the tanker not be able to connect to the odour abatement system, in this instance, the waste is to be rejected, minimising all risk of potential odour.

The centralised odour abatement system pulls air from the head space and treats displaced air from these three activities:

1. Feedstock storage / processing tanks
2. Warehouse processes
3. Tanker discharges

The abatement system for activities 1 & 2 are pulled through carbon scrubbers prior to treatment at the odour abatement system. Off gases / displaced air are pulled into the odour abatement system by extraction, then blown up through the treatment tower and media packing by an integrated blow at the base of the unit. The gas then passes through the media whilst treated effluent containing ozone, sodium hypochlorite, chemical

Should the scrubber be down for maintenance there will be always one of the treatment methods available:

correction and peroxide (where applicable, and introduced into the effluent prior to the abatement system) is introduced at the top of the tower and trickles down through the media, coming into contact with the off gases / displaced air to treat potential odours. Once the treated off gases / displaced air are the dispersed at the top of the tower to atmosphere. Due to the centralised release of the odours from the top of the tower, it can be monitored constantly and adjustments can be made to reduce / increase treatment where required.

Both the addition of nano-bubble treated water (highly oxygenated water) as well as ozonated water (O_3) are highly efficient treatment method for odours, effluents containing ammonia, sulphides etc as well as removing other contaminants. The nano bubble (& attached ozone) unit has the below capabilities, which can be adjusted to be tailored to the site's requirements (both for the centralised scrubbing system & the R1 treatment unit):

Nano-Bubble Oxygen & Ozone Delivery	
O_2 Delivery Rate	$15m^3$/hour liquid flow rate (10 litres per minute) provides 800 g/hour (@93% transfer) and 640 g/hour oxygen (@80% gas transfer)
Ozone Delivery Rate	30 g/hour based at $15m^3$/hour
Ozone Specification	5-14% Ozone by Weight (Oxygen Fed)
Nano Bubble Initial Spec	Oxy 15 with Ozone Atlas 30

The centralised odour abatement system is comprised of numerous elements so that treatment can be tailored for requirements but also it can be maintained in it's individual components / have down-time on individual sections and still operate. For instance, should the blower on unit be down for repair or maintenance, chemical treatment of the effluent is still available (even manually) if required. Should there be a shortage of chemicals available, the nano bubble treatment and ozone treatment is still available to treat the effluent and does not require any chemicals (raw materials) to operate.

To minimise potential downtime:

- Chemical stock taking & ensuring sufficient chemicals held in stock onsite.
- Service schedule and planned preventative maintenance on all plant and equipment

To assist with maintenance of the odour abatement system, and also the maximise performance & run-time, the following key spares are kept on site:

- Suction Pump / Blower
- Compressor
- Chemical Dosing Pumps
- Nano-bubble unit

In regard to the AD process itself, the process parameters are carefully controlled to minimise the production of odour, primarily H_2S, within the reactors. Additionally, ferric chloride dosing is used to remove sulphide from the system, and minimise its production, as well as being utilised in stimulating bacterial growth and colonisation.

Following the AD plant, R6 treatment, tertiary DAF for the removal of suspended solids, treatment for the effluent leaving the AD process, is the dosing of peroxide and sodium hypochlorite at the final effluent discharge point. This not only ensures consent compliance but removes any remaining traces of odour (including H_2S) from the effluent. Additional capabilities for tertiary and quaternary polishing are to be implemented with the final effluent DAF system and the nano bubble polishing (utilising ozone where required). It is this treated effluent that enters the centralised odour abatement system to remove odour from the off-gases. Treatment of the effluent is to be sufficient to ensure both the effluent is treated and is in consent and also that it has sufficient capacity to treat the displaced air / off-gases also.

Treatment of Wastes & Feedstock Utilised

As the site deals primarily with liquid waste, this minimises odour release associated with storing wastes as these are received directly into sealed tanks. The solids stored onsite are to be stored within an enclosed shed.

Due to the modular nature of the AD plant, waste streams via RT2 for the AD process can be fed to individual digesters or in series or parallel.

In regards to feedstock preparation, we have a targeted number of gold, silver & bronze loads which are under contract to supply to partner AD plants. In order for us to achieve our contracted supply, we require a set recipe of wastes & products to achieve this. This recipe & composition of our feedstock blends determines our waste and product input. These recipes & composition have been trialled at lab scale to determine blending rates as well as ensuring no negative interactions between products & waste streams which may cause an odour. As these wastes & products for mixing have been accepted on to site, they all would have had to have passed our pre-acceptance and acceptance procedure which analyses odour. The blending and mixing of these feedstocks are in sealed tanks. The loading of these feedstocks on to tankers to leave site utilises either our onsite pumps (which do not displace air) or if the tanker pumps are used, the tanker will be connected to the centralised odour abatement system.

Should an incoming waste not meet the acceptance criteria, the load will be rejected. Highly odourous wastes will be automatically rejected. In addition, contaminated vehicles will not be admitted on to site for unloading and will be turned away. As vehicles enter the site from the highway, they would have to adhere to a minimum standard for approved road haulage. We will only use approved hauliers which will provide suitable haulage with the specification required for our products / waste.

Site Hygiene & Management

The site will be thoroughly cleaned & washed down on a regular basis including daily wash downs of all waste reception areas. Site cleaning requirements are all documented, and procedures kept within site office. Site cleans will be recorded in the site diary.

Any spillages outside of this daily cleaning regime will be washed down immediately and documented in the site diary. The reception area will be cleaned following every tanker, ensuring any potential odours from tanker reception are minimised. Clean down of site to utilise nano-bubble treated water, ozonated water

where required as well as the potential usage for sodium hypochlorite and/or hydrogen peroxide where required.

Prior to use, all unloading and loading equipment (including hoses & fittings) are to be inspected to ensure fit for purpose.

Section 7: Monitoring & Reporting

Odour is monitored through several aspects of the process as well as daily testing including:

- Daily sniff tests (See attached procedure)
- Daily effluent testing
- Daily testing of feedstock tanks
- Incoming waste analysis (Pre-acceptance, acceptance analysis)
- Daily reception test (Feed Analysis)
- Daily scrubber test – gas analyser/ sniff test
- Daily gas analysis
- Daily Cleaning Regime
- Effluent action to be taken if sulphide concentration is outside of consented limits.
- Incoming waste outside of pre-acceptance designed parameters, or individual margin of variance, waste is rejected.
- Scrubber media changed if any H_2S detected above 50 ppm or odour is detected. Duty standby for scrubber as well as scrubber media kept on site. This allows for changes of media to be made indoors to prevent any odour reaching receptors.
- Check parameters & dosing ferric to reactors, where required.
- Ensure waste processed within 48 hours.

Sniff testing will be conducted daily around both the perimeter of the site, and at certain sensitive receptors. All sniff test records will be kept onsite.

Sniff testing will be carried out by the site operators. Whilst the operators are likely to be more tolerant to the site odours, independent testing is not considered necessary on a regular basis because of the low odour levels expected. If anything, above '2' is recorded, this is a trigger level and cause will be investigated and issue resolved.

Should odour be detected on site, the following contingency measures are immediately undertaken where necessary a series of contingency measures take place, including methods listed on receiving a complaint (below).

Section 8: Complaints History

Any complaints received will be logged into the site diary and a complaint form completed and filed. A complaints record is kept on site logging all complaints received.

On receipt of any odour complaints, a set of precautionary measures will take place immediately.

To identify the source of odour & remediate, we will implement the following if required:

- Inspection of the carbon filters & odour scrubbers on site. Change where required, utilising duty stand-by
- Inspection of the centralised abatement system to determine efficiency and operation.
- Analysis of removal efficiency of the scrubbers
- Minimise deliveries, stop importing waste entirely depending on scale of odour release. Divert waste to agreed (pre-acceptance) disposal route, including alternative AD plants.
- Key spares kept on site.
- Any particularly odourous feedstock will be removed from site.
- Gas line will be checked for leaks.
- Chemical correction will be checked for removal efficiency, increased where required.
- Check chemical levels, ferric addition & sodium hypochlorite dosing.
- Checks for leaks on all sealed tanks & enclosed vessels.
- Reassess waste on site for pre-acceptance and acceptability.
- Check operating parameters.
- Check site for spillages. Deep clean, thorough clean of site
- Investigate operations (including historic) to ascertain potential cause.
- Incident report and investigation with findings

The complaint form will be completed within 24 hours of receipt. A log of complaints will be discussed both at the weekly operations meeting and monthly management meeting with all actions recorded and minutes taken.

The complainant will be contacted within 5 days of complaint by the site manager and informed of any actions resulting from the complaints as well as the undertaking of the above precautionary measures. A further courtesy call and additional monitoring will be implemented to ensure that odours at the receptor are no longer annoying.

Section 9: Contingency Plans

All of the above precautionary measures are undertaken in the event of odour release, detection or complaint.

The site keeps critical spares as well surplus chemical, carbon media and scrubbing media present as well as duty stand-by to ensure efficient changeover of media without odour release. (Please see attached contingency plan).