Acorn Bioenergy Operations Ltd Environmental Management System Manual (EMS) Three Maids AD Plant

V1.0 Issue 0 – March 2024

Version Control

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Earthcare Technical Ltd

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Contents

Abbreviations

AD	Anaerobic digester/ digestion
ABL	Acorn Bioenergy Operations Limited
AMP	Accident Management Plan
AQIA	Air Quality Impact Assessment
AQMA	Air Quality Management Area
AW	Ancient Woodland
BMP	Biochemical methane potential
BUU	Biogas upgrade unit
CH_4	Methane
CNG	Compressed Natural Gas
CO_2	Carbon dioxide
COSHH	Control of Substances Hazardous to Health
CQA	Construction quality assurance
DSEAR	The Dangerous Substances and Explosive Atmospheres Regulations 2002
DWSZ	Drinking Water Safeguard Zone
EA	Environment Agency
EMS	Environmental Management System
EVCS	Electric Vehicle Charging Station
EWC	European Waste Catalogue
H_2S	Hydrogen Sulphide
HCC	Hampshire County Council
HDPE	High density polyethylene
HRA	Hot rolled asphalt
HSE	Health & Safety Executive
LDAR	Leak detection and repair
LDPE	Low-density polyethylene
LWS	Local Wildlife Site
m AOD	Metres Above Ordnance Datum
MPH	Miles per hour
MDPE	Medium-density polyethylene
NGR	National Grid Reference
N_2	Nitrogen
NH_3	Ammonia

NO_2	Nitrogen Dioxide
NO_x	Oxides of nitrogen
OEM	Original Equipment Manufacturer
OMP	Odour Management Plan
PHI	Priority Habitat Inventory
PMP	Pests Management Plan
ppm	Parts per million
PRV	Pressure relief valve
PVC	Polyvinyl chloride
PVRV	Pressure and vacuum relief valve
SCADA	Supervisory Control and Data Acquisition
SAC	Special Area of Conservation
SHEQ	Safety, Health, Environment & Quality
SSAFO	The Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010
SOP	Standard Operating Procedure
SPA	Special Protection Area
SPZ	Source Protection Zone
SSBRA	Site Specific Bioaerosol Risk Assessment
SSSI	Site of Special Scientific Interest
SR	Standard Rules
TCM	Technically Competent Manager
UV	Ultra violet light
VOC	Volatile Organic Compound
WCC	Winchester City Council

1 Scope of the EMS

This Environmental Management System (EMS) Manual is written to cover the scope of operations for Three Maids anaerobic digestion (AD) plant at Three Maids Farm, Three Maids Hill, Winchester, SO21 2QG (the site) operated by Acorn Bioenergy Operations Limited (ABL) (the Operator).

This version of the EMS Manual has been written to support the environmental permit application for the proposed site, which requires a bespoke installation permit (Permit ref: EPR/BP3326SD/A001). It is a live document that will be updated accordingly throughout the construction, commissioning, operation and closure of the AD plant.

The EMS is written with consideration to the site Environmental Risk Assessment (Appendix A) which has been developed to:

- Assess the potential environmental risks from the operations;
- Determine if existing control measures are sufficient; and
- Propose additional site-specific control measures where appropriate.

The entire EMS comprises of a series of 'live' documents to assist and inform daily site operations. This document, the EMS Manual, is an overarching document providing a foundation structure to the EMS which then links to specific EMS documents including the Accident Management Plan (AMP), Odour Management Plan (OMP), Standard Operating Procedures (SOPs), maintenance schedules and template forms used for record keeping.

All the management system documents are listed on the site-specific Master Document Control List **(THR-OD-02)** which is used as a complete reference to all management system documents relevant to the site and includes version numbers and issue dates to ensure document control.

2 Environmental Policy

The environmental policy outlines the environmental commitments of ABL with respect to its overall operations, activities, and environmental performance.

The Environmental Policy **(ABL-OD-01)** is a management system document.

3 Organisation & Site Profile

3.1 Planning

Planning permission for the site was approved by Winchester City Council on the 10 May 2023 (ref: 22/02037/FUL).

3.2 Permitting

The operation requires an Installation permit as the proposed AD plant will have a treatment capacity of over 100 tonnes per day which constitutes a listed activity under Part 2 to Schedule 1 of the Environmental Permitting Regulations 2016.

The operation cannot benefit from the appropriate Standard Rules (SR) permit (SR2021 No.8 permit - on-farm anaerobic digestion facility using farm wastes only, including use of the resultant biogas – installations)**Error! Bookmark not defined.** as:

- The location criteria under permit condition 2.2.4 cannot be met, namely there are areas of Priority Habitat Inventory (PHI) deciduous woodland approximately 20m from the northern and western site boundaries.
- Under Activity 3 of SR2021 No.8 (gas combustion to produce heat and power) the total aggregated rated thermal input for appliances must be less than 5 megawatts. This threshold will be exceeded. The net rated thermal input figures of the proposed plant are shown in Appendix B.
- Carbon dioxide (CO_2) capture from biogas, it's recovery, treatment and storage are not currently included in the SR2021 No.8 permitted activities.

Therefore a new bespoke installation permit is required. The potential environmental impacts relevant to a new bespoke installation permit application have been fully considered in:

- The Air Quality Impact Assessment (AQIA)[1]; and
- The site-specific Environmental Risk Assessment (Appendix A) which also summarises the control measures that will be employed.

Basic pre-application advice was initially sought from the Environment Agency (EA) with respect to this permit variation application in July 2022 (Reference: EPR/FP3945QH/A001). In order to ensure that ensure that all relevant nature and conservation sites have been considered a further basic pre-application request was made in February 2024 (Reference EPR/BP3326SD/P001) to. The Nature and Heritage Conservation Screening Reports are included as Appendix C.

[1] Earthcare Technical Ltd (March 2024) Three Maids AD Plant Air Quality Impact Assessment (Doc ref: ETL724_AQIA_V1.0_THRM_Mar24)

3.3 Management Overview

The site is operated by ABL, who are in the process of developing several AD plants nationwide. The AD plants will be managed by ABL, supported by the management team. There will be a Site Manager, who will be responsible for the day-to-day operation of the AD plant and who will act as the Technically Competent Manager (TCM). The Site Manager will manage Site Operatives to assist in day-to-day operations.

The Site Manager will be managed and supported by the wider ABL management team. Roles and responsibilities are summarised in the Staff Organogram (Appendix D) and are detailed in Section 10.

There are contracts in place for the supply of feedstocks and off-take of all digestate produced to be applied to land for agricultural benefit.

3.4 Site Description

Address:	Three Maids AD Plant, Three Maids Farm, Three Maids Hill, Winchester, SO21 2QG
National Grid Reference (NGR):	SU 46094 33959
Local Authorities:	Winchester City Council, a partner district of Hampshire County Council

The Site Location is shown in Figure 1 - Site Location Plan.

The site is 4.5 hectares (11 acres) in extent.

The site is 4.5 hectares (11 acres) in extent. The site, formerly farmland, sits within the northwest section of the intersection between the A34 dual carriageway and the A272. The site is located approximately 4km north northwest of the city of Winchester.

The surrounding area is used principally for arable farming and grassland with pockets of protected Ancient Woodland. There is also a solar farm (120m north of the site), an area used for muck-away, recycling and aggregates processing (150m east), a pig farm (approximately 600m northwest), and Harestock Wastewater Treatment Works (1.6km south southeast). The site's gradient slopes in a north easterly direction towards the A34 from approximately 93.5m AOD to approximately 87.8m AOD.

The majority of the site boundary contains vegetation which in part of the site provides a visual screen from the surrounding roads.

3.5 Infrastructure

The site infrastructure comprises:

- Liquid feedstock pre-treatment system (macerate and 30mm screen)

- Liquid feedstock tank with mixing system (8 m height x 8 m diameter) (400 m^3)
- Manure reception building (24.623 m x 20.154 m x 12.24 m to eaves, 13.53 m to ridge) containing:
    - Fast acting roller shutter doors
    - Air handling and emissions abatement plant (CentriAir)
    - Dedicated manure conveyor feed hopper
    - Pre-mix system including 30 mm screen.
- Emissions abatement plant for Manure reception building
- Straw treatment building (41.6 m x 23 m x 7 m to eaves, 8.2 m to ridge) containing:
    - Bale conveyor.
    - Destringer
    - Bale breaker.
    - Straw mill with water injection
    - 7.9 m x 12.9 m storage bay for crushed wet straw.
    - 2 No. straw extruders with 1 No. feed hopper
- 1 No. set down bay for prepared extruded straw.
- 2 No. Silage clamps:
    - Clamp 1 – 123.75 m x 42.5m wide x 3.52 m high (28,534 m^3 capacity)
    - Clamp 2 – 118.75 m x 40 m x 3.52 m high (25,080 m^3)
- 1 No. Silage leachate tank with leak detection (50m^3)
- 2 No. Feed hoppers (external) (150 m^3 each)
- 5 No. Digesters:
    - 2 No. Primary digesters (5,840 m^3 each)
    - 2 No. Secondary digesters 6,430 m^3 each)
    - 1 No. Tertiary digester (6,430 m^3)
- 3 No. Pasteurisation tanks (35 m^3 each)
- Suspension buffer tank (400 m^3)
- Separator covered bunker with roller shutter door:
    - 2 No. Separators
    - Fibre storage bay floorspace 18 m x 13.2 m x 6.4 m (L x W x H)
- 2 No. Buffer water tanks (400 m^3 each)
- 1 No. Process water buffer tank (100 m^3)
- 1 No. Digestate storage bag in lined bund with leak detection (7,344 m^3 capacity)
- 1 No. Digestate off-take bay with sump (3 m^3)
- Emergency flare – 8.7 m stack height
- Biogas upgrade unit (BUU) (includes a gatekeeper as there is no Grid Entry Unit)
- Biogas booster on inlet to BUU
- Carbon dioxide (CO_2) capture unit
- 2. No. CO_2 storage tanks (50 m^3 each)
- 2 No. CHP engines with 7 m stacks (TEDOM Quanto 1200 1.2MWe)

- 1 No. 300 kW chiller between 2 Primary digesters.
- 1 No. chiller on BUU
- 2 No. condensate sumps
- 1 No. 550 kW emergency boiler
- 1 No. diesel emergency generator (770 kVA)
- 2 No. compressors (compressing gas before injecting into road tankers)
- 4 No. biomethane / (CO_2) off-take vehicle bays
- 1 No. secondary containment bunds
- Full surface water interceptor and cellular storage system (266 m^3 at 95% void space)
- 3. No pump containers (1 No. inside bund & 2 No. outside bund)
- Site boundary fence
- Parking area
- Access road
- Weighbridge
- Site office
- 1 No. Cesspit (55 m^3)

3.6 Hours of Operation

The normal operational hours for the site are 0700 to 1900, Monday to Sunday inclusive, thus avoiding night-time operations. The planning permission restricts deliveries or dispatch from the site to between 0700 and 2000 hours on any day. However, normal hours of operation will be restricted to between 0700 and 1900.

In addition to the above hours, during peak harvest times (for approximately 4 weeks a year) deliveries of crops to the site can take place from 0700 to 2200 to allow crops to be imported as they are harvested.

3.7 Site Security

The site will benefit from:

- 2.4m high anti-climb mesh fencing installed around the core site, in addition to a safety fence around the Digestate storage bag.
- Double leaf vehicle access gates and a pedestrian access gate.
- CCTV installed and operational remote cameras. The site will be manned from 0700 to 1900 and the CCTV will be remotely monitored out of hours.

4 Environmental Sensitivities

4.1 Comparison against SR2021 No.8 Location Criteria

As detailed in Section 3.2, the operation cannot meet the location criteria for a SR2021 No.8 environmental permit due to the proximity of PHI habitats. Table 1 below shows an assessment of the site location against the SR2021 No.8 location criteria.

Table 1: Assessment against SR2021 No.8 Location Criteria

SR2021 No. 8 location criteria	Assessment for Three Maids AD
Location criteria require that the below sensitive receptors are not within:	
200 metres of the nearest receptor as measured from any combustion stack or stacks, unless the stacks are at least 7 metres high, and the effective stack height of each stack is greater than 3 metres.	Compliant. The nearest sensitive receptor is an Electric Vehicle Charging Station (EVCS) with associated restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary (planning granted but not constructed at the time of writing).[2] Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are approximately 120 m form the site boundary. The next nearest receptor, Three Maids Bungalow is approximately 520 m from the CHP stacks. The stacks will be at least 7 m high with an effective stack height of more than 3 m.
250 metres of the nearest sensitive receptor where any further treatment takes place by composting digestate fibre in the open.	Not applicable digestate fibre will not be composted.
500 metres of a European site (within the meaning of Regulation 8 of the Conservation of Habitats and Species Regulations 2017) or a Site of Special Scientific Interest including candidate or proposed sites, or a marine conservation zone	Compliant. There are no designated sites within 500m
a groundwater source protection zone 1 or 2, or if a source protection zone has not been defined then within 50 metres of any well, spring or borehole used for the supply of water for human consumption (including private water supplies).	Compliant

[2] https://planningapps.winchester.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=RX85WJBPGNB00 Accessed 23 January 2024

SR2021 No. 8 location criteria	Assessment for Three Maids AD
Location criteria require that the below sensitive receptors are not within:	
50 m of a spring	Compliant
250 metres of the presence of great crested newts, where it is linked to the breeding ponds of the newts by good habitat.	Compliant
10 metres of any watercourse	Compliant
50 metres of a Local Nature Reserve, Local Wildlife Site, Ancient Woodland, or Scheduled Monument.	Compliant based on further Information received from Hampshire Biodiversity Information Centre received 10 March 2023 and Nature and Heritage Conservation screening report received from the Environment Agency (EA) 6 February 2024.
50 metres of a site that has species or of principle importance (as listed in Section 41 of the Natural Environment and Rural Communities Act 2006) that the Environment Agency considers at risk to this activity, these are also often referred to as priority habitats and species	Non-compliant confirmed via Nature and Heritage Conservation screening report received from the EA 25 July 2022 and information on Magic Maps.[3]
A specified Air Quality Management Area	Compliant

4.2 Geology

The soil type is classified as freely draining, shallow lime-rich soils over chalk with a loamy texture.[3]

4.3 Hydrogeology

The site is on free draining soils over chalk and is above a principal aquifer with groundwater vulnerability classified as 'high'.

The site is not within a designated groundwater source protection zone (SPZ) or within a Drinking Water Safeguard Zone (groundwater). The site is within a Nitrate Vulnerable Zone (NVZ).[3]

[3] Magic Maps, Defra Accessed 14 February 2024

4.4 Surface Water

There is a gulley or surface water ditch to the A34 to the eastern boundary of the site. The Nun's Walk Stream surface water body Catchment area part of the wider Itchen Catchment falls to the south eastern area of the site with the stream itself some 2,830 m south east.[4] The site is not within a Drinking Water Protected Area (surface water) or Drinking Water Safeguard Zone (surface water).

4.5 Flood Risk

The site is within a flood zone 1 which means that there is a low probability of flooding from rivers and the sea[5].

4.6 Human Receptors

Human receptors within 1 km of the site are captured in Table 2 below and are shown in Figure 6 – Human Receptor Plan. The village of Littleton lies over 1km from the proposed site.

On the 18 December 2023 Winchester County Council granted planning permission (reference: 23/01594/FUL) for the development of an Electric Vehicle Charging Station (EVCS) with associated ancillary restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary. Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are approximately 120 m form the site boundary. At the time of writing construction had not started.

Table 2: Human Receptors within approximately 1 km

ID	Location	Type of receptor	NGR X	NGR Y	Distance from site boundary (m)	Direction from site
R1	Proposed EVCS development including restaurant and playground	Commercial / Recreational	446194	133714	120	South
R2	The Pringle Group / Concrete 247	Aggregate / recycling	446311	133955	155	East
R3	Three Maids Bungalow	Residential	446081	133569	250	South west
R4	Lower Farm Cottages	Residential	445570	133626	530	West south west

[4] Catchment Data Explorer, Environment Agency Accessed 14 February 2024
[5] https://flood-map-for-planning.service.gov.uk/ Accessed 14 February 2024

ID	Location	Type of receptor	NGR X	NGR Y	Distance from site boundary (m)	Direction from site
R5	Worthy Down	Residential	446068	134913	730	North east
R6	Down Farm	Residential	446920	133716	750	South east
R7	Off Down Farm Lane (Static caravans)	Residential	446911	133640	750	South east
R8	Winchester Golf Academy	Recreational	446926	133479	815	South east
R9	Littleton Stud	Residential	445362	133307	890	South west
R10	Drovers Way	Residential	445172	133525	960	West south west
R11	Church Lane, St Catherines (Littleton)	Residential	445532	133031	970	South west
R12	Flowerdown Barracks	Residential / Recreational	446484	132768	1,120	South

4.7 Ecological Receptors

Ecological receptors are shown in Figure 7: Ecological Receptor Plan (2km) and Figure 8: Ecological Receptor Plan (10km) and the EA Nature and Heritage Conservation Screening Reports Appendix E.

4.7.1 Statutory Designated Sites

There are no statutory designated sites within 2 km of the proposed permitted boundary. The River Itchen Special Area of Conservation (SAC) is approximately 3.5 km from the site at the nearest point.

4.7.2 Priority Habitats & Species

There are areas of PHI deciduous woodland within 50 m of the site. There are Local Wildlife Sites and areas of Ancient Woodland within 2 km of the site.

4.8 Scheduled Monuments

There is a one Scheduled Monument within 1km namely Worthy Down Ditch which is 555 m to the north of the proposed site[1]. This Scheduled Monuments sits within the centre of the solar farm in the fields to the north of the site.

4.9 Air Quality Management Areas

Winchester City Council have declared an Air Quality Management Area (AQMA) for nitrogen dioxide and particulate matter (PM_{10}) in Winchester City Centre following the one-way travel system in the city. This is approximately 3.8 km to the south east of the site.[6]

[6] https://uk-air.defra.gov.uk/aqma/ Accessed 7 March 2024

5 Process Description

5.1 Overview

This section provides a summary of the treatment process which should be read in conjunction with the Process Flow Diagram provided in Appendix E and the Figure 3: Site Layout Plan.

The operation of the AD plant is fully automated from an on-site central control panel located in the Control Room which monitors information transmitted from field instrumentation around the AD plant. This is known as the Supervisory Control and Data Acquisition (SCADA) system. This information can be viewed both on site and remotely to ensure optimisation and safe operation of the anaerobic digestion and associated processes.

5.2 Feedstocks

Table 3 below provides an overview of the projected feedstocks for the AD plant.

Table 3: Feedstock description, source, form, storage location and approximate annual throughput

Feedstock description	Source(s) of feedstock	European Waste Catalogue (EWC) code	Form	Storage location	Approximate tonnes treated per year
Maize silage	Grown under farm contracts	Not applicable	Solid	Silage clamp	26,000
Wholecrop silage	Grown under farm contracts	Not applicable	Solid	Silage clamp	17,500
Straw	Grown under farm contracts	Not applicable - residue	Solid	Straw treatment building & silage clamp	20,000
Farmyard manure	Local farms	02 01 06	Solid	Manure reception building	9,000
Chicken manure	Local farms	02 01 06	Solid	Manure reception building	11,000
Pig slurry	Local farms	02 01 06	Liquid	Liquid feedstock tank	4,500
Dairy slurry	Local farms	02 01 06	Liquid	Liquid feedstock tank	6,000
Dirty water	From on-site drainage systems	Not applicable	Liquid	Buffer water tanks	42,000

Feedstock description	Source(s) of feedstock	European Waste Catalogue (EWC) code	Form	Storage location	Approximate tonnes treated per year
Approximate annual tonnage (excluding water)					94,000

5.3 Crop Feedstock Acceptance & Storage

Energy crops are grown under contract with local farms, ensiled within the 2 no. silage clamps and covered with an impermeable polythene cover. See Section 6.1.1 (Primary Containment, Silage Clamps) for details of silage clamp construction.

Cereal straw is provided by local farms. The straw is stored temporarily either in the silage clamps after the maize harvest for up to 10 weeks (maximum 4,000 tonnes) or within the Straw treatment building. Straw is processed on site within the Straw treatment building (see Section 5.5).

When crop feedstocks are brought onto site, they are checked in accordance with the Feedstock Acceptance & Rejection Procedure **(ABL-SOP-06)**. The dry matter content of energy crops is tested to confirm if they are suitable for ensiling. Crop feedstocks are also visually checked for the presence of stones or other physical contaminants. If found, they are either removed by hand or the load may be rejected if deemed too contaminated and unsuitable for treatment.

5.4 Waste Acceptance & Storage

The only waste feedstock are manure and slurry. All waste accepted on site is subject to pre-acceptance checks including waste sampling and verification where appropriate in accordance with the Waste Pre-Acceptance Procedure **(ABL-SOP-05)**. These checks are the responsibility of the Feedstock & Digestate Manager, supported by the Site Manager when required.

The Feedstock & Digestate Manager is responsible for booking feedstocks into site prior to receipt, in consultation with the Site Manager. Only waste that has passed pre-acceptance checks, and is booked in, is accepted on site.

When waste is delivered to site further checks are carried out in accordance with the Feedstock Acceptance and Rejection Procedure **(ABL-SOP-06)**. This includes paperwork checks by the Weighbridge Operator, visual checks by Site Operatives and verification waste sampling and analysis when required in accordance with the Sampling and Analysis Procedure **(ABL-SOP-10)**.

Quarantined and rejected waste will be stored in the designated quarantine area returned or removed to a suitably regulated facility within 5 days in accordance with the Feedstock Acceptance and Rejection Procedure **(ABL-SOP-06)**.

Solid chicken and farmyard manure are received within a dedicated Manure reception building which benefits from fast action roller shutter doors and an air handling and emissions abatement plant. Vehicles containing solid manure reverse into the Manure reception building and discharge their loads inside where the loads are inspected in line with the Feedstock

Acceptance and Rejection Procedure **(ABL-SOP-06)**. Farmyard manure and chicken manure are stored in separate piles. The manure is conveyed via a hopper inside the building for treatment.

Tankers containing slurry reverse up to the Liquid feedstock reception point, couple up and discharge the load via sealed pipework into the Liquid feedstock tank. All tanks are labelled, and unloading is supervised by Site Operatives. Reception of slurry is carried out in accordance with the Liquid Waste Reception Procedure **(ABL-SOP-07).**

The slurry is discharged through a slurry pre-treatment system that macerates and screens the slurry upon receipt and prior to being stored in the Liquid feedstock tank pending feeding into the digesters.

See Section 6.1.3 Primary Containment for further detail on the Liquid feedstock tank construction.

Table 4 below shows maximum waste storage capacities and residence times.

Table 4 – Maximum Waste Storage Capacities & Residence Times

Waste type	Storage location	Maximum stored at any one time (tonnes)	Maximum residence time
Chicken manure, farmyard manure	Manure reception building	400	7 days
Slurry (pig or dairy)	Liquid feedstock tank	400	14 days
Total maximum tonnage of waste at any one time		**800**	

5.5 Straw Processing

Straw processing is carried out in a dedicated Straw treatment building.

String is removed from the straw bales and the bales broken up using a bale breaker. The dry broken up straw is then fed into a straw mill with water injection (water sourced primarily from rainwater harvesting). The crushed wet straw may be stored in a bay within the building prior to being fed into the 1 No. feed hopper of the 2 No. straw extruders. Extrusion is a thermo-mechanical process which due to pressurisation produces a fine stackable broken-down straw material improves digestion and increases gas yield from the straw feedstock. Moist extruded straw lands in an external bunker and is fed into the 2 No. external solid feed hoppers throughout the day as its produced.

5.6 Waste Pre-treatment

Chicken manure and / or farmyard manure is mixed with separated liquor in a dedicated enclosed pre-mix system ready for pumping into the Secondary digesters. The manure passes through a 30 mm screen.

The Slurry pre-treatment system macerates and screens the slurry upon receipt and prior to being stored in the Liquid feedstock tank pending feeding into the digesters

5.7 Feedstock Loading

The quantities of the solid and liquid feedstocks to be fed into the AD plant daily (the daily feed plan) are determined by the Site Manager based on feedstock testing and process monitoring results in accordance with the Process Monitoring Procedure **(THR-SOP-01)** and the Sampling and Analysis Procedure **(ABL-SOP-10).**

Feedstock loading is carried out in accordance with the Feedstock Management & Loading Procedure **(THR-SOP-04)**. Tonnages of feedstock (solid and liquid) are recorded and controlled via the SCADA control panel.

5.7.1 Crop & Straw

Twice daily a front loader is used to load the energy crops from the silage clamps into the 2 No. external feed hoppers. The polythene silage clamp cover is removed enough to cut away required feedstock.

The moist extruded straw material is removed from the set down bay next to the Straw treatment building and loaded into one of two external feed hoppers with the front loader.

There are weigh cells in each feed hopper which are used by the Site Operative to ensure that the correct tonnages of crop feedstocks are added. The tonnages of crop feedstocks loaded into the feed hoppers are recorded on SCADA.

5.7.2 Slurry & Dirty Water

Dirty water is pumped from the Buffer water tanks, and slurry is pumped from the Liquid feedstock tank to the mixing pumps and mixed with the crop feedstocks including straw to make a pumpable mixture which is then fed into the two Primary digesters. This is carried out in accordance with the daily feed plan and controlled via the SCADA control panel.

5.7.3 Manure

A front loader is used to load manure into the conveyor hopper within the Manure reception building. Manure is mixed with separated liquor in a dedicated pre-mix system ready for pumping directly into the Secondary digesters.

Slurry is pumped from the Liquid feedstock tank to the Secondary digesters.

5.8 Digesters

There are two Primary digesters (PD1 & PD2) which operate in parallel. The two Primary digesters feed into the two Secondary digesters (SD1 & SD2). Both Secondary digesters feed into a single Tertiary digester (TD1). The construction type, mixing systems, gas storage and working capacities of the digesters are detailed in Table 5 below. See Section 6.1 4 (Primary Containment, Digesters) for further details on the tank construction.

Table 5: Details of Digester Tanks

Digester type	Ref.	Base and sides type	Roof type	Mixing type	Gas storage capacity (m^3)	Average retention time (days)	Working digestion capacity (m^3)
Primary	PD1 & PD2	Precast concrete	Concrete	7 No. Vertical paddle mixers (accessible from roof)	n/a	40.1	5,840 (each)
Secondary	SD1 & SD2	Precast concrete	Double membrane	4 No. horizontal shaft agitators & 1 No. long axis agitator	2,500 per tank	20.2	6,430 (each)
Tertiary	PD1	Precast concrete	Double membrane	4 No. horizontal shaft agitators	2,500	10.2	6,430
Totals					**7,500**	**70.5**	**30,970**

The digesters have inspection windows which are checked once a day in accordance with Daily Checks **(THR-MP-04).**

The SCADA system ensures that the digesters operate in the mesophilic temperature range at 38-45°C.

The digesters all have pressure and vacuum relief valves (PVRVs) which will release biogas or take in air in the event of an overpressure or under pressure biogas situation respectively.

The PVRVs are a necessary safety feature for an AD plant; but will only be used as a contingency to maintain structural integrity of the tank and dome structures. During normal operation the PVRVs will not operate.

The PVRVs are weighted plates and are insulated and electrically heated to eliminate the risk of freezing in the winter months. The PVRVs on the Primary digesters will operate at 12mbar. The PVRVs on the Secondary digesters and the Tertiary digester will operate at 6mbar. The setting on SCADA will dictate that the emergency flare will automatically start before the PVRVs will release gas, meaning that they are only in place for unforeseen emergency use. The seating of the PVRVs is checked daily in accordance with Daily Checks **(THR-MP-04)**.

In addition, the two Primary digesters have burst discs which are an additional over -pressure contingency measure.

There is a stone trap on the transfer pump between the Primary and Secondary digesters.

5.9 Pasteurisation

Following retention in the Tertiary digester whole digestate is then pasteurised in the three tank pasteurisation unit (at any one time one tank is filling, one holding at pasteurisation temperature and one is emptying). Each 35 m^3 batch is heated to over 70^{o}C for a minimum of one hour prior to being cooled via a heat exchanger.

Pasteurised digestate is pumped to the Suspension buffer tank (400 m^3).

5.10 Digestate Separation & Storage

Whole digestate from the Suspension buffer tank (400 m^3) is pumped to the 2 No. Borger type mechanical separators capable of separating up to 320 tonnes per day whole digestate each.

The digestate separators and the resulting fibre digestate are within a covered bunker. The bunker has a roof which forms a sealed join with the bunker base and a roller shutter door opening. Separated fibre collects in the concrete storage bay below the separators. The digestate fibre will be removed periodically during the day from site to destination field heaps. The front roller shutter door is only open for 20 minutes whilst loading and closed thereafter. This is carried out in accordance with the Digestate Handling Procedure **(THR-SOP-05).**

Separated liquor is pumped from the separators to:

- the Digestate storage bag with working capacity of 7,344 m^3.
- the Process water buffer tank (100 m^3) which feeds the premix system for the manure and the premix systems on the Primary digesters.

Based on the current feedstock tonnage of 94,000 tonnes per annum and the mass balance provided by the technology provider approximately 69,218 tonnes of solid fibre digestate and 40,388 tonnes of digestate liquor are produced per year (assuming 1 tonne = 1 m^3). The Digestate storage bag provides just over 2 months storage capacity for digestate liquor with an additional 4 months plus storage provided offsite through contractual arrangements with local farms. Offsite liquid storage tanks will be principally owned and operated by ABL, giving them control of their use.

Solid fibre digestate will be stored within destination field heaps on farm with specialist track systems used for vehicle access when required to always ensure effective field access and mitigating risk of soil damage.

5.11 Digestate Use

Digestate is removed from site either to on farm storage locations or is spread directly to land for agricultural benefit to meet crop need. The liquor and fibre digestate are used as a biofertiliser on nearby farms. The digestate liquor is a rich source of nitrogen, phosphorus, potassium, and trace elements which is stored and used to replace the use of manufactured fertiliser. The digestate fibre is a very good source of organic matter as well as supplying valuable nutrients and is used primarily as a soil improver.

The digestate liquor is removed via tanker at the digestate dispatch point in accordance with the Digestate Handling Procedure **(THR-SOP-05)**.

The digestate fibre is periodically removed from the digestate fibre storage bay to destination field heaps in accordance with the Digestate Handling Procedure **(THR-SOP-05)**.

5.12 Gas Storage

The gas storage afforded by the digesters is detailed in Table 5 above. The total biogas storage capacity above the digesters is approximately 7,500m³ which is in excess of 3 hours of production. This storage capacity allows for planned routine gas upgrade unit maintenance events when the gas storage levels will be reduced prior to shut down.

5.13 Biogas Treatment

As previously described, biogas is stored within the double membrane gas storage domes above the two Secondary digesters and the Tertiary digester.

Hydrogen sulphide (H_2S) levels within the digesters will be tested and monitored on SCADA. There will be oxygen injection on all of the digesters. To reduce hydrogen sulphide (H_2S) in the biogas, a small amount of oxygen is injected into the digester to increase the oxidising capacity of the system, thus inhibiting sulphate-reducing bacteria activity and promoting sulphide oxidation.

Oxygen is generated from air via pressure swing absorption unit and injected into the tank headspace. The oxygen concentration to be included within detailed engineering average of 0.5% and ≤1%.

Ferric hydroxide powder will be used to further control H_2S levels if needed. It will be stored on site and fed via the feed hoppers as and when required.

The SCADA system manages the biogas treatment, gas distribution system and emergency flare if required.

5.14 Gas Upgrade Unit

Raw biogas is also treated within the Biogas upgrade unit (BUU) thorough a series of steps:

- Biogas cooling to approximately 5^0C to remove water.
- Carbon filtration (2 No. filters to remove H_2S and 1 No. filter for Volatile Organic Compounds (VOCs))
- Compression
- Three-stage membrane filtration which separates the biogas into methane (CH_4) and carbon dioxide (CO_2).

The CO_2 is passed to the CO_2 capture unit, and the CH_4 is compressed and stored prior to dispatch from the site via gas tankers to a grid injection point. This is referred to as a virtual pipeline.

5.15 Carbon Dioxide Recovery & Storage

The CO_2 is treated in the CO_2 capture unit via the following:

- Compression;
- Molecular sieve dryer to remove any moisture that may remain;
- Fine filter to remove any impurities;

- Liquefication – traces of non-condensable gases that may contaminate the CO_2 remain as gases when the CO_2 becomes liquid in the liquefier; and
- Storage in 2. No CO_2 storage tanks (50 m^3 each).

CO_2 is stored pending removal off site via a filling station.

5.16 Gas & Heat Management

Biogas may also be used in one of the CHPs or in the emergency boiler.

Excess biogas and out of specification biomethane is sent to the emergency flare.

5.16.1 CHP Engines

There are 2 No. 1.2 MW CHPs; one of which will burn biogas and the other natural gas to produce heat and electricity. Heat from the CHPs is used to maintain the temperature of the digesters and to provide heat to the pasteurisers.

5.16.2 Emergency Boiler

Treated biogas from the AD plant may be burnt in the emergency boiler (550 kW) to provide heat for the AD process, if one or more of the CHPs is non-operational. The emergency boiler can run on natural gas or biomethane if required.

5.16.3 Emergency Flare

The emergency flare is a BAT compliant, ground enclosed, biogas flare. Biogas may be burnt in the flare under certain emergency operating conditions such as during extended equipment maintenance or during a malfunction of the BUU or the emergency boiler if in biogas mode. In the case of off specification biomethane being produced by the BUU, it will be blended back together with the associated CO_2, which will also be out of specification and this pure biogas stream will be returned to the gas storage domes. In the unlikely event that this causes any over pressure, biogas would be flared.

The emergency flare ignites automatically and is sized appropriately; it can burn between 500 to 2,500Nm^3/hr of biogas. The theoretical maximum production for the AD site is around 2,329 Nm^3/h. See Section 7.3 Control of Emissions of Raw Biogas.

Emergency flare usage is recorded on SCADA in accordance with permit requirements.

5.17 Power Management

The electricity produced by the CHPs is used to power the AD plant (parasitic load). Power demand on site is controlled by a power management system ensuring that no excess is generated in normal operation.

There is an emergency diesel generator (Prime 700 kVA 560kW / Standby 770 kVA 616 kW) in place that can be used to power essential plant functions e.g. SCADA, emergency flare, dome fans in the case of a mains power outage. The fuel tank is sized such that the emergency generator can operate for 8 hours without refuelling.

6 Control of Emissions to Water & Land

6.1 Primary Containment

Site primary containment measures are described below.

6.1.1 Silage Clamps

The 2 No. silage clamps, which will store and contain ensiled crop, have a hot rolled asphalt (HRA) base and three back-filled concrete walls each in a U shape. The clamp dimensions are:

- Clamp 1 – 123.75m x 42.5m wide x 3.52m high (28,534m^3 capacity)
- Clamp 2 – 118.75m. x 40m x 3.52m high (25,080m^3)

The clamps are Ark Agriculture backfilled design, a patented sloping walled silage clamp system. The design incorporates the following features:

- A fall along the axis of the clamps to enable drainage of leachate off the clamp surface to the leachate collection system in front of the clamps.
- A rainwater collection system off the silage clamp covers reducing the potential for rainwater inundation of the leachate collection system.
- A leak detection system in the backfilled walls in accordance with The Water Resources (Control of Pollution) (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (SSAFO).

The leak detection drain of the clamps are inspected daily in accordance with Daily Checks **(THR-MP-04).** The silage clamps are inspected annually when empty, and repairs will be made as necessary, to be signed off by a suitably qualified engineer.

6.1.2 Silage Leachate Tank

Silage effluent arising from the silage clamps flows into 1 No. Silage leachate tank (50 m^3). In preference to storage of leachate below ground, the tank contain level switches and submersible pumps to pump the leachate to the 2 No. Dirty water tanks (400m^3 each) above ground within the secondary containment area.

Leachate storage capacity = (50) + (400 x 2) = 850 m^3

The combined capacity of the Silage leachate tank and the above ground storage tanks is 850 m^3 which exceeds the minimum SSSAFO requirement of 389 m^3, calculated as shown:

Total clamp storage capacity = 53,614 m^3
For clamps with a capacity of over 1,500 m^3, SSAFO requires the leachate tank capacity to be:
30,000 litres (l) + 6.7 l for every m^3 of storage capacity
Required leachate tank volume (l) = 30,000 + (6.7 x 53,614) = 389,214 l or 389 m^3

The Silage leachate tank is constructed of polyethylene and has a secondary liner under the full extent of the tank, carried up to the surface and sealed. A leak detection point is provided between the tank and the liner which will be inspected daily in accordance with Daily Checks **(THR-MP-04).**

The Silage leachate tank benefits from a level sensor linked to SCADA.

6.1.3 Ancillary tanks

There are 5 No. above ground ancillary tanks namely:

- 1 No. Liquid feedstock tank (400 m^3)
- 1 No. Process water buffer tank (100 m^3)
- 1 No. Suspension buffer tank (400 m^3)
- 2 No. Buffer water tanks (400 m^3 each)

These tanks are for the storage of slurry, leachate, separated liquor or water for the process and are constructed of concrete and sited within the secondary containment system.

The 3 No. pasteurisation tanks (35 m^3 each) are made from stainless steel and are also within the secondary containment system.

All tanks will be inspected during installation and by a suitably qualified engineer every 5 years.

The ancillary tanks all benefit from level sensors linked to SCADA.

6.1.4 Digesters

The digesters are pre-cast concrete tanks manufactured by A-Consult, assembled on site.

The 2 No. Primary digesters have flat concrete roofs, the 2 No. Secondary digesters and the Tertiary digester have double-membrane gas tight cover roofs. The inner and outer membranes of the covers are PVC coated and the outer membrane is resistant to UV.

Following construction, all digester tanks will be hydrostatically tested and Construction quality assurance (CQA) validated by a suitably qualified engineer to ensure they are fit for use.

All tanks will be inspected by a suitably qualified engineer every 5 years as part of a scheduled tank inspection and de-grit programme.

The digesters all benefit from level sensors and overfilling / foaming prevention sensors linked to SCADA.

6.1.5 Digestate Storage Bag

The Digestate storage bag is manufactured by Wiefferink. It is rectangular (63 m L x 37 m W x 3.75 m H) with a storage capacity of 7,344m^3 excluding freeboard. The storage bag sits within a lined bund with leak detection which provides 110% secondary containment (8,078 m^3) and a 300 mm freeboard.

The storage bag is manufactured from special reinforced plastic foil, consisting of a polyester fabric fitted on both sides with a biogas-resistant PVC coating. The manufacturers specify that the bag is temperature resistant between - 30°C and + 70°C and is fire retardant <100 mm/min.

The bag is mounted on a low-density polyethylene (LDPE) anti-leakage liner, with a guaranteed 20-year lifespan, within an earth bank with a slope of 2% towards the centre to allow effective bag emptying.

To avoid accumulation of residual emissions inside the storage bag, it is equipped with 3 No. vents.

There is a bag level indicator linked to SCADA. The volume within the Digestate storage bag is restricted to 7,344 m^3 so as to maintain a 300 mm freeboard at all times.

6.1.6 Storage of Oils and Chemicals

Fresh oil and waste oil associated with the operation of the CHPs are stored in bunded tanks.

Diesel and Ad-Blue are stored in bunded tanks. The emergency generator has an integral bunded diesel tank (200 m^3).

Ferric hydroxide powder is kept undercover in the chemical store.

Glycol, sulphuric acid (for Manure reception building emissions abatement plant) and anti-foam are kept in a bunded area in the chemical store.

An Inventory of Substances will be maintained; Appendix A Accident Management Plan Manual .(**THR-OD-06)**[7].

6.2 Secondary Containment

6.2.1 Secondary Containment System for Tanks

The secondary containment system for the AD plant is designed in accordance with CIRIA C736 is fully detailed within the Primary & Secondary Containment Report With Bund Capacity Calculations Report produced by the GGP Consult, who designed the system.[2]

The secondary containment system comprises a concrete slab underlain with an HDPE layer as detailed above. There is concrete wall around the slab providing available containment volume equal to 11,234 m^3 based on the proposed minimum wall level of 93.275m AOD. A surge allowance of 250 mm has been incorporated within the construction design wall level in accordance with the CIRIA guidance.

The containment capacity is designed in accordance with CIRIA C736, with the calculations in the report demonstrating 25% of the combined tank volume to be a greater volume than 110% of the largest tank volume. Pipework will not penetrate the containment walls or floor. The primary and secondary containment infrastructure is checked on a daily basis in accordance with Daily Checks **(THR-MP-04).**

[7] Accident Management Plan Manual, Three Maids AD, THR-OD-06, V1.0

The secondary containment sump is inspected daily in accordance with the Secondary Containment Checking & Emptying Procedure **(THR-SOP-03).**

6.2.2 Leak Detection for Concrete Slab

There is an HDPE layer across the whole of the concrete slab within the secondary containment area which provides leak detection to provide further reassurance as to containment integrity. The inspection of this leak detection system via 1 No. leak detection pot is carried out daily in accordance with Daily Checks **(THR-MP-04).**

6.2.3 Leak Detection for Silage Leachate Tank

The Silage leachate tank has a secondary liner under the full extent of the tank, carried up to the surface and sealed. A leak detection point is provided between the tank and the liner which is inspected daily in accordance with Daily Checks **(THR-MP-04).**

6.2.4 Leak Detection for Digesters

The digesters will sit slightly below the main containment slab to allow the drainage of the slab base to fall towards the secondary containment system sump to the south of the site. Given the tanks are located below the bund slab, but above the HDPE liner, a leak detection system has been incorporated by A-Consult to allow for leak detection of each tank. This system is sealed to prevent leaks escaping into the lower HDPE membrane and or liquid flowing into the system from above.

The 5 No. Digester leak detection pots to be inspected daily in accordance with Daily Checks **(THR-MP-04)**.

Further detail is provided within the Primary & Secondary Containment Report with Bund Capacity Calculations Report by GGP Consult.[8]

6.2.5 Digestate Storage Bag

As detailed under 5.1.5, the Digestate storage bag benefits from secondary containment as it sits within a lined earth bund with the capacity of 110% of the maximum contents of the bag i.e., 8,078 m^3, also providing a 300 mm freeboard above maximum operating level.

6.3 Drainage Description

6.3.1 Overview

The drainage system is designed by GGP Consult and described in their Drainage Impact Assessment report.[9]

[8] Primary & Secondary Containment Report With Bund Capacity Calculations, Three Maids AD, GGP-29348-CON-04, GGP Consult, Issue 04, 23rd February 2024
[9] Drainage Impact Assessment, Three Maids AD, GGP-29348-DIA-06, GGP Consult, Issue 04, 23rd February 2024

This section provides a summary of the drainage which should be read in conjunction with the Drainage Impact Assessment, the Drainage Process Flow Diagram (Appendix F), Figure 4: Drainage Layout and Figure 5: Drainage Catchment Plan.

The entire impermeable surfacing and drainage system is subject to an inspection, maintenance, and repair schedule.

6.3.2 Dirty Areas

Leachate and dirty water from the silage clamps is collected through channel drains running along the front of the clamps falling to 1 No. Silage leachate tank (50 m^3 each). The tank has a level switch and submersible pump which pumps leachate to 2 No. above ground Dirty water tanks (400 m^3 each) for use within the AD process. The Silage leachate tank is described in Section 6.1.2.

The dirty area around the feeders and the digestate separator also drains to the underground storage tank and then to the Dirty water tanks for use in the AD process.

The digestate off-take point benefits from a concrete apron and 3 m^3 spill collection sump.

6.3.3 Condensate

Condensate from gas cooling is collected separately in 2 No. condensate sumps and then recirculated for treatment within the digesters.

6.3.4 Clean Areas

In accordance with the drainage strategy, surface water from hardstanding areas is discharged into a Klargester NSFA030 Full Retention Separator to ensure oil, chemicals and solids are removed. The outflow from the separator along with clean water from building roofs can either be reused within the process or is discharged into a below ground cellular crate system for water storage and infiltration. The cellular storage has been designed to contain 266 m^3 at 95% void space of clean water. The system has been sized to accommodate up to a 1:100-year storm event with a 40% allowance for climate change. The Drainage Impact Assessment should be referred to for full calculations.[9]

There are 3 No. penstocks in place for the clean water drainage system such that any spillages can be contained on site if required:

- Before the full retention separator;
- After the full retention separator; and
- Before the crate storage and infiltration system.

The penstocks also allow for diversion of clean water into process water capture at times of low rainfall.

6.3.5 Secondary Containment Drainage

Water collecting within the secondary containment is quality assessed daily in accordance with the Secondary Containment Checking & Emptying Procedure **(THR-SOP-03)**.

Typically, water from the secondary containment bund is treated as dirty and pumped to the Dirty Water tank for treatment in the AD process. If visibly contaminated the source of the contamination will be immediately investigated in accordance with the Spill Control Procedure **(THR-SOP-08)**, and steps taken to resolve it.

The secondary containment system is designed in accordance with CIRIA 736. The required additional capacity for rainfall accumulation has been calculated using a worst-case scenario for a 12-hour period of the site being unmanned (12 hour 1:100 storm event with a 40% allowance for climate change).

In the case of abnormal excess water levels due to an extreme rainfall event clean water from the secondary containment system may be released to the wider environment following pre-determined checks detailed within the Discharge of Flood Water Procedure **(THR-SOP-18)**. In these circumstances, if the visual and olfactory checks confirm that there have been no spillages, and onsite testing confirms that parameters are at acceptable levels, then the water will be pumped out to the surface water crate system as clean water.

6.3.6 Pipework

Above ground substrate pipework is stainless steel, designed for longevity and visible for daily inspection in accordance with Daily Checks **(THR-MP-04)**.

There is no underground pipework except for drainage pipework which is made of suitable material e.g., Poly Vinyl Chloride (PVCu) and sealed, and pressure tested (water & air) prior to completion. All drainage within the containment system is located above the 1.0 mm HDPE membrane, with pipes, channels & chambers to have minimum 175 mm concrete surround.

6.4 Control of Emissions to Land & Water under Abnormal Operations

Control of emissions to water and land under abnormal operating conditions are detailed in the Accident Management Plan Manual **(THR-OD-06)** and associated procedures including the Discharge of Flood Water Procedure **(THR-SOP-18)**.

7 Control of Emissions to Air

7.1 Overview

The emission points to air A1 to A22 inclusive are shown on Figure 2 – Permit Boundary & Emission Point Plan and are shown in Table 6 below:

Table 6: Emission Points to Air

Emission point reference	Source
A1	Combined heat and power engine stack 1
A2	Combined heat and power engine stack 2
A3	Emergency flare stack
A4	Emergency boiler stack
A5	Emergency generator stack
A6	Emissions abatement plant stack (Manure reception building)
A7	Biogas upgrade unit PRV
A8	Biogas upgrade unit carbon dioxide vent
A9	Carbon dioxide recovery plant PRV1
A10	Carbon dioxide recovery plant PRV2
A11	Compressor PRV1
A12	Compressor PRV2
A13	Underground leachate tank vent
A14	PVRV on Primary digester 1
A15	PVRV on Primary digester 2
A16	PVRV on Secondary digester 1
A17	PVRV on Secondary digester 2
A18	PVRV on Tertiary digester
A19	Digestate storage bag vent 1
A20	Digestate storage bag vent 2
A21	Digestate storage bag vent 3
A22	Liquid digestate off-take point

7.2 Control of Emissions from the Manure Reception Building & Liquid Feedstock Tank

Air from the Manure reception building and displaced air from the Liquid feedstock tank is treated via a bespoke emissions abatement plant supplied by CentriAir which comprises the following steps:

- Sulphuric acid scrubber to remove ammonia.
- High intensity ultraviolet (UV) light treatment termed 'ColdOx UV' which provides two wavelengths of UV light to both breakdown complex compounds and to produce ozone, which is used to oxidise Volatile Organic Compounds (VOCs);
- Double layer carbon filter as a final polishing step; and
- Release of treated air via a 15.5m stack (A6).

The system design will ensure that negative pressure is maintained within the building and an appropriate rate of airflow is maintained for effective treatment in the emissions abatement plant.

7.3 Control of Emissions of Raw Biogas

Biogas pressure is measured by gas pressure sensors within the gas storage infrastructure, and is controlled by SCADA, to ensure process parameters are optimised such that gas production meets demand, and storage capacity is not exceeded (see Section 12.2 Process Monitoring), preventing a release to atmosphere via PVRVs.

If, due to equipment or system failure, excess biogas is produced the emergency flare will automatically and immediately ignite to burn the biogas to ensure it is not released to the atmosphere.

The emergency flare is a ground enclosed BAT compliant flare which is sized appropriately; it can burn between 500 to 2,500 Nm^3hr (variable) of biogas.

The predicted maximum production of biogas is 2,329 Nm^3/hr. The maximum production of biomethane from the BUU is around 1,249 Nm^3/hr. The appropriate flare capacity has been calculated considering these figures and worst-case scenarios for production of off-specification biomethane.

The PVRVs on the Primary digesters will operate at 12 mbar (A15 & A16). The PVRVs on the Secondary digesters (A17 & A18) and the Tertiary digester (A19) will operate at 6 mbar. The setting on SCADA will dictate that the emergency flare will automatically start before the PVRVs will release gas, meaning that they are only in place for unforeseen emergency use.

7.4 Control of Fugitive Emissions of Biogas

There will be a Leak Detection and Repair (LDAR) Programme in place for the operational site which will be used to measure levels of VOCs, including methane from a number of monitoring points around the site as identified through the DSEAR risk assessment **(THR-OD-09)** and LDAR programme.

LDAR inspections will be carried out by a third party annually, as a minimum. LDAR reports including tracking of required actions will be retained onsite.

7.5 Control of Combustion Emissions

Biogas treatment is carried out to reduce H_2S, VOCs and ammonia NH_3 levels within the biogas as described in the Process Description Section 5.13. The removal of these trace gases reduces the potential for emissions when the biogas is combusted.

Emissions from combustion plant; CHPs (A1 & A2), emergency flare (A3), emergency boiler (A4), and emergency generator (A5) are controlled through a planned preventative inspection and maintenance regime.

The use of the emergency flare is minimised through the control of gas pressures and volumes through process monitoring.

7.6 Control of Emissions from the BUU

Under normal operating conditions there will be no emissions from the BUU. There is a PRV on the BUU (A7) which will only operate under abnormal operating conditions. If the CO_2 recovery plant is not operating then CO_2 is released from the CO_2 stack on the BUU (A8) as is normal operation when CO_2 capture equipment is not installed.

7.7 Control of Emissions from the CO_2 Recovery Unit

Under normal operating conditions there will be no emissions from the CO_2 recovery unit. The 2 No. CO_2 recovery plant PRVs (A9 and A10) may release under abnormal operating conditions.

7.8 Control of Emissions from Digestate Storage & Off-take

The Digestate storage bag is fitted with 3 No. vents (A20 – A22 inclusive) to allow the venting of residual emissions which would reduce the digestate storage capacity.

The primary control for the release of biogas from the Digestate storage bag is production of stable digestate through process monitoring and management of the AD process (see Section 12.2 & 12.3 on Process Monitoring & Management respectively). The use of a three-stage digestion process reduces by-pass and thus residual biogas potential.

There is a carbon filter on the vent for displaced air during off-take of digestate liquor (A22). This will be replaced when required in line with manufacturers / suppliers recommendations.

7.9 Control of Emissions to Air under Abnormal Operations

Control of emissions to air under abnormal operating conditions are further detailed in the Accident Management Plan Manual **(THR-OD-06)** and associated procedures.

8 Control of Amenity Impacts

8.1 Odour

Odour emissions will be minimised through:

- Ensuring exposed silage clamp faces are kept tidy and to a minimum, when receiving manure, in accordance with the Feedstock Management & Loading Procedure **(THR-SOP-04).**
- Minimisation of Manure reception building fast acting roller shutter door opening times in accordance with the Feedstock Management & Loading Procedure **(THR-SOP-04)**.
- Digestate separation and fibre storage being within an enclosed bunker with roller shutter door, openings controlled in accordance with the Digestate Handling Procedure **(THR-SOP-05).**
- Process monitoring to ensure production of stable digestate with low odour potential in accordance with the Process Monitoring Procedure **(THR-SOP-01)**.
- Regular inspection and maintenance of abatement measures including the emissions abatement plant for the Manure reception building in accordance with manufacturers recommendations and the Maintenance Planner **(THR-MP-01).**

The maximum odour impact at a receptor location is below the relevant benchmark of 3.0ouE/m^3 for "moderately offensive" odours. Therefore, the site operation is unlikely to cause an odour impact at human receptors. Odour emissions will be controlled in accordance with the Odour Management Plan **(THR-OD-05).**

8.2 Noise

Noise emissions will be minimised through planned preventative maintenance for all equipment including the CHP(s), emergency flare and the gas storage dome fans which are potential sources of noise emissions, in accordance with the Maintenance Planner **(THR-MP-01)**.

A Noise Impact Assessment was carried out as part of the planning permission application for the site.[10] The report concluded:

> *"Following industry standard methodology and national planning policy guidance, it is concluded that noise from the proposed development would have a low impact in that it is not expected to cause any change in behaviour or attitude at the noise-sensitive receptors; that there would be no adverse impact on health or the quality of life.*
>
> *Off-site noise emissions were deemed to be insignificant therefore a noise management plan is not required."*

If noise emissions are detected off-site then corrective actions will be taken as soon as possible and, if required, a Noise Management Plan will be developed, submitted to the EA and implemented.

[10] Noise Impact Assessment, Ref: 404.11923.00004_0004, SLR Consulting, Version No:1, August 2022

8.3 Pests

The presence of pests will be minimised through:

- Routine pest monitoring and control;
- Use of approved products for pest control products only;
- Development and implementation of a Pests Management Plan, if required by the EA.

8.4 Dust

Dust will be minimised through:

- Straw treatment being carried out within a dedicated Straw treatment building and the use of water within the preparation process.
- Enforcing the 7 miles per hour (MPH) site speed limit for all vehicles on site.
- Daily clean down procedures in accordance with a Housekeeping Procedure **(THR-SOP-07)**.

If Daily Checks **(THR-MP-04)** identify that dust may be blowing off site, then the Dust Procedure **(THR-SOP-06)** will be followed.

8.5 Bioaerosols

A site specific bioaerosol risk assessment has been carried out, which is included with the permit application. It concluded *"The results of the assessment indicated residual risk from all sources was determined as low or very low. As such, it is concluded that no further control measures, other than those detailed in the assessment, are required in order to reduce the potential for impacts at sensitive locations in the vicinity of the site."*[11]

9 Control of Climate Change Impacts

Climate change impacts and mitigation controls are considered in a separate site-specific Climate Change Adaptation Risk Assessment **(THR-OD-12)**.

10 Roles & Responsibilities

10.1 Overview

This section of the Manual sets out the management structure of ABL relevant to site operations along with the roles and responsibilities placed on operational staff. Specific responsibilities are also set out in the accompanying operational procedures.

All members of staff should be clear on their role, responsibilities, and position within the management structure to facilitate effective environmental management. All roles and responsibilities will be reviewed no less than annually by the Head of Operations.

An Organogram for Operational Staff is in Appendix D.

10.2 Area Manager

The Area Manager is responsible for several sites operated by ABL and is responsible for:

- Overseeing the management of the site by the Site Managers;
- Providing extra resources / contingency arrangements due to staff shortages; and
- Providing the Site Managers with such support and guidance as necessary to fulfil the requirements of the EMS within the organisation.

10.3 Safety, Health & Environment & Quality Manager

The Safety, Health & Environment & Quality (SHEQ) Manager is responsible for:

- Approving and endorsing the EMS including any amendments.
- Ensuring the EMS requirements are operationally maintained through regular site visits;
- Checking that relevant training and competencies are maintained for operational staff, in particular emergency response procedures within the Accident Management Plan Manual **(THR-OD-06);**
- Ensuring integration of the EMS within the business is achieved;
- Document control and record keeping in relation to the EMS including responsibility for editing, updating, or superseding of documents; and
- Reviewing the EMS procedures and processes ensuring any changes to the EMS are planned and implemented.

10.4 Site Manager

The Site Manager takes day to day responsibility for the operation of the site including:

- Checking that relevant training and competencies in relation to Standard Operating Procedures (SOPs) are maintained for operational staff;
- Document control and record keeping in relation to the EMS including responsibility for editing, updating, or superseding of documents, as advised by the SHEQ Manager;

- Reviewing the EMS procedures and processes ensuring any changes to the EMS are planned and implemented, as advised by the SHEQ Manager;
- Fulfilling the specific role requirements of individual procedures;
- Ensuring the site processes and procedures are implemented and upheld across all areas of operation;
- Implementing and overseeing emergency response procedures as required;
- Overseeing the implementation of corrective actions where required;
- Observing trends in process management data and discussing process management decisions with the Area Manager, Head of Operations and / or Biologist (external);
- Establishing and reviewing the daily feed recipe for the AD plant;
- Responding to SCADA alarms or delegating this responsibility to a Nominated Competent Person;
- Implementing the planned preventative maintenance plan with respect to the AD plant and associated infrastructure;
- Retaining inspection and maintenance records;
- Managing external contractors carrying out planned or ad hoc maintenance tasks;
- Reporting site issues or incidents to the Area Manager & SHEQ Manager; and
- Management of Site Operatives.

10.5 Technically Competent Manager

The TCM has the responsibility for:

- Maintaining technical competence including Continuing Competence assessments;
- Ensuring that operations at the site comply with all relevant environmental and health and safety legislation and where possible relevant guidance; and
- Recording attendance hours on site in the iPad sign in and out system.

10.6 Feedstock & Digestate Manager

The Feedstock & Digestate Manager is responsible for:

- Obtaining and maintaining the necessary professional skills, training and/or experience to deal with all issues relevant for the management of the feedstocks and digestate, including the technical assessments required for waste pre-acceptance checks.
- Fulfilling the specific role requirements of individual procedures;
- Sourcing feedstocks for the AD Plant;
- Carrying out pre-acceptance checks;
- Advising the Site Manager on verification checks on feedstocks that are required;
- Ensuring that there is always a good supply of feedstocks but that the supply doesn't exceed the storage or treatment capacity of the plant;
- Diverting feedstocks to other sites if required; and
- Following up feedstock rejection with the feedstock supplier and preventing unsuitable material being sent to site;
- Ensuring there is sufficient storage for digestate; and
- Securing and maintaining contracts for digestate use.

10.7 Site Operatives

The Site Operatives are responsible for:

- Being fully aware of the EMS to:
- ensure that procedures and controls are upheld; and
- understand and reduce the environmental impact of the organisation's activities.
- Obtaining and maintaining the necessary professional skills, training and/or experience to deal with all issues relevant to their role in the facility;
- Fulfilling the specific role requirements of individual procedures and reporting to the Site Manager.

10.8 Logistics Manager

The Logistics Manager is responsible for:

- Managing the link between the Biomethane Production Plant at the AD facility and the Hub site to which the gas will be delivered;
- Managing the performance of key gas transporter sub-contractors;
- Managing the delivery of CO_2 to end users;
- Managing schedules to ensure that vehicle movements are in line with relevant regulations (e.g., Hazardous Substances Consent, safe carriage of Dangerous Goods) and approvals (e.g., transport management plan linked to planning permission); and
- Managing contractor and equipment compliance with gas safety and health and safety regulations.

11 Implementation & Operation

This section of the EMS Manual outlines the procedures and processes for identifying and delivering training requirements, communications, emergency preparedness and response, operation controls and documentation in relation to the EMS.

11.1 Document & Record Control

ABL is committed to maintaining document and record controls to provide an audit trail of evidence in support of the company's activities.

11.1.1 Control of Documents

The EMS requires that all documents are clearly identifiable and traceable through their version history, and that only the current versions of documents are in circulation throughout the company. ABL will ensure that documents are appropriately organised, stored and archived in a place (physical or electronic) that is easily accessible to staff who may need to consult or edit documents.

The SHEQ Manager is responsible for document management including responsibility editing, updating, or superseding of documents.

The internally produced documentation associated with the EMS is presented in a consistent format including:

- Title of document
- Document reference in the format XXX-YYY-NN where:
    - 'XXX' is either:
        - 'ABL' for a companywide management system document which is used across all sites operated by ABL; or
        - 'THR' denoting a management system document specific to the Three Maids AD site.
    - 'YYY' is:
        - OD denoting an Overarching Document, for example a management plan.
        - SOP is a Standard Operating Procedure.
        - MP is a Monitoring and / or Maintenance Schedule.
        - FT is a Standard form template used to make records in relation to the EMS and associated procedures.
    - 'NN' is a unique number to identify the document.
- Document author / name of person who issued the document.
- Version number. (The Master Document Control File **(THR-OD-02)** is the only document without version number and is controlled through a date format instead)
- Date of issue.

To prevent the loss of documents ABL uses cloud-based systems which are protected and backed up.

The process for creating and reviewing documents is detailed in the Document Control Procedure **(ABL-SOP-01)**. The status of all management system documents is recorded within the Master Document Control File **(THR-OD-02)**.

11.1.2 Control of Records

Records are maintained to provide evidence of conformity with the requirements of the EMS. All records are:

- legible;
- made as soon as reasonably practicable;
- if amended, amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval;
- retained for at least 6 years from the date when the records were made,
- or in the case of the following records until permit surrender:
    - off-site environmental effects; and
    - matters which affect the condition of the land and groundwater.

11.2 Competence, Training & Awareness

ABL will ensure all persons performing tasks for the organisation or on its behalf are competent based on appropriate education, training and/or experience, to enable them to carry out the specific task safely.

ABL has established and implemented procedures to identify the training needs associated with the EMS, the operation of the site and the retention of staff competencies. Training requirements will be determined following the Training Procedure **(ABL-SOP-04)**.

It is essential that all staff are fully aware of the EMS to ensure that procedures and controls are upheld. All new staff joining ABL will receive appropriate training using the environmental permit for the site and the EMS including documented procedures to understand and reduce environmental impact of the organisation's activities.

All formal training and Toolbox Talks received will be logged in Skills and Competency Matrix **(ABL-OD-02)**. Records of training on SOPs will be retained by the Site Manager.

11.3 Communication

11.3.1 Communications & Reporting

For internal communication, the SHEQ Manager ensures that information regarding the EMS such as the environmental policy, EMS manual, management plans and SOPs, including emergency response procedures, are readily available to all relevant employees and contractors.

It is essential that all personnel are fully aware of the EMS to ensure that procedures and controls are upheld. All new employees and contractors receive appropriate training using the EMS documents and procedures to understand and reduce environmental impact of the organisation's activities.

For external communication, the Environmental Policy **(ABL-OD-01)** will be made available upon request. ABL seeks to proactively communicate with its external stakeholders about its EMS.

11.3.2 Complaints

ABL understands the importance of addressing both internal and external complaints in a prompt and comprehensive manner to resolve any issue as quickly as possible. All complaints are dealt with according to the Complaints Procedure **(ABL-SOP-02)**.

11.4 Operational Controls & Emergency Response

11.4.1 Operational Controls

ABL has established and implemented operational controls relevant to the operational processes and the organisation's significant environmental risks.

The management system documents relevant to operational control are Overarching Documents (ODs), including the Environmental Policy and overarching management plans, SOPs, monitoring and maintenance schedules and the record keeping forms associated with the SOPs (Form templates).

The operational controls will be adhered to, by all employees and personnel working for or on behalf of the organisation. ABL therefore ensures that all relevant management system documents are communicated to the personnel to whom they apply.

Management system documents are reviewed at planned intervals as stated within with the Master Document Control File **(THR-OD-02)** and revised when necessary.

Table 7: below lists the management system documents relevant to operational control:

Table 7: Management System Documents (Operational Controls)

Document Reference	Document Title
ABL Overarching Documents	
ABL-OD-01	Environmental Policy
ABL-OD-02	Skills and Competency Matrix
ABL-OD-04	Site Decommissioning Plan
ABL-OD-05	Non-conformance & Corrective Action Log
ABL Overarching Procedures	
ABL-SOP-01	Document Control Procedure
ABL-SOP-02	Complaints Procedure
ABL-SOP-03	Change Control Procedure
ABL-SOP-04	Training Procedure
ABL-SOP-05	Waste Pre-acceptance Procedure

Document Reference	Document Title
ABL-SOP-06	Feedstock Acceptance and Rejection Procedure
ABL-SOP-07	Liquid Waste Reception Procedure
ABL-SOP-08	Environmental Monitoring Procedure
ABL-SOP-10	Sampling & Analysis Procedure
ABL-SOP-12	Procedure for Reporting Incidents & Accidents
ABL Form Templates	
ABL-FT-01	Accident and Incident Report Form
ABL-FT-02	Waste Pre-acceptance Form
ABL-FT-03	Change Control Form
ABL-FT-04	Feedstock Rejection Form
ABL-FT-05	Complaint Record Form
ABL-FT-06	Odour Complaint Form
Site Specific Overarching Documents	
THR-OD-01	Environmental Management System Manual (this document)
THR-OD-02	Master Document Control File
THR-OD-03	Process Flow Diagram
THR-OD-04	Drainage Process Flow Diagram
THR-OD-05	Odour Management Plan
THR-OD-06	Accident Management Plan Manual
THR-OD-07	Digestate Management Plan
THR-OD-08	Hazardous Area Classification Plans
THR-OD-09	DSEAR risk assessment
THR-OD-10	Staff Organogram
THR-OD-11	Lightning Risk Assessment
THR-OD-12	Climate Change Adaptation Risk Assessment
THR-OD-14	Energy Efficiency Plan
Site Specific Procedures	
THR-SOP-01	Process Monitoring Procedure
THR-SOP-02	Odour Monitoring Procedure
THR-SOP-03	Secondary Containment Checking & Emptying Procedure
THR-SOP-04	Feedstock Management & Loading Procedure
THR-SOP-05	Digestate Handling Procedure
THR-SOP-06	Dust Procedure

Document Reference	Document Title
THR-SOP-07	Housekeeping Procedure
THR-SOP-08	Spill Control Procedure
THR-SOP-09	Control Panel Alarm Response
THR-SOP-10	Fire & Explosion Response Procedure
THR-SOP-11	Biogas Leak Response Procedure
THR-SOP-12	Foam Response Procedure
THR-SOP-13	Main Power Outage Response Procedure
THR-SOP-14	Safe Shutdown Procedure
THR-SOP-15	Mechanical Failure Procedure
THR-SOP-16	Flood Response Procedure
THR-SOP-17	Reduced Gas Grid Demand Contingency Plan
THR-SOP-18	Discharge of Flood Water Procedure
THR-SOP-19	Waste Contingency Plan
THR-SOP-20	Digestate Contingency Procedure
Site Specific Monitoring & Maintenance Schedules	
THR-MP-01	Maintenance Planner
THR-MP-02	Site Diary
THR-MP-03	Critical Spares List
THR-MP-04	Daily Checks
THR-MP-05	Weekly Checks
Site Specific Templates	
THR-FT-01	Odour Monitoring Form

11.4.2 Emergency Preparedness & Response

ABL has established and implemented emergency procedures relevant to the operational processes and the organisation's significant environmental risks.

Emergency response procedures will always be adhered to, by all employees and personnel working for and on behalf of the organisation. ABL therefore ensures that all emergency response procedures are communicated to personnel to whom they apply. Emergency response procedures are reviewed at planned intervals as stated within with the Master Document Control File **(THR-OD-02)** and revised when necessary.

Table 8 below lists the Management System documents relating to Emergency Response that have been implemented.

Table 8: Management System Documents (Emergency Response)

Document Reference	Document Title
ABL Overarching Documents	
ABL-OD-02	Skills and Competency Matrix
ABL Overarching Procedures	
ABL-SOP-11	Corrective Action Planning Procedure
ABL-SOP-12	Procedure for Reporting Incidents & Accidents
ABL Form Templates	
ABL-FT-01	Accident and Incident Report Form
Site Specific Overarching Documents	
THR-OD-04	Drainage Process Flow Diagram
THR-OD-05	Odour Management Plan
THR-OD-06	Accident Management Plan Manual
THR-OD-08	Hazardous Area Classification plans
THR-OD-09	DSEAR risk assessment
THR-OD-11	Lightning Risk Assessment
Site Specific Procedures	
THR-SOP-02	Odour Monitoring Procedure
THR-SOP-06	Dust Procedure
THR-SOP-08	Spill Control Procedure
THR-SOP-09	Control Panel Alarm Response
THR-SOP-10	Fire & Explosion Response Procedure
THR-SOP-11	Biogas Leak Response Procedure
THR-SOP-12	Foam Response Procedure
THR-SOP-13	Main Power Outage Response Procedure
THR-SOP-14	Safe Shutdown Procedure
THR-SOP-15	Mechanical Failure Procedure
THR-SOP-16	Flood Response Procedure
THR-SOP-17	Reduced Gas Grid Demand Contingency Plan
THR-SOP-18	Discharge of Flood Water Procedure
THR-SOP-19	Waste Contingency Plan
THR-SOP-20	Digestate Contingency Procedure
Site Specific Form Templates	

Document Reference	Document Title
THR-FT-01	Odour Monitoring Form

11.5 Non-conformance & Corrective Actions

ABL has established a system for ensuring that non-conformance is recorded, and actions are tracked to ensure that the relevant corrective actions are completed.

The management system documents relevant to non-conformance are the Corrective Action Planning Procedure **(ABL-SOP-11)** and the Non-conformance and Corrective Action Log **(ABL-OD-05).**

The Non-conformance and Corrective Action Log **(ABL-OD-05)** will be used for issues identified internally and externally identified issues such as complaints or non-compliance scores from the regulator.

12 Monitoring

12.1 Environmental Monitoring

ABL monitors, on an ongoing basis, the environmental performance of the site through environmental monitoring as required to determine environmental performance and control environmental risks, as determined through the Environmental Risk Assessment (Appendix A).

Environmental monitoring procedures will always be adhered to, by all employees working for or on behalf of the organisation. ABL therefore ensures that all environmental monitoring procedures are communicated to personnel to whom they apply. Environmental monitoring schedules and procedures will be reviewed at planned intervals as stated within with the Master Document Control File **(THR-OD-02)** and revised when necessary.

Table 9 below lists the environmental monitoring procedures and check lists that will be implemented.

Table 9: Management System Documents (Environmental Monitoring)

Document Reference	Document Title
ABL Overarching Documents	
ABL-OD-04	Site Decommissioning Plan
ABL Overarching Procedures	
ABL-SOP-08	Environmental Monitoring Procedure
ABL-SOP-10	Sampling & Analysis Procedure
Site Specific Overarching Documents	
THR-OD-05	Odour Management Plan
Site Specific Procedures	
THR-SOP-01	Process Monitoring Procedure
THR-SOP-02	Odour Monitoring Procedure
THR-SOP-03	Secondary Containment Checking & Emptying Procedure
THR-SOP-07	Housekeeping Procedure
Site Specific Monitoring & Maintenance Schedules	
THR-MP-01	Maintenance Planner
THR-MP-02	Site Diary
THR-MP-04	Daily Checks
THR-MP-05	Weekly Checks
Site Specific Templates	

Document Reference	Document Title
THR-FT-01	Odour Monitoring Form

12.2 Process Monitoring

Process monitoring is key to ensure a stable anaerobic digestion process, to minimise the risk of abnormal events which may lead to emissions. Process monitoring also enables ABL to maximise the efficiency of the process in terms of biogas yield and resulting biomethane, heat and digestate production.

Process monitoring is carried out in accordance with the Process Monitoring Procedure **(THR-SOP-01).**

Process monitoring can be sub-divided into:

- Feedstock analysis
- Visual checks
- Automated monitoring via SCADA
- On site testing
- Offsite testing at an external accredited laboratory.

Relevant process management actions have been detailed here for ease of reference.

12.2.1 Feedstock Analysis

Crop feedstocks are tested for dry matter content as they are received during harvest. Crop feedstocks are also seasonally tested with an offsite laboratory for biochemical methane potential (BMP) to inform the feed regime.

Waste feedstocks undergo pre-acceptance and acceptance checks including sampling and testing in accordance with the Waste Pre-Acceptance Procedure **(ABL-SOP-05)** and the Feedstock Acceptance and Rejection Procedure **(ABL-SOP-06).**

In addition, there is an on-site laboratory which is used for feedstock analysis for operational test parameters to optimise the digestion process.

Test results are used to inform the daily feed plan for the AD plant which is determined by the Site Manager.

12.2.2 Visual checks

Every day a visual inspection is carried out through the inspection windows on all the digesters. Observations are made on the apparent mixing speed and the presence of crusting or foam as these are important indications of the health of the AD process. This check is recorded in the Daily Checks **(THR-MP-04).**

12.2.3 Automated monitoring via SCADA

SCADA is a software application program which collects and records data in real time from remote locations to control equipment and conditions within an anaerobic digestion plant. The monitoring data is fed back to the SCADA system which is visible to site operatives.

The SCADA system detects any faults or approach to limits via a graphical interface and can be operated remotely.

12.2.4 Gas production

Gas production is measured through monitoring biomethane production, consumption by the emergency boiler and by the volume of biogas in storage across all tanks.

The daily biogas production is an important parameter because it shows immediately if there are changes in the biological process. As soon as the production drops in relation to the organic loading rate, then it indicates either reduced organic loading rate in the fermenter or potential inhibition within the digestion process.

If gas production drops in relation to organic loading rate, then the appropriate corrective action may be to increase the organic loading rate and / or investigate if there is inhibition of the process via sample analysis.

12.2.5 Gas Pressure

Gas pressure monitors are in all the gas holding tanks.

Gas pressure is monitored via SCADA and regulated via through the BUU and use in the emergency boiler and / or CHP in biogas mode.

The regulation of gas pressure is fully automated and SCADA links gas pressure readings with mixing within the tanks.

SCADA is set such that the emergency flare will automatically operate at a lower pressure than that at which the PVRVs are set to release.

SCADA will alarm if:

- the emergency flare automatically ignites.
- the gas upgrading unit trips.
- the emergency boiler in biogas mode trips.

The Site Manager or Nominated Competent Person is responsible for evaluating the root cause of the alarm and acting accordingly to resolve the problem. This may require re-setting of equipment.

12.2.6 Gas Quality

Gas quality is a key parameter for process monitoring and may give a quick indication of potential issues with the anaerobic digestion process.

Gas quality is continuously via 3 No. in-line analysers. The following parameters are measured within the ranges detailed below:

- Methane (CH_4)- 0-100% vol.
- Cardon dioxide (CO_2)- 0-100% vol.
- Hydrogen Sulphide (H_2S)- 0-2,000ppm
- Oxygen (O_2)- 0-25% vol.
- Hydrogen (H_2)- 0-1,000ppm

The reading from the inline gas monitors is checked weekly using a hand-held gas monitor. The hand-held gas monitor is calibrated annually or sooner if there is a significant difference between the in-line and handheld device readings.

A decreasing methane or increasing carbon dioxide trend may suggest that the feed rate needs to be reduced or that there is some level of inhibition in the process.

An increasing H_2S trend may suggest that there is a change in the feedstock make-up which should be checked by further analysis or rectified with oxygen addition or use of ferric hydroxide or ferric chloride. H_2S can act to inhibit methanogenesis i.e. methane production and is also potentially corrosive to plant and equipment when in solution.

12.2.7 Temperature

Temperature control is required to keep the temperature in the digesters as stable as possible. The temperature probe in the process tanks continuously monitor temperature and the SCADA system keeps the temperature within mesophilic limits 38°C -45°C.

12.2.8 On site testing

A sample is taken from each digester on a daily basis and tested for pH, dry matter and FOS/TAC in accordance with the Process Monitoring Procedure **(THR-SOP-01)**. The data is logged, and trends observed over time to inform process management.

The FOS TAC ratio and additional analyses are indicators for assessing fermentation processes. The FOS TAC ratio measures Volatile Organic Acids (FOS) in relation to Total Alkaline Carbonate (TAC); the TAC value is an estimation of the buffer capacity of the sample.

12.2.9 Offsite testing at an external laboratory

On a monthly basis, or as advised by a specialist biologist, a sample is taken from each of the digesters in accordance with the Sampling and Analysis Procedure **(ABL-SOP-10)** and sent off site for analysis at a UKAS Accredited laboratory for a minimum of:

- pH
- FOS/TAC
- Dry matter
- Volatile fatty acids
- Trace elements.

This data is used by the Site Manager to inform process decisions including the daily feed plan, mixing regime and the addition of trace elements.

12.3 Process Management

Process monitoring determines appropriate process management. Process monitoring results are reviewed to identify data trends to inform decisions about managing the process. By reviewing trends in the data rather than individual results, changes in the balance of the whole system are more easily identified.

Further process monitoring may be required to confirm findings. The expertise of a biologist is used as necessary to help inform process management decisions made by the Site Manager.

It is the responsibility of the Site Manager to look at process monitoring data and make process management decisions in consultation with the technical experts and to record decisions on the Site Diary **(THR-MP-02).** Where appropriate, external Biological support may be sought. Major decisions may also be recorded within minutes of weekly management meetings.

12.4 Digestate Quality Monitoring

The separated fibre and liquor digestate are sampled and analysed at a suitably accredited laboratory to determine their characteristics. Results will be provided to the end users and their agronomist such that a nutrient management plan may be made prior to the digestate being used.

The samples are taken and dispatched to the laboratory in accordance with the Sampling and Analysis Procedure **(THR-SOP-10)** which includes a recommended sampling frequency schedule. Residual Bigas Potential of the digestate will be tested for twice a year.

12.5 Inspection & Maintenance of Equipment

ABL will ensure that all process plant and equipment is commissioned, operated, and maintained in accordance with the manufacturers recommendations and is documented and recorded.

ABL will ensure that all monitoring and measuring equipment is fit for purpose, maintained, and calibrated to appropriate standards (UKAS approved where applicable).

The following procedures and processes listed in Table 10 have been implemented to ensure continued maintenance of the site's infrastructure. A suitably qualified person undertakes all maintenance and calibration work.

Table 10: Management System Documents (Monitoring & Maintenance)

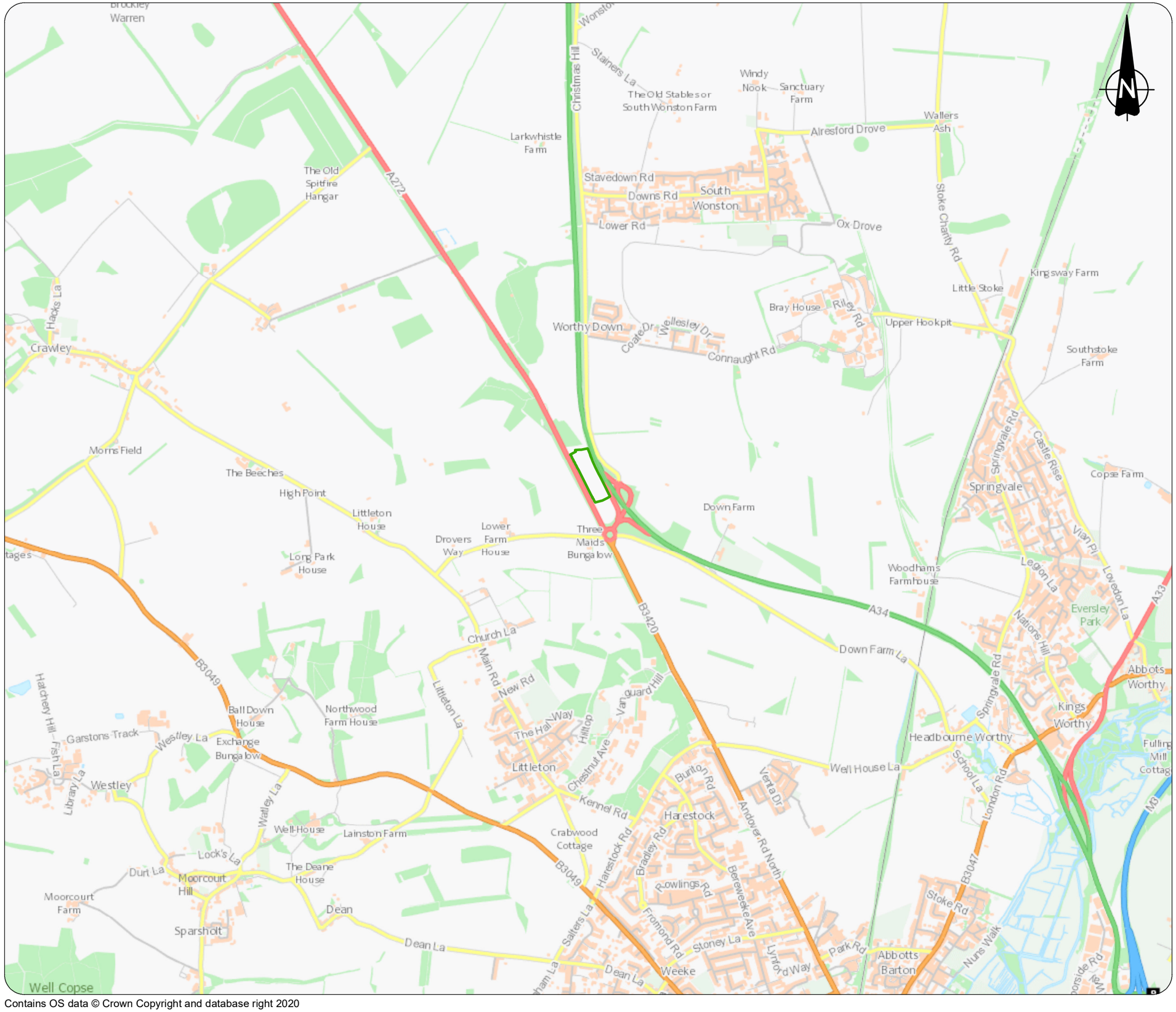
Document Reference	Document Title
ABL Overarching Documents	
ABL-OD-02	Skills and Competency Matrix
Site Specific Monitoring & Maintenance Schedules	
THR-MP-01	Maintenance Planner
THR-MP-02	Site Diary

Document Reference	Document Title
THR-MP-03	Critical Spares List
THR-MP-04	Daily Checks
THR-MP-05	Weekly Checks

ABL carries out all inspection and maintenance of plant and equipment in house except for the following plant and equipment which is maintained under contract:

- CHPs;
- BUU;
- CO_2 liquefaction system;
- Compressed Natural Gas (CNG) compression system; and
- Gas analysis equipment outside of the above scope(s) will be maintained by Original Equipment Manufacturer (OEM) or OEM 3rd party.

Figures



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	20/02 2024	First Issue	JJ	MF	MF

LEGEND

Permit Boundary

0 250 500 750 1,000 1,250 m

Scale at A3: 1:25,000

Client
Acorn Bioenergy Operations Limited

Project
Three Maids AD Permit Application

Title
Site Location Plan

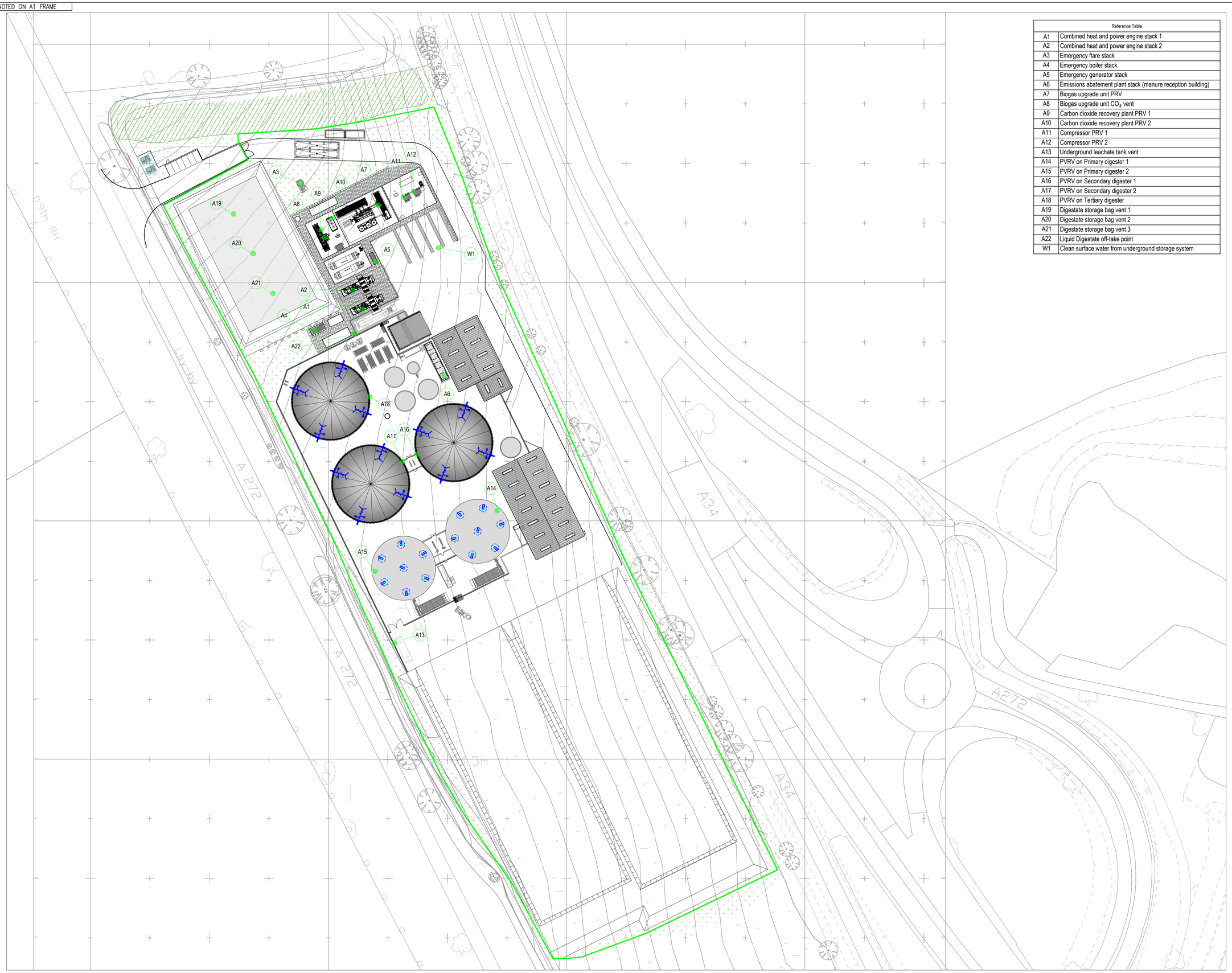
Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2024	1:25,000	A3

Drawing Number	File Reference
ETL724/THRM/SiteLocation/EPR01	ETL274.mxd

AS NOTED ON A1 FRAME



Reference Table	
A1	Combined heat and power engine stack 1
A2	Combined heat and power engine stack 2
A3	Emergency flare stack
A4	Emergency boiler stack
A5	Emergency generator stack
A6	Emissions abatement plant stack (manure reception building)
A7	Biogas upgrade unit PRV
A8	Biogas upgrade unit CO_2 vent
A9	Carbon dioxide recovery plant PRV 1
A10	Carbon dioxide recovery plant PRV 2
A11	Compressor PRV 1
A12	Compressor PRV 2
A13	Underground leachate tank vent
A14	PVRV on Primary digester 1
A15	PVRV on Primary digester 2
A16	PVRV on Secondary digester 1
A17	PVRV on Secondary digester 2
A18	PVRV on Tertiary digester
A19	Digestate storage bag vent 1
A20	Digestate storage bag vent 2
A21	Digestate storage bag vent 3
A22	Liquid Digestate off-take point
W1	Clean surface water from underground storage system

SITE PLAN
Scale: 1:750 @ A1

NOT FOR CONSTRUCTION

NOTES:-

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Topographic survey
4. This drawing is to be read in conjunction with 29348/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Perimeter Fence
Permitted Area Boundary (4.453ha)
Emission Release Location
15m Woodland Easement

Rev	Date	Description	DR	CH
E	21/02/24	Issued For Information	SJC	JHC
D	14/02/24	Issued For Information	SJC	JHC
C	01/02/24	Issued For Approval	SJC	JHC
B	31/01/24	Issued For Approval	SJC	JHC
A	17/01/24	Issued For Approval	SJC	JHC

UVDB Achieving Excellence Registered
Link-up Qualified via Audit
GGP CONSULT
CONSULTING ENGINEERS
ARCHITECTS
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HULL HU4 7DY
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Client: acorn

Job Title: AD Plant. Three Maids

Drawing Title: Site Emissions Plan.

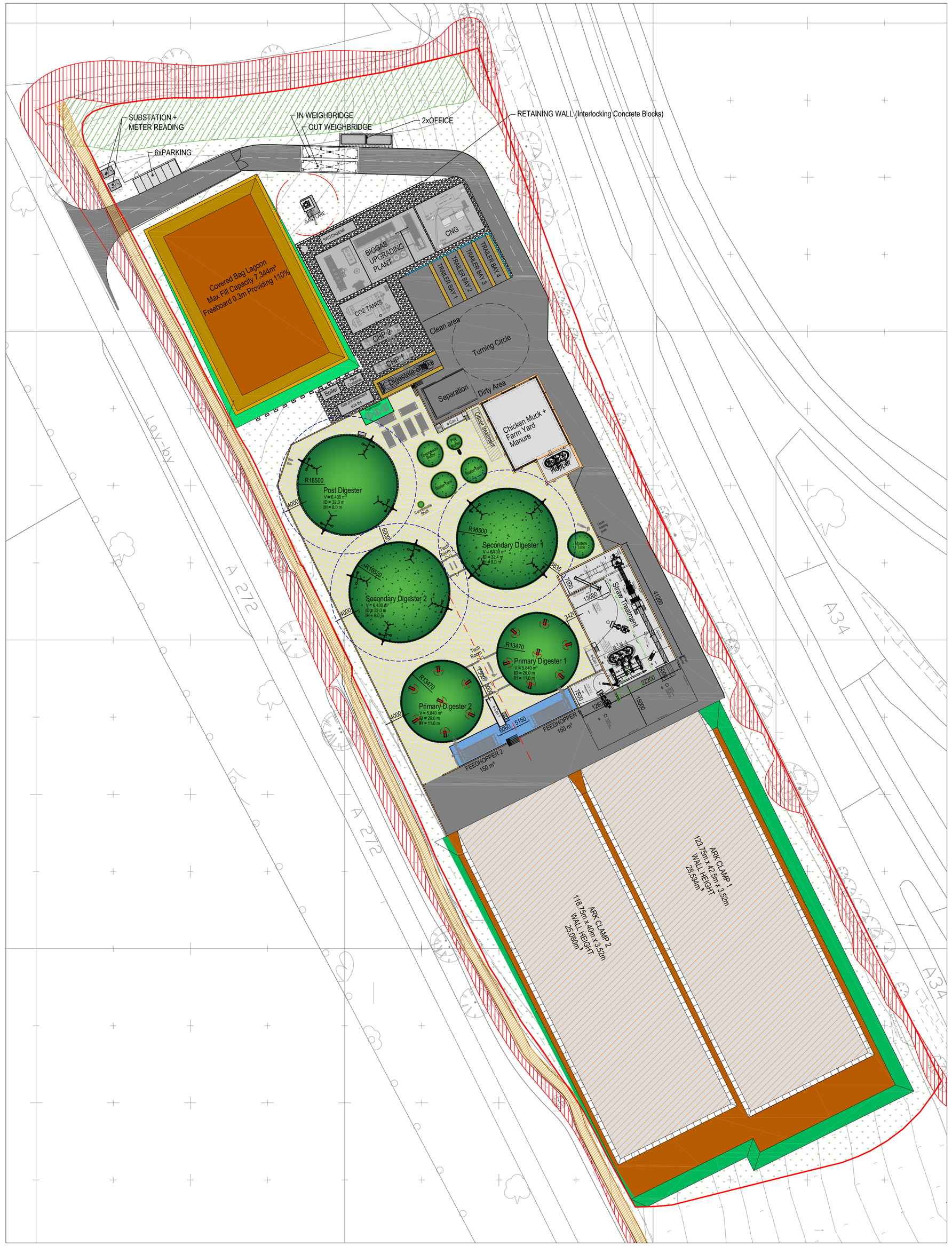
Status: Approval

Scale: As Shown | Date: Jan '24

Drawn By: SJC | Checked: JHC | Approved: JHC

Drg. No.: 29348/202 | Rev: E

AS NOTED ON A1 FRAME



0 50m 100m 150m 200m 250m
Scale 1:5000 @ A1

SITE LOCATION PLAN
Scale: 1:5000 @ A1

SITE PLAN
Scale: 1:750 @ A1

FOR CONSTRUCTION

NOTES:-

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Topographic survey
4. This drawing is to be read in conjunction with 29348/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Site Red Line Boundary (4.453ha)

15m Woodland Easement

Tree Easement

Rev	Date	Description	DR	CH
C6	26/01/24	Tanking Layout amended	MK	JHC
C5	15/01/24	Odour moved	MK	JHC
C4	11/01/24	Switchgear updated to 40ft	MK	JHC
C3	11/01/24	Separation changed	MK	JHC
C2	18/12/23	ISSUED FOR CONSTRUCTION	MK	JHC
C1	08/12/23	ISSUED FOR CONSTRUCTION	MK	JHC

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Client: acorn BIOENERGY

Job Title
AD Plant.
Three Maids

Drawing Title
Site Layout Plan

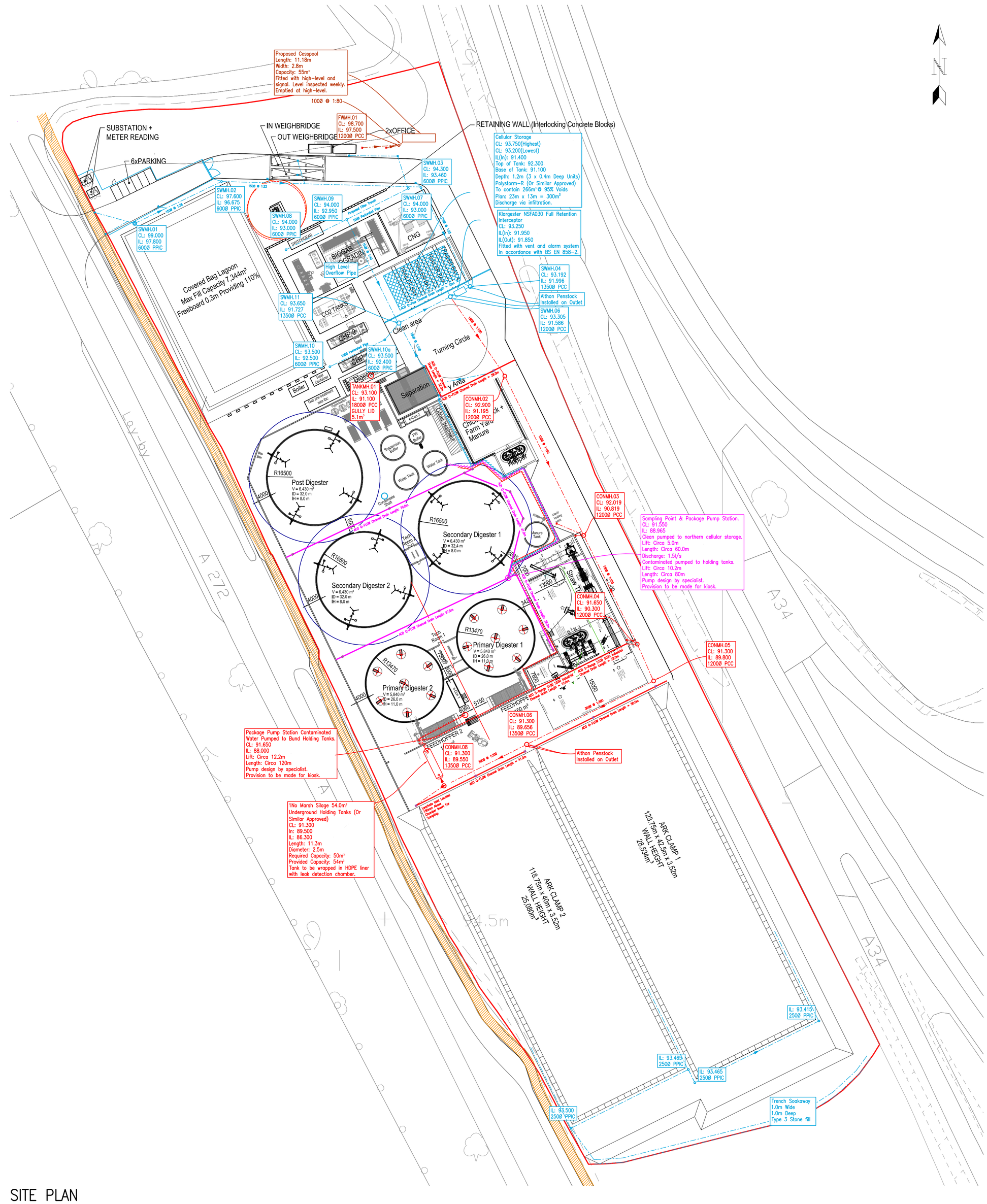
Status: For Construction

Scale: AS NOTED @ A1
Date: DEC' '23

Drawn By: MK
Checked: JHC
Approved: JHC

Drg. No.: 29348/C/101
Rev: C6

DRAWN AT 1:1 ON A1 FRAME



SITE PLAN
Scale: 1:750 @ A1

FOR EA PERMIT

NOTES:-

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Topographic survey
4. This drawing is to be read in conjunction with 29348/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

- Site Red Line Boundary
- Clean Surface Water Sewer
- Clean Surface Water Chamber
- Clean Surface Water Headwall
- Clean Surface Water Drainage Channel
- Clean Surface Water Rainwater Pipe
- Clean Surface Water Rising Main
- Contaminated Surface Water Sewer
- Contaminated Surface Water Chamber
- Contaminated Surface Water Drainage Channel
- Contaminated Surface Water Rising Main
- Bund Surface Water Sewer
- Bund Surface Water Chamber
- Bund Surface Water Channel Drain
- Foul Water Sewer
- Foul Water Chamber
- Soil Vent Pipe

All pipes to be encased in concrete.

All Clean manholes to be double sealed

Rev	Date	Description	DR	CH
EA1	26/02/24	ISSUED FOR COMMENT	WS	JHC

Constructionline
intertek
Achilles UVDB SILVER PLUS
Audited RISQS
GGP CONSULT
CONSULTING ENGINEERS
ARCHITECTS
PROJECT MANAGEMENT
2 Hallam Road
Priory Park East
HULL HU4 7DY
United Kingdom
Telephone (+44) 01482 627963
Fax (+44) 01482 641736
Email info@ggpconsult.co.uk

Client: acorn anaerobics

Job Title
AD Plant.
Three Maids

Drawing Title
Proposed Drainage Layout

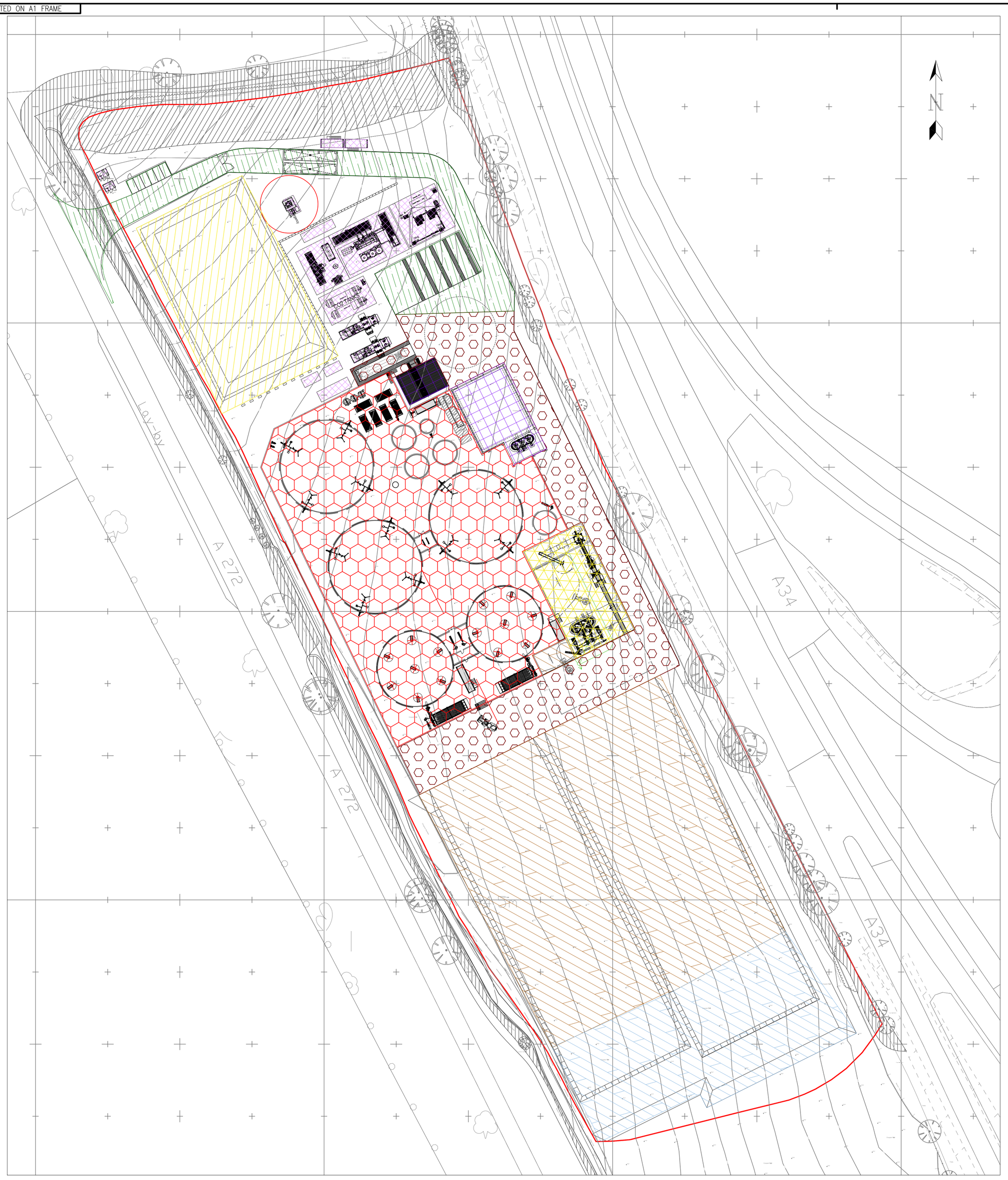
Status: EA Permit

Scale: 1:750 @ A0
Date: DEC' '23

Drawn By: W.GRANT
Checked: JHC
Approved: JHC

Drg. No. 29348/C/110
Rev EA1

AS NOTED ON A1 FRAME



SITE PLAN
Scale: 1:750 @ A1

FOR EA PERMIT

NOTES:-

1. All dimensions must be checked on site and not scaled from this drawing.
2. The Contractor shall make a survey of the site and shall be responsible for obtaining all dimensions and levels necessary for the proper fabrication of the structure as indicated.
3. All levels shown on this drawing are relative to Agreed Topographic survey
4. This drawing is to be read in conjunction with 29348/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Site Red Line Boundary

Denotes Digestate Lagoon Area – 3,042m²

Denotes Clean w/Petrochemicals Hardstanding Runoff Area – 2,461m²

Denotes Clean Equipment Runoff Area – 1,457m²

Denotes Clean/Contaminated Bund Runoff Area – 8,323m²

Denotes Dirty Silage Clamp Runoff Area – 9,220m²

Denotes Contaminated Hardstanding Runoff Area – 3,745m²

Denotes Clean Roof Runoff Area – 804m²

Denotes Clean Silage Clamp Cover Runoff Area – 3,696m²

Denotes Clean Runoff Straw Building – 956m²

Rev	Date	Description	DR	CH
EA1	26/02/24	EA PERMIT	WG	JHC

GGP CONSULT
CONSULTING ENGINEERS
ARCHITECTS
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Fax (+44) 01482 641736
Email info@ggpconsult.co.uk

Client: acorn BIOENERGY

Job Title
AD Plant.
Three Maids

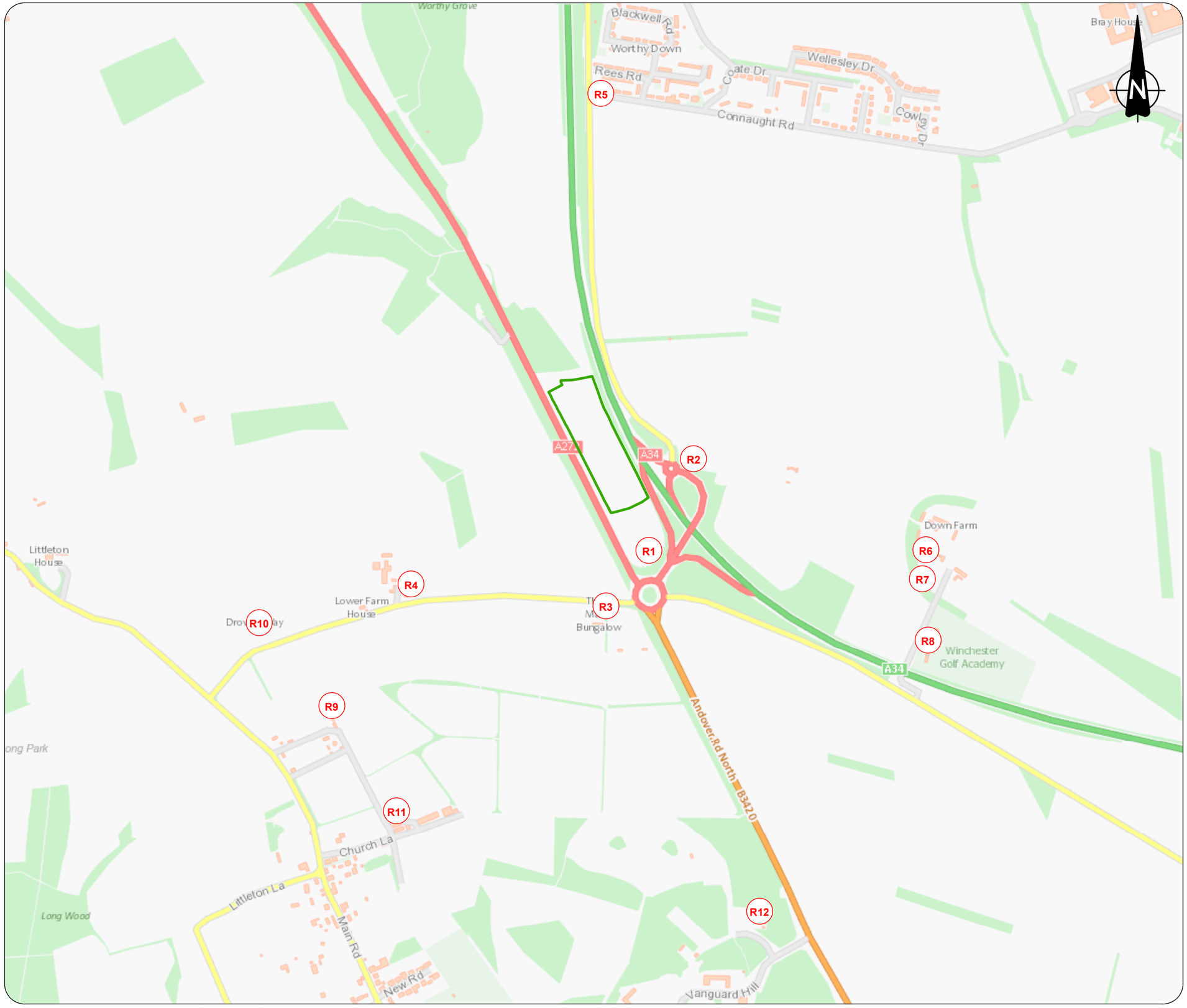
Drawing Title
Drainage Catchment Plan

Status: EA PERMIT

Scale: AS NOTED @ A1 | Date: DEC' '23

Drawn By: WG | Checked: JHC | Approved: JHC

Drg. No.: 29348/C/103 | Rev: EA1



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	20/02 2024	First Issue	JJ	MF	MF

LEGEND

Permit Boundary

Human Receptors

0 100 200 300 400 500 m

Scale at A3: 1:10,000

Client
Acorn Bioenergy Operations Limited

Project
Three Maids AD Permit Application

Title
Human Receptor Locations Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2024	1:10,000	A3

Drawing Number	File Reference
ETL724/THRM/HumanReceptors/EPR02	ETL274.mxd

REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	20/02 2024	First Issue	JJ	MF	MF

LEGEND

- Permit Boundary
- 2km Study Area
- Ecological Receptor - Local Sites
- Local Wildlife Sites
- SINC

Ancient Woodland Inventory

- Ancient Replanted Woodland
- Ancient & Semi-Natural Woodland

Scale at A3: 1:17,500

Client
Acorn Bioenergy Operations Limited

Project
Three Maids AD Permit Application

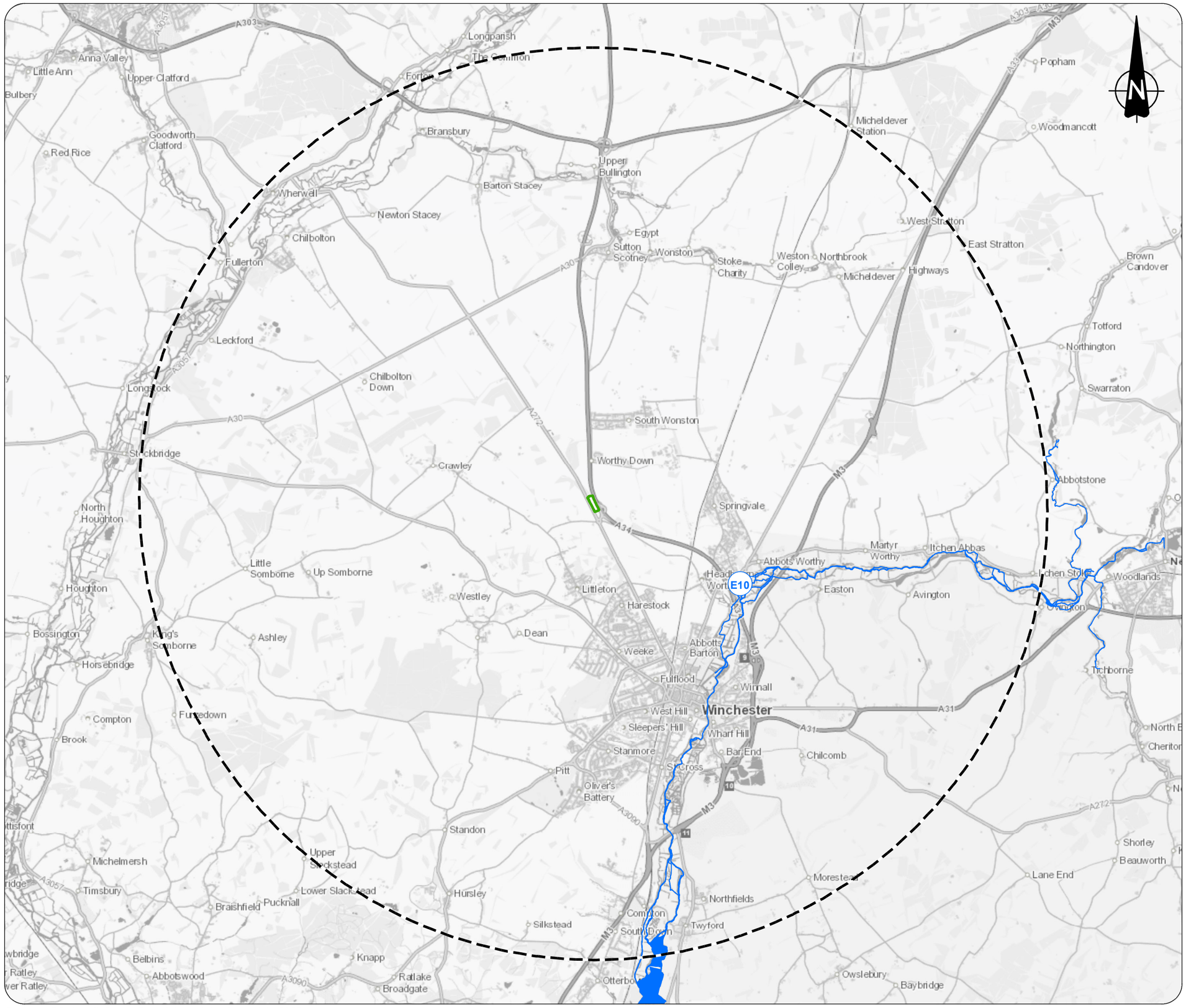
Title
Ecological Receptor Locations Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
Tel: 02392 290488
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2024	1:17,500	A3

Drawing Number	File Reference
ETL724/THRM/EcoReceptors2km/EPR03	ETL274.mxd



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	20/02 2024	First Issue	JJ	MF	MF

LEGEND

- Permit Boundary
- 10km Study Area
- Ecological Receptor - Statutory Sites
- River Itchen SAC

0 1,000 2,000 3,000 4,000 m

Scale at A3: 1:85,000

Client
Acorn Bioenergy Operations Limited

Project
Three Maids AD Permit Application

Title
Ecological Receptor Locations Plan

Earthcare TECHNICAL
Manor Farm
Chalton
Waterlooville
Hants PO8 0BG
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enquiries@earthcaretechnical.co.uk
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Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2024	1:85,000	A3

Drawing Number	File Reference
ETL724/THRM/EcoReceptors10km/EPR04	ETL274.mxd

Appendix A – Environmental Risk Assessment

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
1.1 Local human population.	Releases of NOx, SOx, NH_3, H_2S, CO and TVOCs, PM10 and PM2.5	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Medium	**Medium**	There is potential for exposure to anyone living close to the site and to members of the public at locations to which they could be regularly exposed. The nearest sensitive receptor is an Electric Vehicle Charging Station (EVCS) with associated restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary (planning granted but not constructed at the time of writing). Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are approximately 120 m form the site boundary. The next closest receptor is Three Maids Bungalow is located 250 m from the site boundary to the south west and 520 m from the CHP stacks. The CHP stack heights	Activities will be managed and operated in accordance with a written management system which will include: Planned preventative inspection and maintenance programme including engine management systems by third party contractor. The emissions abatement plant for the Manure reception building will be inspected and maintained in line with manufacturers recommendations and emissions monitoring will be carried out as per permit requirements. Emissions to air from the CHPs and emergency boiler stacks are monitored annually by a MCERTS contractor in accordance with the permit. All monitoring required by the permit will be reported as per the permit requirements. Leak detection and repair (LDAR) programme will be in place to	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							are 7m and have an effective stack height of >3m. The proposed site is not within an Air Quality Management Area for NOx. Air quality impacts from the operation on human receptors have been predicted through an AQIA which concluded the long-term and short-term impacts at all receptors can be screened out as not significant.[1] Straw is treated within a dedicated Straw treatment building. The moist prepared extruded straw lands in an external bunker and is the fed into the external feed hoppers throughout the day as its produced. Solid manures are stored within a dedicated Manure reception building fitted with air handling and emissions abatement.	mitigate and prevent fugitive emissions of biogas. Gas pressure is continuously monitored by SCADA system and process controlled to minimise emissions from pressure relief systems and use of the emergency flare. All pressure relief systems will be inspected and calibrated as per manufacturers recommendations. This will be included within the Daily Checks **(THR-MP-04)** and Maintenance Planner **(THR-MP-01**).	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
							There is a covered bunker to contain the digestate separators and the fibre digestate storage. Digestate liquor is stored within a storage bag which will significantly abate emissions to air. There are 3 No. vents in the storage bag to allow release of residual emissions. The tanker off-take point for digestate is fitted with a carbon filter.		
1.2 Local human population.	Release of microorganisms (bio-aerosols).	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Low	**Low**	The nearest sensitive receptor is an EVCS with associated restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary (planning granted but not constructed at the time of writing). Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are	Activities will be managed and operated in accordance with a written management system which will include: The emissions abatement plant for the Manure reception building is inspected and maintained in accordance with manufacturers recommendations and emissions monitoring is carried out as per permit requirements.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							approximately 120 m form the site boundary. The next closest receptor is Three Maids Bungalow is located 250 m from the site boundary to the south west. There is the potential for bioaerosol release when waste is received and during storage of digestate. Straw is stored and treated within a dedicated Straw treatment building. The prepared extruded straw lands in an external bunker and is the fed into the external feed hoppers throughout the day as its produced. Manures are stored and treated within an enclosed dedicated Manure reception building with air handling and emissions abatement. Digestate liquor is stored within a Digestate storage bag.	Silage is managed in accordance with the Feedstock Management & Loading Procedure **(THR-SOP-04)**. Process monitoring to ensure the production of a stable digestate with low residual biogas in accordance with the Process Monitoring Procedure **(THR-SOP-01)** Management systems to ensure that digestate fibre doesn't accumulate on site; Digestate Handling Procedure **(THR-SOP-05)**.	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							Digestate fibre is stored within a covered bunker and is removed continuously from site to destination field heaps. The tanker off-take point for digestate is fitted with a carbon filter. A Site Specific Bioaerosol Risk Assessment[11] (SSBRA) has been carried out and indicates that the residual risk from all sources was determined as low or very low. As such, it is concluded that no further control measures, other than those detailed in the assessment, are required in order to reduce the potential for impacts at sensitive locations in the vicinity of the site.		

[11] Bioaerosol Risk Assessment, Three Maids Anaerobic Digestion Plant, Reference: 7547r3, March 2024

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
1.3 Local human population	Odour	Nuisance, loss of amenity	Air transport then inhalation.	Medium	Medium	**Medium**	The nearest sensitive receptor is an EVCS with associated restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary (planning granted but not constructed at the time of writing). Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are approximately 120 m form the site boundary. The next closest receptor is Three Maids Bungalow is located 250 m from the site boundary to the south west. Local residents are often sensitive to odour. Odour can result from: • a wide range of waste, particularly when the site receives it. • the release of biogas	An Odour Management Plan **(THR-OD-05**) is in place. Crops are ensiled on site and remain covered with the open face of the clamp minimised in accordance with the Feedstock Management & Loading Procedure **(THR-SOP-04)**. The residence time of waste feedstocks will be minimised as far is possible, with older waste being fed prior to newer. Feedstock acceptance and loading is undertaken in accordance with the Feedstock Acceptance and Rejection Procedure **(ABL-SOP-06)** and Feedstock Management & Loading Procedure **(THR-SOP-04)**. The Manure reception building emissions abatement plant is inspected and maintained in accordance with manufacturers recommendations.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							• digestate Manures are stored and treated within an enclosed dedicated Manure reception building with air handling and emissions abatement. Digestate liquor is stored within a Digestate storage bag. Digestate fibre is stored within a covered bunker and is removed continuously from site to destination field heaps. The tanker off-take point for digestate is fitted with a carbon filter. The digesters and ancillary tanks are all covered and gas tight. The AQIA has shown that the maximum odour impact at a receptor location is below the relevant benchmark of 3.0ouE/m^3 for “moderately offensive” odours. Therefore, the site operation is unlikely to	Minimisation of biogas loss as per 1.1 above. Control of emissions from digestate storage as per 1.2 above. To reduce emissions to air and to improve the overall environmental performance (BAT 38), process monitoring will be undertaken and digestate samples will be analysed periodically to verify that process controls have been effective in producing stable digestates; Process Monitoring Procedure **(THR-SOP-01).**	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
							cause an odour impact at human receptors.[1]		
1.4 Local human population.	Noise and vibration.	Nuisance, loss of amenity, loss of sleep.	Noise through the air and vibration through the ground.	Medium	Medium	**Medium**	Local residents can be sensitive to noise and vibration. There is medium potential for exposure. The nearest sensitive receptor is an EVCS with associated restaurant, outdoor seating and play area on land directly adjacent to the southern site boundary (planning granted but not constructed at the time of writing). Whilst the proposed EVCS development is adjacent to the southern boundary of the site, the areas where people will be present i.e., the playground and the restaurant are approximately 120 m form the site boundary. The next closest receptor is Three Maids Bungalow is located 250 m from the site boundary to the south west.	Noise and vibration are minimised so as not cause nuisance. The maintenance of all critical plant and equipment (including fans, extraction equipment and condensate sumps) will be captured on the Maintenance Planner **(THR-MP-01)** and / or Daily Checks **(THR-MP-04)**, to ensure it is suitably maintained and reduce the likelihood of noise from improper upkeep. Emergency flare usage will be minimised with operating hours recorded on SCADA. A noise and vibration management plan will be produced in the event that noise complaints are attributed to the operation of the AD Plant.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
							Although the AD system will operate continuously, the normal operational hours for vehicle movements are 0700 to 1900, Monday to Sunday inclusive, thus avoiding night-time operations. The planning permission restricts deliveries or dispatch to between 0700 and 2000 hours on any day, except during peak harvest times (for approximately 4 weeks a year) deliveries of crops to the site can take place from 0700 to 2200 to allow crops to be imported as they are harvested.		
2.1 Local human population, livestock and wildlife after gaining unauthorised access to the installation.	Gaining unauthorised access to the installation.	There is a risk of direct physical contact with all on-site hazards such as wastes, machinery and vehicles.	Direct physical contact.	Low	Low	**Low**	Direct physical contact is minimised by the activity being carried out within enclosed tanks, pipework, and digesters, so a low magnitude risk is estimated.	Activities are managed and operated in accordance with a management system which includes site security measures (Section 3.7, EMS Manual **(THR-OD-01)** to prevent unauthorised access. The site will benefit from: • 2.4m high anti-climb mesh fencing installed around the core site.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
		There is a risk of causing injury to humans or livestock.						• Double leaf vehicle access gates and a pedestrian access gate. • CCTV installed and operational remote cameras. The site will be manned from 0700 to 1900 and the CCTV will be remotely monitored out of hours. • Any security breaches will be reported to Management. The site specific DSEAR risk assessment **(THR-OD-09)** will cover unauthorised access to site. Maintenance workers and contractors will only be permitted on site if suitably qualified for planned tasks and in accordance with Permit to Work requirements if applicable.	
3.1 Local human population	Arson and / or vandalism	Respiratory irritation, illness and	Air transport of smoke.	Low	Medium	**Medium**	Although biogas is flammable, risk of direct physical contact is	As above.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
and local environment.	causing the release of polluting materials to air (smoke or fumes), water or land.	nuisance to local population. Injury to staff, fire fighters or arsonists/ vandals. Pollution of water or land.	Spillages and contaminated firewater by direct run-off from site and via surface water drains and ditches.				reduced by activity being carried out within enclosed systems. The consequences of an incident may be serious, affecting both human health and the environment, through loss of containment. The tanks containing polluting substances either sit within the secondary containment system for the site or benefit from separate bunding and control.	An Accident Management Plan Manual **(THR-OD-06**) forms part of management system (includes fire, biogas release and spillages). The site specific DSEAR risk assessment **(THR-OD-09)** will identify all areas of risk. Fire control measures and procedures will be set out in the DSEAR plan and will be communicated to the local fire service. A HAZOP **(THR-OD-17)** will be produced, which will in part inform the schedule of planned maintenance which will be in place **(THR-MP-01)** Warning signs including ATEX zone signage will be clearly displayed, and operatives will be fully trained in gas alarm procedures. All visitors will be accompanied by trained staff.	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								LDAR programme will be in place to mitigate and to prevent fugitive emissions of biogas. Contingency measures will be considered in the event of loss of plant and are detailed in the Accident Management Plan Manual **(THR-OD-06).** This will include contingencies for waste diversion and digestate storage in the absence of critical plant.	
3.2 Local human population and local environment.	Accidental explosion of biogas risks causing fire and smoke to travel through the air.	Respiratory irritation, illness and nuisance to local population. Injury to staff, fire fighters or arsonists/ vandals. Pollution of water or land.	Air transport. Spillages and digestate direct run-off from site and via surface water drains and ditches.	Low	Medium	**Medium**	The risk of occurrence is reduced by effective management systems. However, biogas is flammable, and the consequences are likely to be serious, including risk to the safety and wellbeing of those working or in close proximity to the site and loss of containment may be detrimental to the environment.	Risks will be managed as per 2.1 and 3.1. The management system will include the risk management measures specified in the HAZOP **(THR-OD-17**) and DSEAR risk assessment **(THR-OD-09)** including planned maintenance schedules **(THR-MP-01)**. An Accident Management Plan Manual **(THR-OD-06**) forms part of management system (includes fire, biogas release and spillages).	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								A Training procedure **(ABL-SOP-04)** and Overarching Skills and Competency Matrix (**ABL-OD-02**) form part of the EMS and include training for emergency situations and incident preparedness, at prescribed training intervals. Details of the site's secondary containment, including tank bunding design is included within Section 6.2 of the EMS Manual **(THR-OD-01).**	
3.3 Local human population and local environment.	Accidental fire causing the release of polluting materials to air (smoke or fumes), water or land.	Respiratory irritation, illness and nuisance to local population. Injury to staff or fire fighters. Pollution of water or land.	As above.	Low	Medium	**Medium**	The risk is reduced by an effective management system.	This risk is managed in the same way as risks 2.1, 3.1 and 3.2. A Lightning Risk Assessment **(THR-OD-11)** will be undertaken to determine the requirement of any lightning conduction equipment. Equipment identified as necessary by the risk assessment will be installed. Activated carbon and other combustible materials will be stored safely and in accordance	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								with any manufacturers' recommendations.	
4. Risk of land bank contamination	Plastic in digestate and chemicals of concern contaminating the land bank Operators land spreading contaminated digestate.	Risk of long term impact on soil and crop quality.	Direct application to soils through land spreading, uptake of contaminants from crops.	Low	Low	**Low**	There is a risk of impact on soil and crop quality. However, slurry and manures should not contain plastic.	Feedstock materials are unlikely to contain plastics due to nature and origin. Feedstocks are to be visually inspected prior to use in accordance with the Feedstock Acceptance **(ABL-SOP-06)**. Visible plastics will be removed prior to processing and where not possible, the feedstock will be rejected. Digestate liquor and fibre will be routinely tested (Sampling & Analysis Procedure **(ABL-SOP-10)**) to ensure it is suitable for application to land and it is applied at an appropriate rate (Digestate Management Plan **(ABL-OD-07)**).	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								Quarterly waste returns will include the details of any recovered outputs.	
5.1 All surface waters close to and downstream of site.	Spillage of liquids, including oil and digestate.	Acute effects: fish kill. Water supply pollution	Direct run-off from site across ground surface, via surface water drains, ditches etc.	Medium	Medium	**Medium**	There is the potential for spillage from digestion tanks and digestate and other polluting substances such as oil from storage vessels on site. There is a gulley or surface water ditch to the A34 to the eastern boundary of the site. The Nun's Walk Stream surface water body Catchment area part of the wider Itchen Catchment falls to the south eastern area of the site with the stream itself some 2,830m south east. There is a sealed drainage system in place with clearly designated clean and 'dirty areas'. Run-off from areas designated as 'dirty' as well as condensate will be recirculated back through the AD process. Condensate sumps will be	Construction Quality Assurance validation will be undertaken on all anaerobic digestion tanks and ancillary tanks where appropriate and reports will be retained. During abnormal rainfall events, clean water from the containment bunds may need to be discharged to maintain capacity within the bund for a catastrophic tank failure. Any water would be subject to analysis prior to discharge and would need to meet BAT-associated emission levels (BAT-AELs) for direct discharges to a receiving water body. Procedures for discharging flood water are detailed in Discharge of Flood Water Procedure **(THR-SOP-18)**. All staff will be trained and conversant with the site's Accident	**Medium**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							checked daily **(THR-MP-04)**. There will be a documented drainage plan for the site. Manure is stored on concrete surfacing within the Manure reception building with sealed drainage back to the process. Run-off is restricted to clean surface water and under normal operating conditions, there will be no point source emissions. Digestate liquor is stored within a storage bag in a lined earth bund with 110% containment capacity. Oil storage tanks are to be provided with the CHP Engines and are bunded within the container. Secondary containment is designed in line with CIRIA 736 and industry standards.	Management Plan Manual **(THR-OD-06)** and associated procedures.	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
5.2 All surface waters close to and downstream of site.	As above	Chronic effects: deterioration of water quality.	As above. Indirect run-off via the soil layer.	Medium	Medium	**Medium**	As above	As above. All storage areas and containment are designed and constructed to the relevant industry standard (SSAFO for silage clamps & CIRIA 736 for primary and secondary containment). A validation report for all critical infrastructure (primary and secondary containment) will be provided prior to commencing operation to ensure all elements have been designed and built to the relevant standard. An inspection, maintenance and repair schedule of the facility's critical infrastructure, including the impermeable surfacing and drainage system will be implemented; Daily Checks **(THR-MP-04)** & Maintenance Planner **(THR-MP-01)**. The Digestate storage bag will be inspected daily and a freeboard of	**Medium**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								300mm maintained at all times **(THR-MP-04)**. The transfer of digestate will be supervised and undertaken in accordance with the Digestate Handling Procedure **(THR-SOP-05)**.	
6. Abstraction from watercourse downstream of facility (for agricultural or potable use).	As above	Acute effects, closure of abstraction intakes.	Direct run-off from site across ground surface, via surface water drains, ditches etc. then abstraction.	Medium	Medium	**Medium**	As above	This risk is managed in the same way as risks 5.1 and 5.2 above. Impermeable surfacing is in place to prevent potential pathways for any pollution; spills for example, to groundwater. Visual integrity checks of all primary containment will be undertaken daily in line with the site Daily Checks **(THR-MP-04**) and the digesters are subject to integrity testing every 5 years, which is captured on the Maintenance Planner **(THR-MP-01**). The 1 No. leak detection pot to HDPE layer (under concrete slab)	**Medium**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
								to be inspected every day in accordance with Daily Checks **(THR-MP-04).** The 5 No. leak detection pots for the digesters will be checked daily in accordance with Daily Checks **(THR-MP-04).**	
7. Groundwater	As above	Chronic effects: contamination of groundwater, requiring treatment of water or closure of borehole.	Transport through soil/groundwater then extraction at borehole.	Medium	Medium	**Medium**	As above The site is not located within a Groundwater Source Protection Zone, or within 50 metres of any well, spring or borehole used for the supply of water for human consumption. The inlet to the surface water storage and infiltration system can be isolated with the use of a penstock stopping any further releases to the crate system.	Risk management is as set out in 5.1, 5.2 and 6.1. The 1 No. leak detection chamber serving the concrete slab will be checked daily. This is to assess if there are any spillages arising from the concrete slab and concrete tank bases onto the HDPE liner below. Process parameters, such as volumes within tanks and digestate stores will be monitored daily by site operatives and recorded on the site's Daily Check list **(THR-MP-04**). There are no underground pipes except drainage pipes which will	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
								be made of suitable material e.g., Poly Vinyl Chloride (PVCu) and sealed, and pressure tested (water & air) prior to completion. All drainage within the containment system will be located above the 1.0mm HDPE membrane, with pipes, channels & chambers to have minimum 175mm concrete surround. There is an HDPE layer under the concrete slab with leak detection to provide further reassurance as to containment integrity. The inspection of this leak detection system via 1 No. leak detection pots on a daily basis will identify any leaks arising from the concrete slab. The sub-surface tanks, namely the Silage leachate tank and the Digesters (slightly submerged) benefit from leak detection. Leak detection pots will be inspected daily in accordance with Daily Checks **(THR-MP-04).**	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
8. Risk of diffuse emissions from polluting and greenhouse gases such as methane and ammonia	Fugitive releases of volatile organic compounds such as methane from storage of gas bags, lagoons, tanks, vents and pipe work.	Acute effects and long-term effects on air quality, longer term effects of volatile organic compound releases and adding to global climate change	Airborne fugitive emissions from site	Medium	Medium	**Medium**	Biogas contains high levels of methane and carbon dioxide. Digestate and digestate storage may release ammonia which can impact air quality. Burning biogas and biomethane can produce harmful pollutants. Manures are stored and treated within an enclosed dedicated Manure reception building with air handling and emissions abatement. Digestate liquor is stored within a Digestate storage bag. Digestate fibre is stored within a covered bunker and is removed continuously from site to destination field heaps. The tanker off-take point for digestate is fitted with a carbon filter.	There will be controls in place to mitigate the risk of diffuse emissions from the site which include: The Manure reception building emissions abatement plant is inspected and maintained in accordance with manufacturers recommendations. Venting to air from digester tanks will be minimised by the correct fitting and configuration of PVRVs including Daily Checks **(THR-MP-04)**. Process monitoring of the AD plant will minimise excess biogas production and the likelihood of an overpressure event – Process Monitoring Procedure **(THR-SOP-01)**. The emergency flare has a set point lower than that of the PVRVs minimising emissions of unburnt biogas. The operation of the	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
							The digesters and ancillary tanks are all covered and gas tight.	PVRVs will be recorded as an abnormal event. Gas pressures will be continually measured and monitored within SCADA. LDAR programme will be actioned to mitigate and prevent fugitive emissions. Gas holders will be maintained as per manufacturer's recommendations and will be included on the Maintenance Planner **(THR-MP-01**).	
9. Protected Sites, including National Parks and Areas of Outstanding Natural Beauty,	Any, but principally NOx and NH_3.	Harm to protected sites: - contamination -nutrient enrichment -leachate - surface water run-off	Any	Low	Low	**Low**	Anaerobic digestion operations may cause harm to and deterioration of nature conservation sites. The site is located; >500m from any European site (defined within Regulation 8 of the Conservation of Habitats and Species Regulations 2017)	Control measures as detailed under 1.1, 3.1, 3.2, 3.3, 5.1, 5.2, 6 and 8 above. The Manure reception building emissions abatement plant is inspected and maintained in accordance with manufacturers recommendations. An ammonia reduction plan will be implemented where necessary.	**Low**

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	**What is the agent or process with potential to cause harm?**	**What are the harmful consequences if things go wrong?**	**How might the receptor come into contact with the source?**	**How likely is this contact?**	**How severe will the consequences be if this occurs?**	**What is the overall magnitude of the risk?**	**On what did I base my judgement?**	**How can I best manage the risk to reduce the magnitude?**	**What is the magnitude of the risk after management?**
Marine Conservation Zones, Sites of Special Scientific Interest, Special Areas of Conservation , Special Protection Areas & Ramsar wetland sites		-smothering -disturbance -predation from pests and vermin					or a Site of Special Scientific Interest; > 250 metres of the presence of great crested newts, and >50 metres of a Local Nature Reserve, Local Wildlife Site, Ancient Woodland, Scheduled Monument. There are several areas of Priority Habitat Inventory Deciduous Woodland within close proximity (<50m) to the site. There will be no composting of digestate fibre on site. Emission limits for stack gases are specified within the permit. Manure is handled in a dedicated building with air handling and emissions abatement including ammonia abatement.	A fugitive emission plan will be implemented where necessary.	

Receptor	Source	Harm	Pathway	Probability of exposure	Consequence	Magnitude of risk	Justification for magnitude	Risk management	Residual risk
What is at risk? What do I wish to protect?	What is the agent or process with potential to cause harm?	What are the harmful consequences if things go wrong?	How might the receptor come into contact with the source?	How likely is this contact?	How severe will the consequences be if this occurs?	What is the overall magnitude of the risk?	On what did I base my judgement?	How can I best manage the risk to reduce the magnitude?	What is the magnitude of the risk after management?
							All tanks are covered and the digestate liquor is stored in a storage bag. There is a carbon filter on vent for displaced air during off-take of digestate liquor. Digestate fibre is stored in a covered bunker and moved off-site to destination field heaps continuously. Air quality impacts from the operation on ecological receptors have been predicted through an AQIA which concluded that he long-term and short-term impacts at all receptors can be screened out as not significant.		

Magnitude of Risk	Consequence		
Probability of Exposure	**Low**	**Medium**	**High**
Low	**Very Low**	**Low**	**Medium**
Medium	**Low**	**Medium**	**Medium**
High	**Medium**	**Medium**	**High**

Appendix B – Net Rated Thermal Input Calculations

The thermal input of the **CHPs** and the **emergency generator** have been calculated in accordance with Annex B of the AMPS Technical Committee document – Determination of the thermal input power of an engine driven generator.[12]

$P_{th} = P_{(r)} * 100/n_e$

Where:

P_{th} = thermal input power

$P_{(r)}$ = rated power (mechanical or electrical, whichever is available)

n_e = effective efficiency (relevant for mechanical or electrical power)

The thermal input of the **emergency boiler** has been determined utilising the Combustion Engineering Association guidance on 'Determination of The Thermal Input Rating of a Steam or Hot Water Boiler'[13]

Combustion plant / Generator	Rated power (electrical) kWe	Effective efficiency (electrical) (%)	Thermal input power kWthi
CHP1 (biogas)	1,200	42.4 (at full load)	2,830
CHP2 (natural gas)	1,200	42.0 (at full load)	2,857
Emergency boiler	550	Not applicable	647*
Emergency generator	616	33**	1,867
Aggregated thermal input			7,554

* @ 85% efficiency

** Used suggested efficiency (based on electrical power) from AMPS guidance for a <1 MW compression ignition generator using liquid fuel.

[12] Determination of thermal input power of an engine driven generator, Association of Manufacturers of Power generating Systems (AMPS) Technical Committee, 2016

[13] https://cea.org.uk/boiler-calculations-for-mcpd/

Appendix C – Nature and Heritage Conservation Screening Reports

Nature and Heritage Conservation

Screening Report: SR2021 No 6

Reference	**EPR/FP3945QH/A001**
NGR	**SU 46080 33961**
Buffer (m)	**280**
Date report produced	**25 July 2022**
Number of maps enclosed	**1**

The nature conservation sites and/or protected species and habitats identified in the table below must be considered in your application.

As you have not met the criteria for a standard rules permit, you will need to contact us for further advice on the type of permit you should apply for. Please submit a request through this link: https://www.gov.uk/government/publications/environmental-permit-pre-application-advice-form

Protected Habitats	Screening distance (m)	Further Information
Deciduous woodland	within 50	Natural England

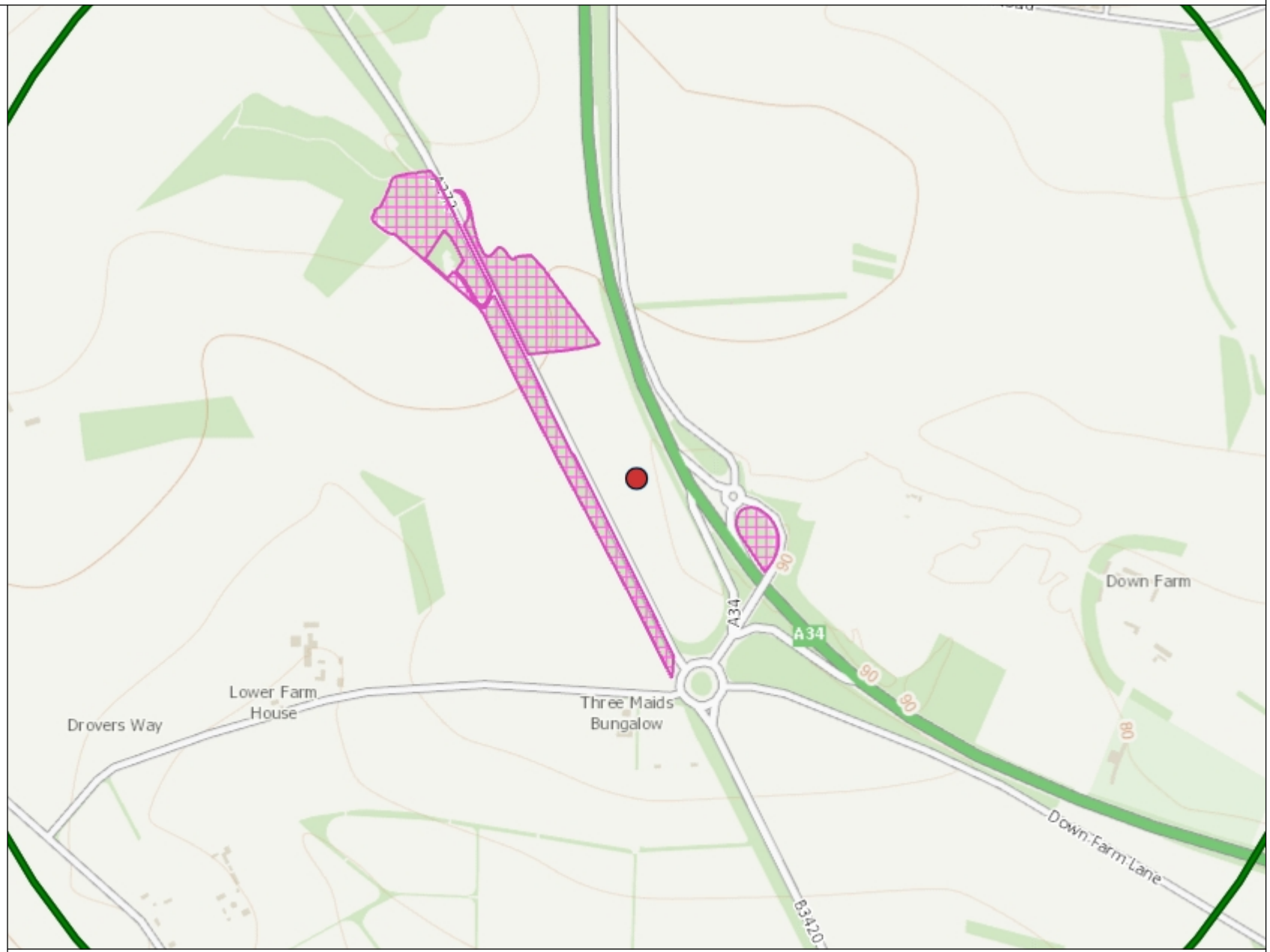
Please note the nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information.

Protected Habitats

Environment Agency

Legend

Protected Habitats screened for Env Permits



1: 10,000

0 250

Metres

N
W E
S

Nature and Heritage Conservation

Screening Report: Bespoke installation

Reference	**EPR/BP3326SD/P001**
NGR	**SU 46094 33959**
Buffer (m)	**205**
Date report produced	**06/02/2024**
Number of maps enclosed	**1**

This nature and heritage conservation report

The nature and heritage conservation sites, protected species and habitats, and other features identified in the table below **must be considered in your application**.

In the further information column, there are links which give more information about the site or feature type and indicate where you are able to self-serve to get the most accurate site boundaries or feature locations.

Most designated site boundaries are available on Magic map. Using Magic map allows you to zoom in and see the site boundary or feature location in detail, Magic map also allows you to measure the distance from these sites and features to your proposed boundary. Help videos are available on Magic map to guide you through.

Where information is not publicly available, or is only available to those with GIS access, we have provided a map at the end of this report.

Sites and Features within screening distance	Screening distance (km)	Further Information
Special Areas of Conservation (cSAC or SAC)	5	Joint Nature Conservation Committee and Magic map
River Itchen		
Local Wildlife Sites (LWS) (see map below)	2	Appropriate Wildlife Trust
Worthy Copse		

Worthy Grove		
Worthy Camp Grassland		
The Gallops, Worthy Down		
Flowerdown, Littleton		
Northwood Park Woods		
Worthy Down Railway Halt		
Ancient Woodland	2	Woodland Trust Forestry Commission Natural England and Magic map
WORTHY COPSE		
SOUTH WORTHY GROVE		
LONG WOOD		

Where protected species are present, a licence may be required from Natural England to handle the species or undertake the proposed works.

The relevant Local Records Centre must be contacted for information on the features within local wildlife sites. A small administration charge may also be incurred for this service.

The following nature and heritage conservation sites, protected species and habitats, and other features have been checked for, where they are relevant for the permit type requested, but have not been found within screening distance of your site unless included in the list above.

Special Areas of Conservation (cSAC or SAC), Special Protection Area (pSPA or SPA), Marine Conservation Zone (MCZ), Ramsar, Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR), Local Wildlife Sites (LWS), Ancient Woodland, relevant species and habitats.

Please note we have screened this application for features for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

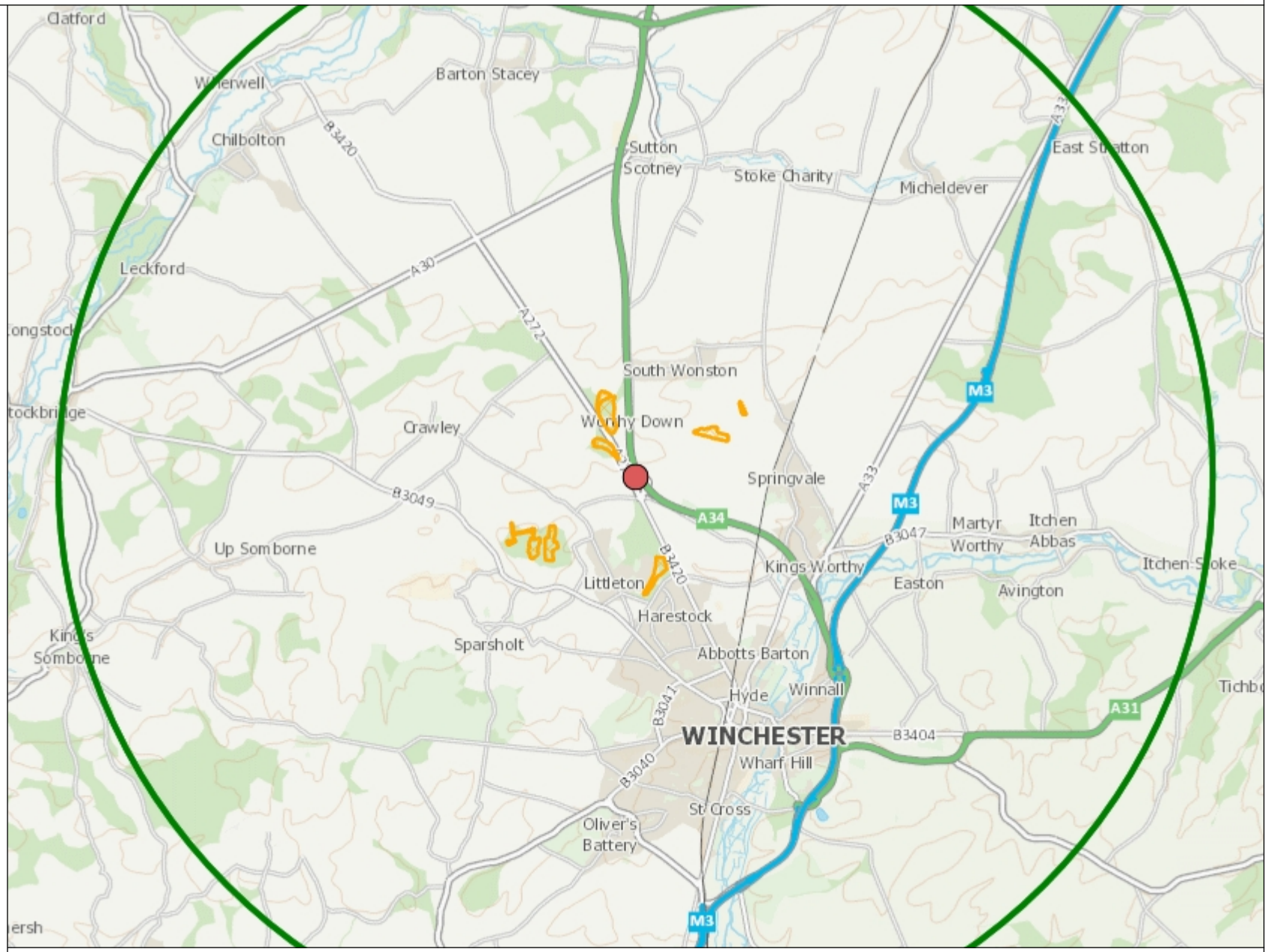
The nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information

LWS

Environment Agency

Legend

Local Wildlife Sites



1: 100,000

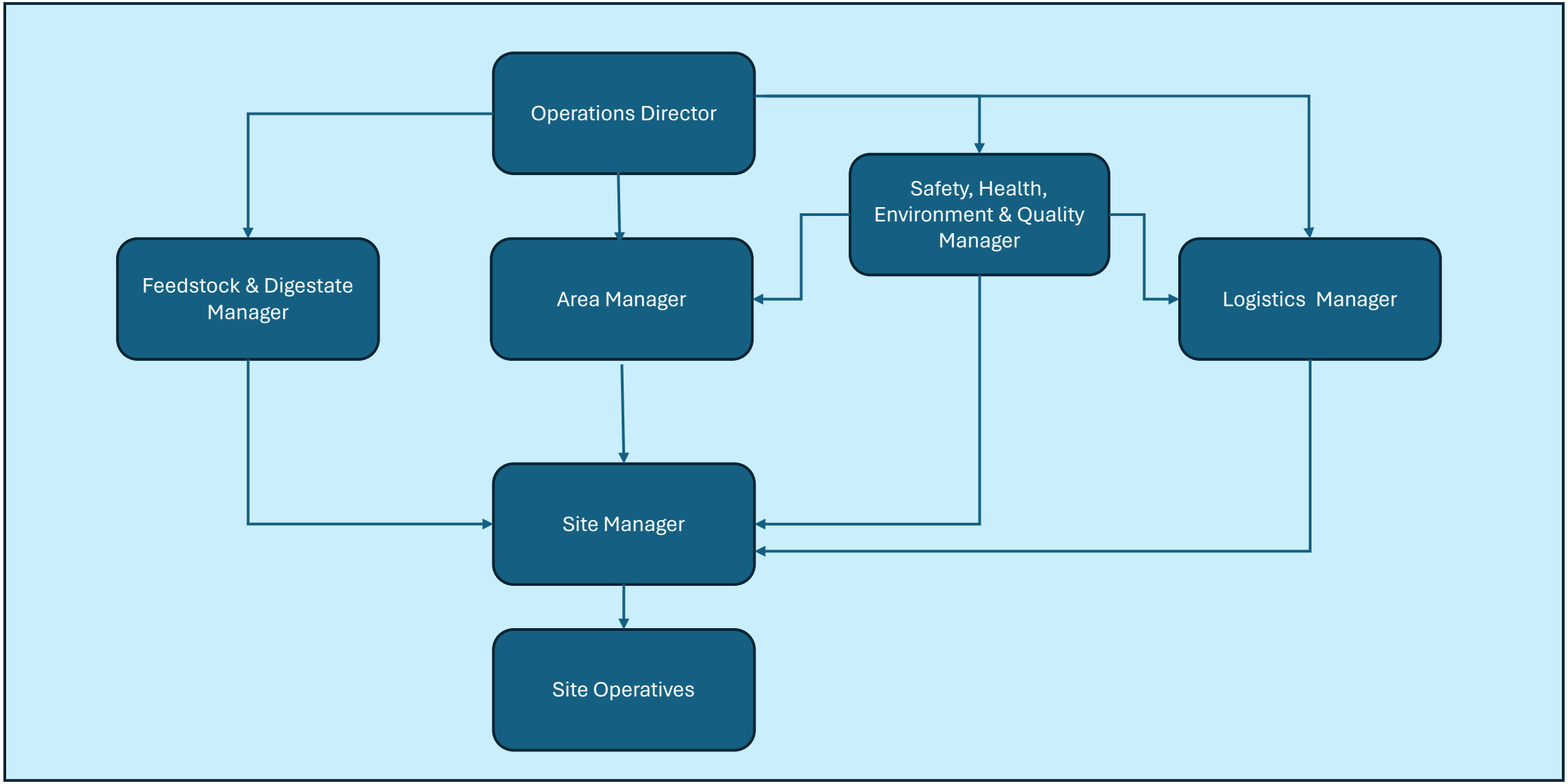
0 2,500

Metres

N W E S

Appendix D – Staff Organogram

THR-OD-10 Three Maids AD, Staff Organogram V1.0, March 2024



Appendix E - Process Flow Diagram

STRAW TREATMENT BUILDING

BALES OF STRAW

INPUT SOLIDS

Belt conveyor | String remover | Bale breaker | Screw conveyor | Straw mill | Humidification screw conveyor 1 | Humidification screw conveyor 2 | Belt conveyor | Storage area for humidified straw | Feedhopper | Metal detection belts | Extruders | Storage area for extruded straw

EXHAUST AIR

EMERGENCY FLARE

CONDENSATE SHAFT

BIOGAS UPGRADING UNIT

BIOMETHANE

BIOGAS CONDITIONING

CHP 1

CHP 2

BY CLIENT

THERMAL POWER

ELECTRICAL POWER

CONDENSATE PIT

S 01

S 02

S 03

FEED HOPPER 1

PRIMARY DIGESTER 1
5,800 m³

SECONDARY DIGESTER 1
6,430 m³

GAS HOLDER

BUFFER TANK WATER 2
400 m³

BUFFER TANK WATER 1
400 m³

SILAGE CLAMPS

FEED HOPPER 2

PRIMARY DIGESTER 2
5,800 m³

SECONDARY DIGESTER 2
6,430 m³

POST DIGESTER
6,430 m³

HOT WATER FLOW

HOT WATER RETURN

HEAT EXCHANGERS

TO WASTE AIR TREATMENT

SANITATION

INPUT LIQUIDS

MANURE TANK
400 m³

PW BUFFER TANK
100 m³

INPUT SOLIDS

CHICKEN MUCK + FARM YARD MANURE

SUSPENSION BUFFER TANK
400 m³

SEPARATOR 1

SEPARATOR 2

SOLID DIGESTATE

LEACHATE TANK

LAGOON

LIQUID DIGESTATE

CONFIDENTIAL

PRELIMINARY

REV.	DATE	REVISION DETAILS	DRAWN	CH'K	APP'D
A	-	-	-	-	-

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PROJECT	Three Maids
ORDER NO.	A2878UK
TITLE	Process Flow Diagram
DATE	09.01.2024
DRAWN	SKa
CH'K	-
APP'D	-
DRAWING NO.	-
REVISION	-
VERSION	01
SHEET	A1
SCALE	-
PAGE	-
DOCUMENT NO.	-
DWG NO.	A2878UK Three Maids_PFD.dwg

Appendix F - Drainage Process Flow Diagram

THR-OD-04 Three Maids AD, Drainage Process Flow Diagram V1.0, March 2024