Acorn Bioenergy Operations Ltd Environmental Management System Manual (EMS) Horse Close AD Plant

V1.0 Issue 1 – June 2025

Version Control

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V1.0 Issue 0	19/02/2025	First issue	Earthcare Technical Ltd	Nick McAllister
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Document owner

Acorn Bioenergy Operations Limited

Management approval

Nick McAllister (Acorn Bioenergy Operations Limited)

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
GSM	Grams per square metre
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
OCU	Odour Control Unit
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	Ultraviolet light
VOC	Volatile Organic Compound

1 Scope of the EMS

This Environmental Management System (EMS) Manual is written to cover the scope of operations for Horse Close AD Plant, Courteenhall, Northamptonshire, NN7 2QF (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/ RP3426SN/P001). 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 **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)** 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 forms part of the company wide Acorn Integrated Management System (AIMS) (**ABL-QUAL-SHEQ-MAN-P1**).

3 Organisation & Site Profile

3.1 Site Description

The facility will treat around 94,900 tonnes per annum (TPA) of liquid and solid feedstocks comprising livestock waste (poultry litter, farmyard manures and slurry), energy crops and crop residues; and as well as dirty water several non-hazardous liquid wastes to supplement process water use. The 6.2ha of site area was previously arable land and is adjacent to a poultry unit, the manures from which will be treated within the AD Plant.

The site will produce 20,286,323 Nm^3/y of biogas which will be used on site to generate heat and power and upgraded to biomethane for injection to the National Gas Grid via virtual pipeline and carbon dioxide captured for use or sequestration. In addition, around 26,182 TPA of solid fibre digestate and 67,454 TPA of liquid digestate will be produced to be used as a biofertiliser on local farms.

3.2 Planning

Planning permission for the site was approved by West Northamptonshire Council on the 18 January 2024 (ref: WNS/2022/2402/EIA). The site has a continuous history of being open agricultural fields. The surrounding area has remained agricultural with generally only minor changes except for construction of the M1 motorway 200m east in the 1950s-1960s and a newly constructed poultry farm on the adjacent property around 2019.

3.3 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.6 permit: Anaerobic digestion facility, including use of the resultant biogas – installations*[1] as:

- The location criteria under permit condition 2.2.4 cannot be met, namely there are areas of Priority Habitat Inventory (PHI) deciduous woodland adjacent to the southwest corner of the AD site area and west of the Lagoons and a further PHI woodland area around 34m to the northwest of the site boundary.

- Under Activity 3 of SR2021 No.6 (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.

- It is proposed that the Combined Heat and Power Engines (CHPs) are fitted with heat exchangers which reduce the exit temperature of the exhaust gas. The Standard Rules Installation permits stipulate that the "*(ii) the gas exit temperature shall be no less than*

[1] https://www.gov.uk/government/publications/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations/sr2021-no-6-anaerobic-digestion-facility-including-use-of-the-resultant-biogas-installations

200°C". The heat exchangers may introduce a non-compliance to the Standard Rules permit.

- Carbon dioxide (CO_2) capture from biogas, it's recovery, treatment and storage are not currently included in the SR2021 No.6 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)[2]; 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 application in December 2022 (Reference: EPR/ KP3440QR/A001). To ensure that all relevant nature and conservation sites have been considered a second basic pre-application request was made in March 2024 (Reference EPR/ RP3426SN/P001). The Nature and Heritage Conservation Screening Reports are included as Appendix C.

3.4 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.

[2] Earthcare Technical Ltd (June 2025) Horse Close AD Plant Air Quality Impact Assessment (Doc ref: ETL747_HRCL_AQIA_V1.1)

3.5 Site Description

Site address:	Horse Close AD Plant, Courteenhall, Northamptonshire, NN7 2QF
National Grid Reference (NGR):	SP 77438 52588
Local Authority:	West Northamptonshire Council

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

The site permitted area is 6.2 hectares (15.3 acres) in extent. The site is located on the Courteenhall Estate which is an arable operation producing cereals, oilseeds, and pulses. The proposed site sits within the South Northamptonshire area of West Northamptonshire Council. The large town of Northampton lies 3.3km north of the proposed site and the City of Milton Keynes 12.5km to the south. Both Northampton and Milton Keynes are easily accessible from the M1 motorway which runs from the northwest to southeast. The M1 is approximately 190m, as the crow flies, from the proposed site with access at J15 around 3km north of the site.

The proposed site will be accessible to vehicles from the southwest corner of the site boundary from a network of local roads.

The proposed site is an agricultural field which has been in arable production for at least 10 years and was under a Countryside Stewardship Agreement. An online pond which forms part of the River Nene basin is situated approximately 30m from the northern edge of the site boundary.

3.6 Infrastructure

The site infrastructure is listed in Table 1.

Table 1 list of site infrastructure

Item.	Working capacity
3 No. Silage clamps	Clamp 1: 11,760 m^3
	Clamp 2: 17,000 m^3
	Clamp 3: 19,900 m^3
	Total: 48,660 m^3
1 No. Silage effluent Tank	54 m^3
1 No. Manure reception building	
Centriair abatement plant to manure building	
1 No. Straw processing building	
1 No. Straw set down bay	
2 No. Silage feed hoppers	120 m^3 each
2 No. Pre-treatment Hammer Mills	75 kW each
1 No. Solid Manure Feed System	65 m^3

1 No. Straw Feed System	65 m^3
1 No. Liquid Feedstock Tank	402 m^3
2 No. Water Tanks (Dirty)	402 m^3
Primary Digester-I	9000 m^3
Secondary Digester-I	4512 m^3
Primary Digester-II	9000 m^3
Secondary Digester-II	4512 m^3
Tertiary Digester	7444 m^3
1 No. Gas Dome above tertiary digester	3,800 m^3
2 No. Desulphurisation plant with oxygen injection	
Supervisory Control and Data Acquisition (SCADA) System	
3 No. Pasteurisation Tanks	25 m^3 each
1 No. Hygienized Digestate Tank	80m^3
1 No. Digestate separation fully enclosed bunker	
2 No. Borger RC75	Up to 75m^3/hr
1 No. Digestate Buffer Tank	402 m^3
1 No. Fire Water Tank	250 m^3
1 No. Digestate Lagoon (750mm freeboard)	12,350 m^3
2 No. Digestate offtake points	5.1m^3 (sump for secondary off-take point located outside of bund)
1 No. Clean Water lagoon (300m freeboard)	511.57 m^3
1 No. Dirty Water Lagoon (750mm freeboard)	510 m^3
2 No. Gas Valve/ Condensate Chambers (Condensate sump 1 & 2)	
Gas Booster and carbon filter	
2 No. Quanto Dual fuel CHPs with heat exchangers	2 No. 1200 kW each
1 No. Emergency boiler	560 kW
1 No. Emergency Flare	50-2,600 Nm^3/hr
1 No. Emergency Generator (Back up)	616 kW (770 KVA)
Biogas upgrade unit (BUU)	Capacity: 2,200 Nm^3/hr
Chiller(s) on BUU	
Biogas booster skid	
Compressors	
3 No. CO_2 recovery unit and CO_2 tanks	CO_2 tanks: 50 m^3
4 No. Biomethane (CNG) trailer bays /CO_2 off-take bays	
Secondary containment bund	
Parking area	

Access road	
Pump containers	
Site boundary fence	
2 No. Weighbridges	
Site office, Welfare (including Wastewater package treatment plant (Klargester)) and Workshop	
Technical Building, including site laboratory (within containment bund)	
Clean water break tank	10 m^3
2 No. Clean water tanks	30 m^3 each
Additional booster pumps	

3.7 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 of agricultural by-products to the site to between 0800- and 1800-hours Monday – Friday and 0800 to 1300 Saturday. The export of digestate is restricted to take place between the hours of 0800- and 1800-hours Monday – Friday and 0800 to 1300 Saturday and Sunday.

In addition to the above hours, during periods of specific agronomic crop benefit in March, May and July the export of digestate can take place between 0800- and 1800-hours Monday – Sunday.

3.8 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 covered Digestate storage lagoon, Clean Water Lagoon and Dirty Water Lagoon.
- Double leaf vehicle access gates and a pedestrian access gate.
- CCTV installed and operational remote cameras. The site will be manned from 07:00 to 19:00 and the CCTV will be remotely monitored out of hours.
- Main gate will be locked when the Site is not manned.

4 Environmental Sensitivities

4.1 Comparison against SR2021 No.6 Location Criteria

As detailed in Section 3.2, the operation cannot meet the location criteria for a SR2021 No.6 installation environmental permit due to the proximity of PHI habitats and due to activities on site. Table 2 below shows an assessment of the site location against the SR2021 No.6 location criteria.

Environmental sensitivities have been assessed through a Groundsure Enviro + Geo Insight Report[3] obtained 11 March 2024 and verified via publicly available data sources accessed 04 February 2025.

Table 2 Assessment against Standard Rules SR2021 No.6 Installation location criteria

SR2021 No. 6 location criteria	Assessment for Horse Close 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 Courteenhall East Lodge (residential properties) located 270m north of the proposed site boundary and associated commercial premises approximately 211m northwest. The combustion stacks will be least 7m high.
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
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

[3] Groundsure Enviro+Geo Insight Report, obtained 11 March 2024

SR2021 No. 6 location criteria	Assessment for Horse Close AD
50 metres of a Local Nature Reserve, Local Wildlife Site, Ancient Woodland, or Scheduled Monument.	Compliant based on Heritage Conservation screening report received from the Environment Agency (EA) 15 March 2024. However, Northamptonshire Biodiversity Records Centre note the presence of a ***Potential*** Wildlife Site (PWS), adjacent to the NW site corner which has been considered within the permit application.
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 - New PHI Deciduous woodland designated adjacent to the permit boundary confirmed via information on Magic Maps.[3]
A specified Air Quality Management Area	Compliant

4.2 Geology

Site soils are classified as lime-rich loamy and clayey soils with slightly impeded drainage[4] over superficial geology of Oadby Member, Diamicton of Low to moderate permeability. Underlying bedrock geology is Blisworth Limestone Formation of Bathonian age. Bedrock permeability is very high[5].

The site has an Agricultural Land Classification of Grade 3[6]. Good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield.

4.3 Hydrogeology

The Site is over a Principal Aquifer, but risk is mitigated due to significant thickness of low permeable superficial deposits overlying the bedrock and is therefore designated as a secondary superficial aquifer of Medium Vulnerability. The site is over Productive Bedrock Aquifer and Productive Superficial Aquifer.
The closest Abstraction is a groundwater abstraction for general farming and domestic use at Qinton Green (Licence No. 5/32/04/*G/0013). This is located 1067m north east of the site.

There is a historical surface water abstraction at Lower Farm 1867m north of the site which is not actively used.

There are two investigative borehole records on the farm itself. Additional borehole records relate to widening works to the M1 road junction nearby.

[4] Soilscape Viewer https://www.landis.org.uk/soilscapes, accessed 04 February 2025
[5] British Geological Viewer, https://geologyviewer.bgs.ac.uk/ accessed 04 February 2025
[6] https://magic.defra.gov.uk/MagicMap.aspx, accessed 04 February 2025

4.4 Groundwater

There is low to moderate risk to groundwater given that the deep low permeability superficial deposits are above the underlying limestone bedrock aquifer.

The site overlies the Northampton Sands Groundwater body but is not within a Groundwater Source Protection Zone or Drinking Water Safeguard Zone (Groundwater) (England).
The site is within the River Nene Nitrate Vulnerable Zone (NVZ), designated for surface water sensitivity and the Thrapston lake Eutrophic NVZ.

4.5 Surface Water

The site is within the Nene Catchment and there is a watercourse 28m northwest of the site boundary which feeds into a small inline pond (approximately 50m^2 in area) and then into a tributary of the Wootton Brook (2.9km north of the site), which was classified as having a 'Poor' overall rating in terms of water quality under the Water Framework Directive. The site is within a Drinking Water Safeguard Zone for Surface Water (Anglian_SWSGZ1006,1007,1008,1009,1010_River Nene).

There is a new pond, a biodiversity enhancement feature, to be built and landscaped to the northeastern corner of the site.

4.6 Flood Risk

The proposed site is situated within a Flood Risk Zone 1, which means it has low probability of flooding from rivers and the sea. [7] There is a negligible risk of flooding on site from surface or groundwaters.

4.7 Human Receptors

Human receptors within 1 km of the site are shown in Figure 4 below and detailed within Table 3. An Odour Impact Assessment would include receptors at a greater distance than 1 km however, the following is to illustrate receptors within the immediate vicinity of the site.

[7] https://flood-map-for-planning.service.gov.uk accessed 9th December 2024

Table 3 Human receptors within 1km of the site permit boundary

ID	Receptor Name	Type of receptor	NGR X	NGR Y	Distance from site boundary (m)	Direction from site
R1	Courteenhall East Lodge	Residential and commercial units including building supplies and physiotherapists	477260	252901	211	N
R2	Quinton Green	Residential and commercial units including children's day care	478151	253020	634	NE
R3	Courteenhall, West Northamptonshire, England, NN7 2QE, United Kingdom	Residential	476718	253031	645	NW
R4	Bluebell Rise, Grange Park, West Northamptonshire, England, NN4 5DF, United Kingdom	Residential	476832	254278	1643	NW
R5	Village Spinney	Residential	476679	252985	660	NW
R6	St Peter and St Pauls Church	Place of worship	476460	252929	836	NW
R7	Quinton, West Northamptonshire, England, NN7 2EG, United Kingdom	Residential	478276	253263	857	NE
R8	Courteenhall Farm	Residential, public house and gardens, commercial units	476103	252952	1190	WNW
R9	Quinton, West Northamptonshire, England, NN7 2EA, United Kingdom	Residential	477839	253970	1239	NNE

ID	Receptor Name	Type of receptor	NGR X	NGR Y	Distance from site boundary (m)	Direction from site
R10	Quinton, West Northamptonshire, England, NN7 2EG, United Kingdom	Residential	478394	253701	1248	NE
R11	Quinton, West Northamptonshire, England, NN7 2EG, United Kingdom	Residential	478849	252302	1268	SE
R12	14, Fox Covert Drive, Roade, West Northamptonshire, England, NN7 2LL, United Kingdom	Residential	476603	251440	1268	SW
R13	M1, Quinton, West Northamptonshire, England, NN7 2HD, United Kingdom	Residential	478350	251531	1280	SE
R14	Ashton, Roade, West Northamptonshire, England, NN7 2JT, United Kingdom	Commercial	477038	251137	1336	SSW
R15	Manor Close, Roade, West Northamptonshire, England, NN7 2PE, United Kingdom	Residential	476080	251805	1451	SW
R16	Northampton Road, Roade, West Northamptonshire, England, NN7 2PF, United Kingdom	Residential	475612	252158	1702	WSW

Note: There is a permitted poultry Installation located 10 m to the northeast of the Site boundary. Following a review of Site personnel attendance hours, the poultry unit has been dismissed as a potential sensitive receptor; employees are typically present on Site for short periods (<6 hours at a time) with the exception of approximately 2 days out of every 7 weeks when the units are cleaned out.

4.8 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 C.

4.8.1 Statutory Designated Sites

There are no statutory designated sites within 2 km of the proposed permitted boundary. SSSI Sites within 5km are:

- Roade Cutting SSSI 2.04km west which can be excluded as an ecological receptor as it is designated for geological features only; and
- Salcey Forest SSSI 2.95km south west, (which is also classified as an Ancient Woodland and contains areas of Local Wildlife site).

The Upper Nene Valley Gravel Pits SSSI, Special Protection Area (SPA) and Ramsar is 6.9km northeast of the site.

4.8.2 Priority Habitats & Species

There is an area designated as Priority Habitat (PHI) deciduous woodland adjacent to the southwest corner of the AD site area and west of the lagoon and a further PHI woodland area around 34m to the northwest of the site boundary. There are no Local or National Nature Reserves within 5km of the site.

There are two records of Ancient Woodland within 2km of the site, both are components of the Salcey Forest and Rowley Wood, the closest of which are:

- Stoneway Copse 1.32km east of the site, part of Salcey Forest.
- Rowley Wood 1.64km south east of the site

The following Local Wildlife Sites are present within 2km of the site:

- Roade Disused Railway East 0.48km south
- Salcey Forest the closest area being 1.32km east, Stoneway Copse
- Rowley Wood 1.64km south east
- Preston Wood 2.0km north east

Northamptonshire Biodiversity Records Centre note the presence of a Potential Wildlife Site (PWS), adjacent to the NW site corner which has not been considered as such as this is unverified but has been considered as designated PHI Habitat.

The nearest area identified for the presence of Great Crested Newts (GCN) is situated in Roade 1.7km south west of the proposed site. A recent survey of the ponds within 500m of the site carried out by SLR consulting found no evidence of GCNs.

4.9 Scheduled Monuments

There are no Scheduled Monuments within 1km of the Site boundary.

4.10 Air Quality Management Areas

The site is not within an Air Quality Management Area (AQMA). The nearest AQMA is 2.8km northwest of the site starting at Junction 15 of the M1 motorway running northwest away from the proposed site.[8]

[8] https://uk-air.defra.gov.uk/aqma/maps/ accessed 6th December 2024

5 Process Description

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.

5.1 Feedstocks

Table 4 below provides an overview of the projected feedstocks for the AD plant. The proposed feedstocks include a number of non-hazardous liquid wastes which may be used to replace liquid process water. These waste streams are not part of the current mass balance and as such are not shown in Table 3 below.

Table 4 Feedstock description, source, form, storage location and approximate annual throughput

Feedstock description	Source(s) of feedstock	Waste code	Form	Storage location	Approximate tonnes treated per year
Maize silage	Grown on farm	Not applicable	Solid	Silage clamp	24,000
Wholecrop silage	Grown on farm	Not applicable	Solid	Silage clamp	23,600
Straw	Grown on farm	Not applicable - residue	Solid	Straw Treatment Building & Silage Clamp	20,000
Farmyard manure	Local farms	02 01 06	Solid	Manure Reception Building	13,800
Chicken manure	Local farms	02 01 06	Solid	Manure Reception Building	3,000
Pig slurry	Local farms	02 01 06	Liquid	Liquid Feedstock Tank	*4,500
Cattle slurry	Local farms	02 01 06	Liquid	Liquid Feedstock Tank	*6,000
Non-hazardous liquid wastes	02 03 liquid wastes	02 03 01 02 03 04 02 03 05	Liquid	Liquid Feedstock Tank	To replace process water volume as a contingency

Feedstock description	Source(s) of feedstock	Waste code	Form	Storage location	Approximate tonnes treated per year
	02 04 liquid wastes 02 06 liquid wastes 02 07 liquid wastes	02 04 03 02 06 01 02 06 02 02 07 01 02 07 02 02 07 04 02 07 05			
Dirty water	Dirty water from on-site drainage systems	Not applicable	Liquid	Water Tanks (Dirty)	35,000
			Approximate annual tonnage (excluding water)		**94,900**

*Note – quantities provided are estimated values, should the Site accept slurry to replace manure and process water volume to balance dry matter**.**

5.2 Energy Crop Feedstock Acceptance & Storage

Energy crops are grown under contract with local farms, ensiled within the 3 No. Silage Clamps and covered with an impermeable cover. See Section 6.1.1 Primary Containment, Silage Clamps, for details of silage clamp construction. The dry matter content of energy crops is tested to confirm if they are suitable for ensiling prior to receipt

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 then 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-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)**. 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.

5.3 Waste Acceptance & Storage

The waste feedstocks are manure, slurry and non-hazardous liquid wastes. 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-ENV-WASTE PRE-ACCEPTANCE-PRO-P1)**. 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-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)**. 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-ENV-SAMPLING & ANALYSIS-PRO-P1)**.

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-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)**.

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 dedicated Manure Reception Building and discharge their loads inside where the loads are inspected in line with the Feedstock Acceptance and Rejection Procedure **(ABL-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)**. 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 and non-hazardous liquid waste 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 and non-hazardous liquid waste is carried out in accordance with the Liquid Waste Reception Procedure **(ABL-ENV-LIQUID WASTE RECEPTION-PRO-P1).**

The slurry and non-hazardous liquid waste are discharged from the delivery tanker and macerated within the tanker dispatch pump during transfer into the Liquid Feedstock Tank where they are stored pending feeding into the PowerRing Digesters.

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

Table 5 below shows theoretical maximum waste storage capacities and residence times.

Table 5 Theoretical maximum waste storage capacity and residence times

Waste type	Storage location	Maximum residence time	Maximum stored at any one time (tonnes)
Chicken manure, farmyard manure	Manure reception building	21 days	400
Slurry (pig or dairy)	Liquid feedstock tank	14 days	402
Non-hazardous liquid wastes	Liquid feedstock tank	14 days	402
Total theoretical maximum tonnage of waste at any one time			**802**

5.4 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 moist straw may be stored in a bay within the building prior to being fed into the feed hopper serving the 2 No. Straw Extruders. Extrusion is a thermo-mechanical process on the moist straw which due to pressurisation produces a fine stackable broken-down straw material, which improves digestion and increases gas yield from the straw feedstock. Moist extruded straw lands in an external bunker, the Straw Set Down Bay.

5.5 Waste Pre-treatment

Chicken manure and / or farmyard manure is transported to the dedicated Manure Feed Hopper before entering the 2 No. PowerRing Digesters via the Liquid Feeding System and macerator.

The enclosed Liquid Feeding System uses digestate from the Digester Tanks to pre-mix the solid feedstock in order to homogenize the incoming biomass and avoid layer formation inside the digester.

Liquid waste feedstocks are macerated prior to being transferred from the Liquid Feedstock Tank to the digesters.

5.6 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 **(HRCL-QUAL-PROCESS MONITORING-WI16-P1)** and the Sampling and Analysis Procedure **(ABL-ENV-SAMPLING & ANALYSIS-PRO-P1).**

Feedstock loading is carried out in accordance with the Feedstock Management & Loading Procedure **(HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1)**. Tonnages of feedstock (solid and liquid) are recorded and controlled via the SCADA control panel.

All feedstock is loaded into the Primary Digesters within each of the PowerRing Digesters.

5.6.1 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 Silage Clamp cover is removed enough to cut away required feedstock. The two No. 120 m^3 capacity crop Feed Hoppers feed a hammermill pre-treatment process. These 2 No. hammermill units pre-treat by reducing the feedstock particle size further, improving digestion, avoiding floating layers and decreasing the power consumption for stirring. The feedstock is then loaded through a Screw Loader into the PowerRing Digesters.

The moist extruded straw material is removed from the Straw Set Down Bay next to the Straw Processing Building and loaded into the dedicated external straw Solid Feed Hopper throughout the day as its produced. The straw is mixed with digestate within an enclosed Pre-mix Liquid Feeding System and macerated before entering the 2 No. PowerRing Digesters.

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.

5.6.2 Slurry, Liquid Wastes & Dirty Water

Slurry and non-hazardous liquid waste are stored within the Liquid Feedstock Tank, which is equipped with a submersible mixer and will transfer the substrate into the two PowerRing Digesters though a rotary lobe pump. Dirty water and leachate are stored within the process tanks; preferentially within the 2 No. Dirty Water Tanks. Pumping Station 2 within the Central Pumping Station (CSP) is used to distribute the liquid feedstock from the Liquid Feedstock Tank to the PowerRing Digsters via two progressive cavity pumps.

The feeding of liquid feedstocks is carried out in accordance with the daily feed plan and controlled via the SCADA control panel.

5.6.3 Manure

A front loader is used to load manure into the internal Hopper within the Manure Reception Building. Manure is then processed within the dedicated pre-mix system ready for pumping directly into the PowerRing Digesters.

5.7 Digesters

The Digester Tanks utilise PowerRing concept technology. Each of the 2 No. PowerRing Digesters consists of two digesters (one inside the other); a Primary Digester and a Secondary Digester. The 2 No. Primary Digesters (PD1 & PD2) operate in parallel and feed into the two Secondary Digesters (SD1 & SD2) via an overflow. Both Secondary Digesters feed into a single Tertiary Digester (TD1). Pumping station 1 within the CPS is used to interconnect the two PowerRings to allow the digestate to be pumped between Digestors via two progressive cavity pumps based on operational needs.
The construction type, mixing systems, gas storage and working capacities of the digesters are detailed in Table 6 below. See Section 6.1 4 Primary Containment, Digesters, for further details on the tank construction.

Table 6 Digester details

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	9 No. Blade Agitators	1,070 (void)	34	9,000 (each)
Secondary	SD1 & SD2			2 No. Paddle Agitators	532 (void)	20	4,512 (each)
Tertiary	TD1	Precast concrete	Double membrane	4. No. Horizontal paddle agitators	727 (void) 3,800 (gas dome)	17	7,444
				Totals	**6,129**	**71**	**34,468**

The Digesters have inspection windows which are checked once a day in accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**

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 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**.

There is a grit channel in the base of both Primary Digesters to enable the removal of grit and stones.

5.8 Pasteurisation

Following retention in the Tertiary Digester whole digestate is then pasteurised within the Pasteurisation Unit. The unit contains two cavity pumps and a macerator prior to the pasteurisation process which takes place in 3 No. Pasteurisation Tanks, each of 25m^3 capacity, (at any one time one tank is filling, one holding at pasteurisation temperature and one is emptying). Each 25 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 Hygienized Digestate Tank (80 m^3).

5.9 Digestate Separation & Storage

Whole digestate from the Hygienized Digestate Tank (80 m^3) is pumped to the 2 No. RC75 Börger type mechanical separators capable of separating 75m^3/hr and up to 1800 m^3/tonnes per day of whole digestate each. The expected daily process requirement is to separate approximately 448 m^3/tonnes per day. The resultant liquor enters the Digestate Buffer Tank (402 m^3) for recirculation or is transferred to the Digestate Storage Lagoon (12,350 m^3) for storage.

The Digestate Separators and the resulting fibre digestate are within the Digestate Separation Bunker. The building 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 **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1).**

Separated liquor is pumped from the separators to either:

- the Digestate Storage Lagoon with working capacity of 12,350 m^3.
- the Digestate Buffer Tank (402 m^3).

Based on the current feedstock tonnage of 94,900 tonnes per annum and the mass balance provided by the technology provider approximately 26,182 tonnes of solid fibre digestate and 67,454 m^3 of digestate liquor are produced per year (assuming 1 tonne = 1 m^3). The Digestate Storage Lagoon provides 2 months storage capacity for digestate liquor with additional storage provided offsite through contractual arrangements with local destination farms. Offsite liquid storage tanks will be principally owned and operated by ABL, giving them control of their use.

The covered Digestate Storage Lagoon benefits from leak detection and mixing. See Section 6.1.5 for further details.

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.

5.10 Digestate Use

The site is designed such that the digestate produced is compliant with the requirements of BSI PAS110: 2014 Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source-segregated biodegradable materials.

Digestate will be removed from site either to on farm storage locations or will be spread directly to land for agricultural benefit to meet crop need as a biofertiliser. 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 will be used primarily as a soil improver.

The digestate liquor is removed via tanker at the digestate dispatch points in accordance with the Digestate Handling Procedure **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1)**.

The digestate fibre is periodically removed from the Digestate Fibre Storage Bay to destination field heaps in accordance with the Digestate Handling Procedure **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1)**.

5.11 Gas Storage

The gas storage afforded by the void space within the PowerRing Digesters and Tertiary Digester, as well as the gas dome is approximately 6,129m³ which, given maximum gas production levels of 2,315 Nm³/hr is in excess of 2.65 hours of production. This storage capacity allows for planned routine gas upgrade unit maintenance events. Storage levels will be maximised prior to any planned shutdown.

5.12 Biogas Treatment

Hydrogen sulphide (H_2S) levels within the digesters will be tested and monitored on SCADA. There are 2 No. Desulphurisation plant with oxygen injection on the PowerRing Digesters. Around 17Nm³/h of gaseous oxygen is injected into the digesters to increase the oxidising capacity of the system, thus inhibiting sulphate-reducing bacteria activity and promoting sulphide oxidation.

First, atmospheric air is compressed and then it is forced towards a purifying substrate to isolate and store oxygen, which is supplied to the digesters through valves and oxygen lines. A regulating valve will control injecting the right amount of O_2 in the upper part of the Digesters (gas zone).

The resulting oxygen concentration is between 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.

5.13 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 Virtual Pipeline (gas tankers to a Grid Injection Point).

5.14 Carbon Dioxide Recovery & Storage

The CO_2 is treated in the CO_2 capture unit via:

- 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 3. No CO_2 storage tanks (50 m^3 each).

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

5.15 Gas & Heat Management

Biogas may also be used in one of the CHPs or in the Emergency Boiler.

Excess biogas will be sent to the Emergency Flare.

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 dome above the Tertiary Digester.

5.15.1 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.

5.15.2 Emergency Boiler

Treated biogas from the AD plant may be burnt in the Emergency Boiler (500kW for biogas, 560 kW for natural gas) 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.

5.15.3 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 unlikely event that this causes any over pressure, biogas would be flared.

The emergency flare ignites automatically and is sized appropriately; it can burn up to 2,600Nm^3/hr of biogas. The theoretical maximum production for the AD site is around 2,315Nm^3/h. See Section 7.4 Control of Emissions of Raw Biogas.

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

5.16 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 3 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 – 58.75 m (l) x 42.5 m (w) x 3.52 m (wall height) (11,760 m^3capacity)
- Clamp 2 – 73.75 m (l) x 42.5 m (w) x 3.52 m (wall height) (17,000 m^3)
- Clamp 3 – 97.80 m (l) x 42.5 m (w) x 3.52 m (wall height) (19,900 m^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 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).** 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 Effluent Tank

Silage effluent arising from the silage clamps flows into 1 No. Silage Effluent Tank (54 m^3). The Silage Effluent 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 (**HRCL-QUAL-DAILY CHECKS-AQD 24-P1**).

The Silage Effluent Tank benefits from a level sensor linked to SCADA. In preference to storage of leachate below ground, the tank contains level switches and submersible pumps to pump the leachate to the 2 No. above ground Dirty Water Tanks (402m^3 each) within the secondary containment area.

Leachate storage capacity = 54 m^3 + 804 m^3 =858 m^3

The combined capacity of the Silage Effluent Tank and the above ground storage tanks is 858 m^3 which exceeds the minimum SSSAFO requirement of 356 m^3, calculated as shown:

Total clamp storage capacity = 48,660m^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 48,660) = 356.022 l or 356 m^3

6.1.3 Ancillary tanks

There are 5 No. above ground ancillary tanks namely:

- 1 No. Liquid Feedstock Tank (402 m^3)
- 2 No. Water Tanks (Dirty) (402 m^3 each)
- 1 No. Hygienized Digestate Tank (80 m^3)
- 1 No. Digestate Buffer Tank (402 m^3)

These tanks are for the storage of slurry, non-hazardous liquid waste, 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 (25 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 Wolf, assembled on site.

The 2 No PowerRing digesters are each constructed of concrete base, walls and flat roofs, manufactured and cast in situ by Wolf. The Tertiary digester is constructed of concrete base and walls and has a double-membrane gas tight cover roof. 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 Lagoon

The Digestate storage lagoon is constructed of the following layers starting from the base:

- Sub-grade material with a smooth surface.
- Proprietary drainage medium.
- 200 grams per square metre (GSM) non-woven geotextile membrane to separate and protect secondary liner from sub-grade materials.
- Secondary 1.0mm low density polyethylene (LDPE) liner.
- Intermediate drainage medium laid in 750mm wide strips at 2.5m centres gravitating to an inspection/monitoring chamber on the outside of the fence.
- Primary 2.0mm High density polyethylene (HDPE) liner.
- 2.0mm LDPE floating gas collection cover

The liners will be continuously welded and anchored in trench around the top of lagoon and graded down to the draw-off sump.

The Leak detection and sampling point will allow the use of a sampling jar on a retractable rod to recover samples from the ground water collection chamber beside the draw-off sump.

The recirculation pipework will sit within a lined trench with leak detection.

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 housed within bunded on-site stores. The emergency generator has an integral bunded diesel tank (200 m^3).

Ferric hydroxide powder is kept undercover in the integrally bunded 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 within Appendix A of the Accident Management Plan Manual. (**HRCL-ETL-AMP-RPT-P1)**[9].

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 and is fully detailed within the Primary & Secondary Containment Report With Bund Capacity Calculations Report produced by the GGP Consult, who designed the system.[10]

The secondary containment system comprises a concrete slab underlain with an HDPE layer. The bund walls are comprised of sections of earthwork bunds (lined with a protective HDPE liner) and concrete wall around the slab, providing available containment volume equal to 17,010 m^3, based on the proposed minimum wall level of 121.800 m AOD and earth bund level of 122.800 m AOD. A surge allowance of 750 mm for the earth bund areas and 250 mm for the concrete bund area has been used within the construction design wall levels in accordance with the CIRIA guidance.

The containment capacity is designed in accordance with CIRIA C736, with the calculations in the report demonstrating 110% of the largest tank volume to be a greater volume than 25% of the combined 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**

The secondary containment sump is inspected daily in accordance with the Secondary Containment Checking & Emptying Procedure **(HRCL-QUAL-SECONDARY CONTAINMENT CHECKS AND EMPTYING-WI12-P1).**

6.2.2 Leak Detection for Concrete Slab

There is an HDPE layer underlying the whole of the concrete slab within the secondary containment area. This will provide an enhanced composite secondary containment slab and the ability to perform

[9] Accident Management Plan Manual, Horse Close AD, HRCL-ETL-AMP-RPT-P1, V1.0

leak detection on the secondary containment with any failures of the bund slab been trapped between the slab and HDPE membrane allowing for sampling.

The inspection of this leak detection system via 1 No. leak detection pot is carried out daily in accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**

6.2.3 Leak Detection for Silage Effluent Tank

The Silage Effluent 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**

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 Wolf 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 3 No. Digester leak detection pots to be inspected daily in accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**.

Further detail is provided within the Primary & Secondary Containment Report with Bund Capacity Calculations Report by GGP Consult.[11]

6.3 Drainage Description

6.3.1 Overview

The drainage system is designed by GGP Consult and described in their Drainage Impact Assessment report.[12]

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 and covers is collected through channel drains running along the front of the clamps falling to 1 No. Silage Effluent Tank (54 m³). The tank has a level switch and submersible pump which pumps leachate to the 2 No. Dirty Water Tanks for use within the AD process. The Silage Effluent Tank is described in Section 6.1.2.

[11] Primary & Secondary Containment Report With Bund Capacity Calculations, Horse Close AD, GGP-29384-CON-03, GGP Consult, February 2025
[12] Drainage Impact Assessment, Horse Close AD, GGP-29348-CD-DIA-07, GGP Consult, February 2025

Dirty water from around the Feeders and from within the Manure Reception Building and the Digestate Separator Building is collected through a series of drainage channels, pipes and chambers and stored within the 2 No. Dirty Water Tanks (402 m³) for use in the AD process. Should capacity be reached within the holding tanks, the Dirty Water Lagoon will allow 510 m^3 of water to be stored.

The principal digestate off-take point is located within the containment bund. The secondary off-take point benefits from a concrete apron and 5.1 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 Full Retention Separator to ensure oil, chemicals and solids are removed. The outflow from the separator along with clean water from building roofs is stored within the Clean Water Lagoon (511 m^3) before out falling to an existing watercourse to the north west corner via a hydro brake to allow for flow control or being directed to the No. Dirty Water Tanks for reuse within the process.

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.[12]

Penstocks are in place for the clean water drainage system, including at the following locations, such that any spillages can be contained on site if required:

- Before the full retention interceptor.
- Downstream of the full retention interceptor; and
- On the Hydro-Brake.

6.3.5 Secondary Containment Drainage

Water collecting within the secondary containment area is quality assessed daily in accordance with the Secondary Containment Checking & Emptying Procedure **(HRCL-QUAL-SECONDARY CONTAINMENT CHECKS AND EMPTYING-WI12-P1)**.

Within the containment bund, areas at high risk of producing dirty water runoff (the area around the Feeders and Digestate Separators) are segregated and managed separately as described in Section 6.3.2 as Dirty Areas. Typically, water from the remainder of the secondary containment bund is also treated as dirty and pumped to the Liquid Feedstock 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 **(HRCL-QUAL-SPILL CONTROL/USE OF SPILL KITS-WI24-P1)**, 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 **(HRCL-QUAL-DRAINING MANAGEMENT AND CONTROL-WI23-P1)**. In these circumstances, if the visual and olfactory checks confirm that there have been no spillages, and onsite testing confirms that required parameters are at acceptable levels, then the water will be pumped out to the Clean Water Lagoon 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**.

Underground pipework has been avoided where possible and except for drainage pipework is limited to a small stretch of HDPE pipework beneath the farm track, transferring separated liquor digestate to the Digestate Lagoon. The lagoon pipework benefits from secondary containment and leak detection. Drainage pipework will 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 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 **(HRCL-ETL-AMP-RPT-P1)** and associated procedures including the Discharge of Flood Water Procedure **(HRCL-QUAL-DRAINING MANAGEMENT AND CONTROL-WI23-P1)**.

7 Control of Emissions to Air

7.1 Overview

The emission points to air A1 to A23 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 Pressure Relief Valve (PRV)
A8	Biogas upgrade unit Carbon dioxide vent
A9	Carbon dioxide recovery plant PRV1
A10	Carbon dioxide recovery plant PRV2
A11	Compressor PRV 1
A12	Compressor PRV 2
A13	Underground Leachate Tank vent
A14	Pressure and Vacuum Relief Valve (PVRV) on Primary Digester 1
A15	PVRV on Secondary Digester 1
A16	PVRV on Secondary Digester 1
A17	PVRV on Secondary Digester 2
A18	PVRV on Tertiary Digester
A19	Covered Digestate Storage Lagoon carbon filter outlet
A20	Liquid feedstock tank carbon filter outlet
A21	Liquid Digestate off-take point carbon filter outlet
A22	PVRV on liquid digestate storage lagoon
A23	Carbon dioxide recovery plant unit Carbon dioxide vent
A24	Liquid Digestate off-take point carbon filter outlet (principal loading point)

7.2 Control of Emissions from the Manure Reception Building

Air from the Manure reception building 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 Treatment of displaced air from the pasteurisers

Displaced air from the pasteurisers is passed through the Sulphuric acid scrubber (part of the emissions abatement plant serving the Manure Reception Building) before release to mitigate ammonia within emissions.

7.4 Control of Emissions from Liquid Feedstock Tank

Displaced air from the Liquid feedstock tank is directed through an impregnated carbon filter to reduce emissions to air. The carbon filter will be replaced in line with manufacturers/ suppliers' recommendations.

Air from the Hygienized Digestate Tank and the Digestate Buffer Tank will be captured.

7.5 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 2,600 Nm^3hr of biogas.

The predicted maximum production of biogas is 2,315 Nm^3/hr. Given that the CHP plant will also consume biogas, the expected maximum production of biomethane from the BUU is around 1,301 Nm^3/hr. Any reject Biomethane 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 dome above the Tertiary Digester.

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.

7.6 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 **(HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1)** 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.

7.7 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.

7.8 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 practice when CO_2 capture equipment is not installed.

7.9 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.

7.10 Control of Emissions from Digestate Storage & Off-take

The digestate separators and fibre digestate storage is within a covered bunker with a door which is closed when not in use.

The Digestate Storage Lagoon is fitted with gas capture with the captured gas channelled through an impregnated carbon filter to abate ammonia emissions (A19).

The primary control for the release of biogas from the Digestate Storage Lagoon 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 with a 71-day hydraulic retention time reduces by-pass and thus residual biogas potential.

There are carbon filters at both digestate offtake points, located on the vents for displaced air during off-take of digestate liquor (A21 & A24). Carbon filters will be replaced when required in line with manufacturers / suppliers' recommendations.

The PRV on the Digestate Storage Lagoon (A22) may release under abnormal operating conditions.

7.11 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 **(HRCL-ETL-AMP-RPT-P1)** 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 energy crops, in accordance with the Feedstock Management & Loading Procedure **(HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1).**
- Minimisation of Manure reception building fast acting roller shutter door opening times in accordance with the Feedstock Management & Loading Procedure **(HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1)**.
- Digestate separation and fibre storage being within an enclosed bunker with roller shutter door, openings controlled in accordance with the Digestate Handling Procedure **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1).**
- Process monitoring to ensure production of stable digestate with low odour potential in accordance with the Process Monitoring Procedure **(HRCL-QUAL-PROCESS MONITORING-WI16-P1)**.
- Regular inspection and maintenance of abatement measures including those associated with the odour control unit (OCU) for the Manure Reception Building, the Liquid Feedstock Tank and the Digestate Storage Lagoon and digestate offtake points in accordance with manufacturers recommendations and the Maintenance Planner **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1).**

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 **(HRCL-ETL-OMP-RPT-P1).**

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 (**HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1**). The Environment Agency’s Qualitative Noise Screening Assessment Tool (QNST) has been completed for the Site and is included with the permit application. The QNST concludes that neither a Noise Impact Assessment nor a Noise Management Plan are required for the permit application.

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

A Noise Impact Assessment was carried out as part of the planning permission application for the site. The findings verified those of the report concluded:

‘*It is concluded that noise should not present reasonable grounds for planning refusal. The likely acoustic effects have been established about the NOAEL and LOAEL thresholds of the NPSE, such that noise is not expected to cause any change in behaviour or attitude. Following local Council guidance and policy interpretation, the impact has been described about the ‘NOEL - No Observed Effect Level’ where the rating level is below the background sound level*.’

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 written 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 10 miles per hour (MPH) site speed limit for all vehicles on site.
- Daily clean down procedures in accordance with a Housekeeping Procedure **(HRCL-QUAL-HOUSEKEEPING-WI03-P1)**.

If Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)** identify that dust may be blowing off site, then the Dust Procedure **(HRCL-ENV-DUST CONTROL-WI17-P1)** 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 indicate that the residual risk from all sources associated with the plant is 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*."[13]

[13] Bioaerosol Risk Assessment Horse Close Anaerobic Digestion Plant, 8876 r1, Redmore Environmental, February 2025

9 Control of Climate Change Impacts

Climate change impacts and mitigation controls are considered in a separate site-specific Climate Change Adaptation Risk Assessment **(HRCL-ETL-CCARA-H&S-P1)**.

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 **(HRCL-ETL-AMP-RPT-P1);**
- 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 AAAA-BBB-CCC-DDD-EE* where:
- ''AAAA' is either:
    - 'ABL' for a companywide corporate management system document which is used across all sites operated by ABL; or
    - 'HRCL' denoting a management system document specific to the Horse Close AD site.
- 'BBB' is:
    - Issuer: It may be Acorn Bioenergy, Technology provider, Consultants, Competent Authorities, etc.
- 'CCC' is:
    - Document description
- 'DDD' is:
    - Document Type: It may be a report, Procedure, Layout, etc.
- EE is:
    - Revision status: Preliminary (P1), Issued for Comment (R1) and Approved for use (A1).
- Document author / name of person who issued the document.
- Version number. (The Master Document Control File **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)** is the only document without version number and is controlled through a date format instead)
- Date of issue.

*Note, in the case of some procedures/documents not all codes would be required.

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-QUAL-DOCUMENT REFERENCE PROCEDURE-PRO-P1)**. The status of all management system documents is recorded within the Master Document Control File **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)**.

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-QUAL-TRAINING-PRO-P1)**.

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-QUAL-SKILLS & COMPETENCY MATRIX-MAT-P1)**. 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 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-QUAL-COMPLAINTS-PRO-P1)**.

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, including the overarching management plans, procedures, monitoring and maintenance schedules and the record keeping forms associated with the procedures (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 **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)** 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-QUAL-SHEQ-MAN-P1	Acorn Integrated Management System (AIMS) Manual (including the Environmental Policy)
ABL-QUAL-SKILLS & COMPETENCY MATRIX-MAT-P1	Skills and Competency Matrix
ABL-QUAL-SITE DECOMMISSIONING-PLA-P1	Site Decommissioning Plan
ABL-QUAL-NCCAR-Log-R1	Non-conformance & Corrective Action Log
ABL Overarching Procedures	
ABL-QUAL-DOCUMENT REFERENCE PROCEDURE-PRO-P1	Document Control Procedure
ABL-QUAL-COMPLAINTS-PRO-P1	Complaints Procedure
ABL-QUAL-MANAGEMENT OF CHANGE-PRO-P1	Management of Change Procedure
ABL-QUAL-TRAINING-PRO-P1	Training Procedure
ABL-QUAL-NCCAPREVENT-PROC-R1	Non-conformance and Preventive Action Procedure
ABL-QUAL-INCIDENTS ACCIDENTS-PRO-P1	Procedure for Reporting Incidents & Accidents
ABL-ENV-WASTE PRE-ACCEPTANCE-PRO-P1	Waste Pre-acceptance Procedure
ABL-ENV-FEEDSTOCK ACCEPTANCE REJECTION-PRO-P1	Feedstock Acceptance and Rejection Procedure
ABL-ENV-LIQUID WASTE RECEPTION-PRO-P1	Liquid Waste Reception Procedure
ABL-ENV-ENVIRONMNETAL REPORTING-PRO-P1	Environmental Monitoring Procedure
ABL-ENV-SAMPLING ANALYSIS-PRO-P1	Sampling & Analysis Procedure
ABL Form Templates	
ABL-QUAL-WASTE PRE-ACCEPTANCE AQD01-R1	Waste Pre-acceptance Form
ABL-QUAL-CHANGE CONTROL AQD02-R1	Change Control Form
ABL-QUAL-FEEDSTOCK REJECTION AQD03-R1	Feedstock Rejection Form
ABL-QUAL-COMPLAINT FORM AQD04-R1	Complaint Record Form
ABL-QUAL-INTERNAL AUDIT REPORT AQD18-R1	Internal Audit Report Form
ABL-QUAL-ACCIDENT AND INCIDENT	Accident and Incident Report Form

REPORT-AQD19-P1	
ABL-QUAL-MANAGEMENT REVIEW REPORT FORM AQD20-P1	Management Review Report Form
ABL-QUAL-NCCAR-FORM-R1	Non-conformance and Preventive Action Form
ABL-QUAL-COMPLAINT FORM- AQD04-R1	Odour Complaint Form
Site Specific Overarching Documents	
HRCL-ETL-EMS-MAN-P1	Environmental Management System Manual (this document)
HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1	Master Document Control File
HRCL-ABL-PROCESS FLOW-PFD-P1	Process Flow Diagram
HRCL-ETL-DRAINAGE PROCESS-PFD-P1	Drainage Process Flow Diagram
HRCL-ETL-OMP-RPT-P1	Odour Management Plan
HRCL-ETL-AMP-RPT-P1	Accident Management Plan Manual
HRCL-ETL-DMP-RPT-P1	Digestate Management Plan
HRCL-ABL-HAZARDOUS AREA CLASSIFICATION PLAN-H&S-P1	Hazardous Area Classification Plans
HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1	DSEAR risk assessment
HRCL-ABL-STAFF ORGANOGRAM-QUL-P1	Staff Organogram
HRCL-ABL-LIGHTNING RISK ASSESSMENT-H&S-P1	Lightning Risk Assessment
HRCL-ETL-CCARA-H&S-P1	Climate Change Adaptation Risk Assessment
HRCL-BIO-ENERGY EFFICIENCY PLAN-QUL-P1	Energy Efficiency Plan
HRCL-ABL-LDAR-PRO-P1	Leak Detection & Repair Plan
HRCL-ETL-PEST MANAGEMENT PLAN-E&S-P1	Pest Management Plan
HRCL-ETL-DIGESTATE QUALITY MANAGEMENT SYSTEM-E&S-P1	Digestate Quality Management System
HRCL-ETL-HAZARD AND CRITICAL CONTROL POINT PLAN-E&S-P1	Hazard and Critical Control Point Plan
Site Specific Procedures	
HRCL-QUAL-PROCESS MONITORING-WI16-P1	Process Monitoring Procedure
HRCL-ETL-ODOUR MONITORING -WI19-P1	Odour Monitoring Procedure
HRCL-QUAL-SECONDARY CONTAINMENT CHECKS AND EMPTYING-WI12-P1	Secondary Containment Checking & Emptying Procedure

HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1	Feedstock Management & Loading Procedure
HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1	Digestate Handling Procedure
HRCL-ENV-DUST CONTROL-WI17-P1	Dust Procedure
HRCL-QUAL-HOUSEKEEPING-WI03-P1	Housekeeping Procedure
HRCL-QUAL-SPILL CONTROL/USE OF SPILL KITS-WI24-P1	Spill Control Procedure
HRCL-QUAL-CONTROL PANEL ALARM RESPONSE-WI07-P1	Control Panel Alarm Response
HRCL-QUAL-FIRE & EXPLOSION RESPONSE-WI08-P1	Fire & Explosion Response Procedure
HRCL-QUAL-BIOGAS LEAK RESPONSE-WI09-P1	Biogas Leak Response Procedure
HRCL-QUAL-FOAM RESPONSE-WI04-P1	Foam Response Procedure
HRCL-QUAL-MAINS POWER OUTAGE RESPONSE WI05-P1	Main Power Outage Response Procedure
HRCL-QUAL-SAFE SHUTDOWN-WI06-P1	Safe Shutdown Procedure
HRCL-QUAL-FLOOD RESPONSE AND DISCHARGE OF FLOOD WATER-WI10-P1	Flood Response Procedure
HRCL-QUAL-REDUCED GAS GRID DEMAND CONTINGENCY PLAN-WI11-P1	Reduced Gas Grid Demand Contingency Plan
HRCL-QUAL-DRAINING MANAGEMENT AND CONTROL-WI23-P1	Discharge of Flood Water Procedure
HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1	Maintenance Planner
HRCL-QUAL-SITE DIARY-AQD 29-P1	Site Diary
HRCL-QUAL-Critical Spares List-AQD 31-P1	Critical Spares List
HRCL-QUAL-DAILY CHECKS-AQD 24-P1	Daily Checks
HRCL-QUAL-WEEKLY/MONTHLY CHECKS-AQD 25-P1	Weekly /Monthly Checks
HRCL-ETL-ODOUR MONITORING-AQD 22-P1	Odour Monitoring Form
HRCL-ETL-NOISE MONITORING -AQD 23-P1	Noise 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 **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)** 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-QUAL-SKILLS & COMPETENCY MATRIX-MAT-P1	Skills and Competency Matrix
ABL Overarching Procedures	
ABL-SOP-11	Corrective Action Planning Procedure
ABL-QUAL-INCIDENTS & ACCIDENTS-PRO-P1	Procedure for Reporting Incidents & Accidents
ABL Form Templates	
ABL-QUAL-ACCIDENT AND INCIDENT REPORT-AQD19-P1	Accident and Incident Report Form
Site Specific Overarching Documents	
HRCL-ETL-DRAINAGE PROCESS-PFD-P1	Drainage Process Flow Diagram
HRCL-ETL-OMP-RPT-P1	Odour Management Plan
HRCL-ETL-AMP-RPT-P1	Accident Management Plan Manual
HRCL-ABL-HAZARDOUS AREA CLASSIFICATION PLAN-H&S-P1	Hazardous Area Classification plans
HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1	DSEAR risk assessment
HRCL-ABL-LIGHTNING RISK ASSESSMENT-H&S-P1	Lightning Risk Assessment
Site Specific Procedures	
HRCL-ETL-ODOUR MONITORING -WI19-P1	Odour Monitoring Procedure
HRCL-ENV-DUST CONTROL-WI17-P1	Dust Procedure
HRCL-QUAL-SPILL CONTROL/USE OF SPILL KITS-WI24-P1	Spill Control Procedure

HRCL-QUAL-CONTROL PANEL ALARM RESPONSE-WI07-P1	Control Panel Alarm Response
HRCL-QUAL-FIRE & EXPLOSION RESPONSE-WI08-P1	Fire & Explosion Response Procedure
HRCL-QUAL-BIOGAS LEAK RESPONSE-WI09-P1	Biogas Leak Response Procedure
HRCL-QUAL-FOAM RESPONSE-WI04-P1	Foam Response Procedure
HRCL-QUAL-MAINS POWER OUTAGE RESPONSE WI05-P1	Main Power Outage Response Procedure
HRCL-QUAL-SAFE SHUTDOWN-WI06-P1	Safe Shutdown Procedure
HRCL-QUAL-FLOOD RESPONSE AND DISCHARGE OF FLOOD WATER-WI10-P1	Flood Response Procedure
HRCL-QUAL-REDUCED GAS GRID DEMAND CONTINGENCY PLAN-WI11-P1	Reduced Gas Grid Demand Contingency Plan
HRCL-QUAL-DRAINING MANAGEMENT AND CONTROL-WI23-P1	Discharge of Flood Water Procedure
Site Specific Form Templates	
HRCL-ETL-ODOUR MONITORING-AQD 22-P1	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-QUAL-NCCAPREVENT-PROC-R1)**, Non-conformance and Preventive Action Form (**ABL-QUAL-NCCAR-Form-R1**) and the Non-conformance and Corrective Action Log **(ABL-QUAL-NCCAR-Log-R1).**

The Non-conformance and Corrective Action Log **(ABL-QUAL-NCCAR-Log-R1)** 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 **(HRCL-ETL-MASTER DOCUMENT CONTROL FILE-QUL-P1)** 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-QUAL-SITE DECOMMISSIONING-PLA-P1	Site Decommissioning Plan
ABL Overarching Procedures	
ABL-ENV-ENVIRONMNETAL REPORTING-PRO-P1	Environmental Monitoring Procedure
ABL-ENV-SAMPLING & ANALYSIS-PRO-P1	Sampling & Analysis Procedure
Site Specific Overarching Documents	
HRCL-ETL-OMP-RPT-P1	Odour Management Plan
Site Specific Procedures	
HRCL-QUAL-PROCESS MONITORING-WI16-P1	Process Monitoring Procedure
HRCL-ETL-ODOUR MONITORING -WI19-P1	Odour Monitoring Procedure
HRCL-QUAL-SECONDARY CONTAINMENT CHECKS AND EMPTYING-WI12-P1	Secondary Containment Checking & Emptying Procedure
HRCL-QUAL-HOUSEKEEPING-WI03-P1	Housekeeping Procedure
HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1	Maintenance Planner
HRCL-QUAL-SITE DIARY-AQD 29-P1	Site Diary
HRCL-QUAL-DAILY CHECKS-AQD 24-P1	Daily Checks
HRCL-QUAL-WEEKLY/MONTHLY CHECKS-AQD 25-P1	Weekly/ Monthly Checks
Site Specific Templates	
HRCL-ETL-ODOUR MONITORING-AQD 22-P1	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 **(HRCL-QUAL-PROCESS MONITORING-WI16-P1).**

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-ENV-WASTE PRE-ACCEPTANCE-PRO-P1)** and the Feedstock Acceptance and Rejection Procedure **(ABL-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1).**

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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**

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 CHPs, Emergency Boiler and by the volume of biogas in storage above the Tertiary Digester.

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 digesters 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 sampling and analysis of the digester contents.

12.2.5 Gas Pressure

Gas level is measured via gas pressure monitors within each digester.

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

The regulation of gas pressure is fully automated and SCADA links gas pressure readings with mixing and feeding of the tanks. When the gas level decreases under a certain level, feeding is automatically increased to increase the biogas production. If the gas storage is full, the feeding system will reduce feed rates into the digesters.

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 monitored throughout the process. The following parameters are measured within the ranges detailed below:

Table 10 Gas Quality Monitoring parameters

Parameter	Range
Methane (CH_4)	0-100% volume
Cardon dioxide (CO_2)	0-100% volume
Carbon monoxide (CO)	0-100% volume
Hydrogen Sulphide (H_2S)	0-500 ppm
Oxygen (O_2)	0-25% volume
Hydrogen (H_2)	0-50,000ppm & 0-100% vol.

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 **(HRCL-QUAL-PROCESS MONITORING-WI16-P1)**. 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-ENV-SAMPLING & ANALYSIS-PRO-P1)** 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 **(HRCL-QUAL-SITE DIARY-AQD 29-P1).** 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.

Digestate separated fibre and liquor digestate will be sampled and tested for digestate quality parameters monthly or in accordance with the sampling frequencies required for PAS110.

The samples are taken and dispatched to the laboratory in accordance with the Sampling and Analysis Procedure **(HRCL-QUAL-FIRE & EXPLOSION RESPONSE-WI08-P1)** 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 11: Management System Documents (Monitoring & Maintenance)

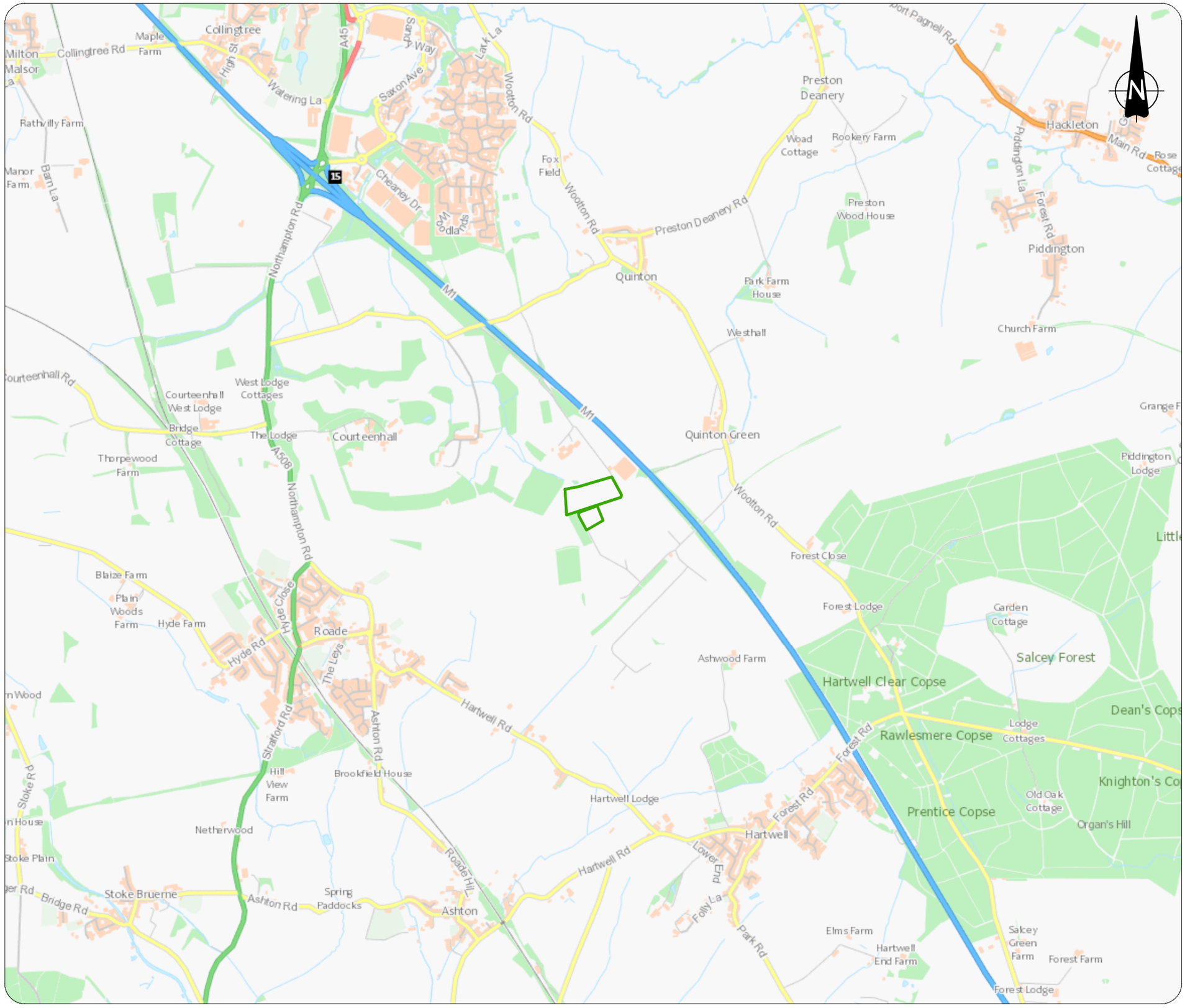
Document Reference	Document Title
ABL Overarching Documents	
ABL-QUAL-SKILLS & COMPETENCY MATRIX-MAT-P1	Skills and Competency Matrix
Site Specific Monitoring & Maintenance Schedules	
HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1	Maintenance Planner
HRCL-QUAL-SITE DIARY-AQD 29-P1	Site Diary
HRCL-QUAL-CRITICAL SPARES LIST-AQD 31-P1	Critical Spares List
HRCL-QUAL-DAILY CHECKS-AQD 24-P1	Daily Checks
HRCL-QUAL-WEEKLY/MONTHLY CHECKS- AQD 25-P1	Weekly/ Monthly 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

Figure 1 : Site Location Plan (ETL747_/HRCL/Site Location/EPR01)



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	04/02 2025	First Issue	JJ	MF	MF

LEGEND

Permitted Boundary

0 250 500 750 1,000 1,250 1,500 m

Scale at A3: 1:25,000

Client
Acorn Bioenergy Operations Limited

Project
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

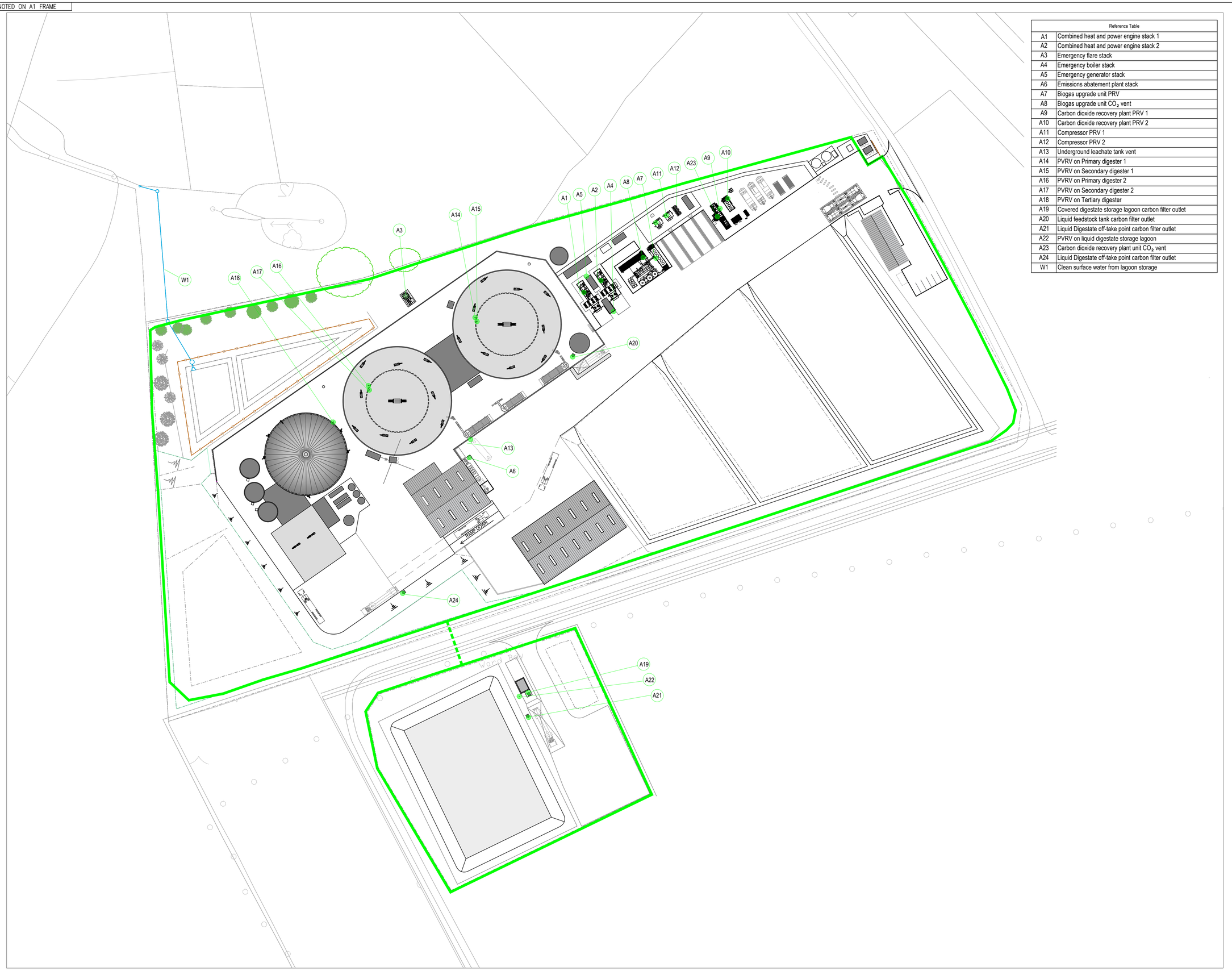
Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2025	1:25,000	A3

Drawing Number	File Reference
ETL747_/HRCL/SiteLocation/EPR01	ETL747.mxd

Figure 2: Site Emissions Plan (Plan (HRCL-LAY-ABE-010 Rev C Site Emissions Plan

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
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 Secondary digester 1
A16	PVRV on Primary digester 2
A17	PVRV on Secondary digester 2
A18	PVRV on Tertiary digester
A19	Covered digestate storage lagoon carbon filter outlet
A20	Liquid feedstock tank carbon filter outlet
A21	Liquid Digestate off-take point carbon filter outlet
A22	PVRV on liquid digestate storage lagoon
A23	Carbon dioxide recovery plant unit CO_2 vent
A24	Liquid Digestate off-take point carbon filter outlet
W1	Clean surface water from lagoon storage

SITE PLAN
Scale: 1:750 @ A1

NOT FOR CONSTRUCTION

NOTES:-

Permitted Area Boundary (5.89ha)

Emission Release Location

Underground pipe conduit with leak detection

Rev	Date	Description	DR	CH
C	15/05/25	Issued For Approval	SJC	-
B	27/01/25	Issued For Approval	SJC	-
A	21/11/24	Issued For Approval	SJC	-

acorn BIOENERGY

Job Title
AD Plant.
Horse Close

Drawing Title
Site Emissions Plan.

Status
Approval

Scale
As Shown

Date
Nov '24

Drawn By
SJC

Checked
–

Approved
–

Drg. No.
HRCL-LAY-ABE-010

Rev
C

Figure 3: Site Layout & Permit Plan (HRCL-LAY-ABE-011 rev C Site Layout and Permit Plan)

AS NOTED ON A1 FRAME

Reference Table	
1	Site Office / Staff Welfare and Workshop
2	Weighbridges (in and out)
3	Site Parking
4	CHP No2
5	CHP No1
6	Emergency Boiler
7	Switch Room
8	Biogas Upgrade Unit
9	CO2 Recovery Unit and CO2 tanks
10	Emergency Generator
11	CNG Unit
12	CNG Trailer Bays - 4 Nos.
13	Covered lagoon - Volume 12,350m³ plus 750m freeboard
14	Gas Flare
15	Digestate Separator Building
16	3 No. Pasteurisation tanks (25m³ each)
17	Manure Reception Building
18	Abatement Plant
19	Straw Process Building
20	Tertiary Digester - Volume 7444m³
21	Secondary Digester 1 - Volume 4512m³
22	Secondary Digester 2 - Volume 4512m³
23	Primary Digester 1 - Volume 9000m³
24	Primary Digester 2 - Volume 9000m³
25	Digestate Buffer Tank - Volume 402m³
26	Water Tank 1- Volume 402m³
27	Water Tank 2 - Volume 402m³
28	Fire Water Tank - Volume 250m³
29	Liquid Feedstock Tank - Volume 402m³
30	Feed Hoppers - Volume 2No 120m³ & 1No 65m³
31	Covered Storage Clamp 1 - Volume 19900m³
32	Covered Storage Clamp 2 - Volume 17000m³
33	Covered Storage Clamp 3 - Volume 11760m³
34	Silage Leachate Tank - Volume 54m³
35	Condensate sump 1
36	Condensate sump 2
37	Wastewater treatment plant
38	Digestate offtake bay with sump (5.1m³)
39	Liquid Feedstock loading point
40	Straw set down bay
41	Site Boundary Fence
42	Dirty water lagoon 511m³
43	Attenuation lagoon (clean) 510m³
44	Hygienized tank 80m³
45	Clean water break tank 10m³
46	Oxygen Generator
47	Biogas desulpherisation
48	Heat distribution container
49	Machinery Hall
50	Pump building
51	Clean Water Tanks, each 30m³

NOTES:-

Permitted Area Boundary (5.89ha)

Underground pipe conduit with leakage detection

N

Rev	Date	Description	DR	CH
C	15/05/25	Issued For Approval	SJC	-
B	25/02/25	Issued For Approval	SJC	-
A	21/11/24	Issued For Approval	SJC	-

acorn BIOENERGY

Job Title
AD Plant.
Horse Close

Drawing Title
Site Layout & Permit Plan

Status
Approval

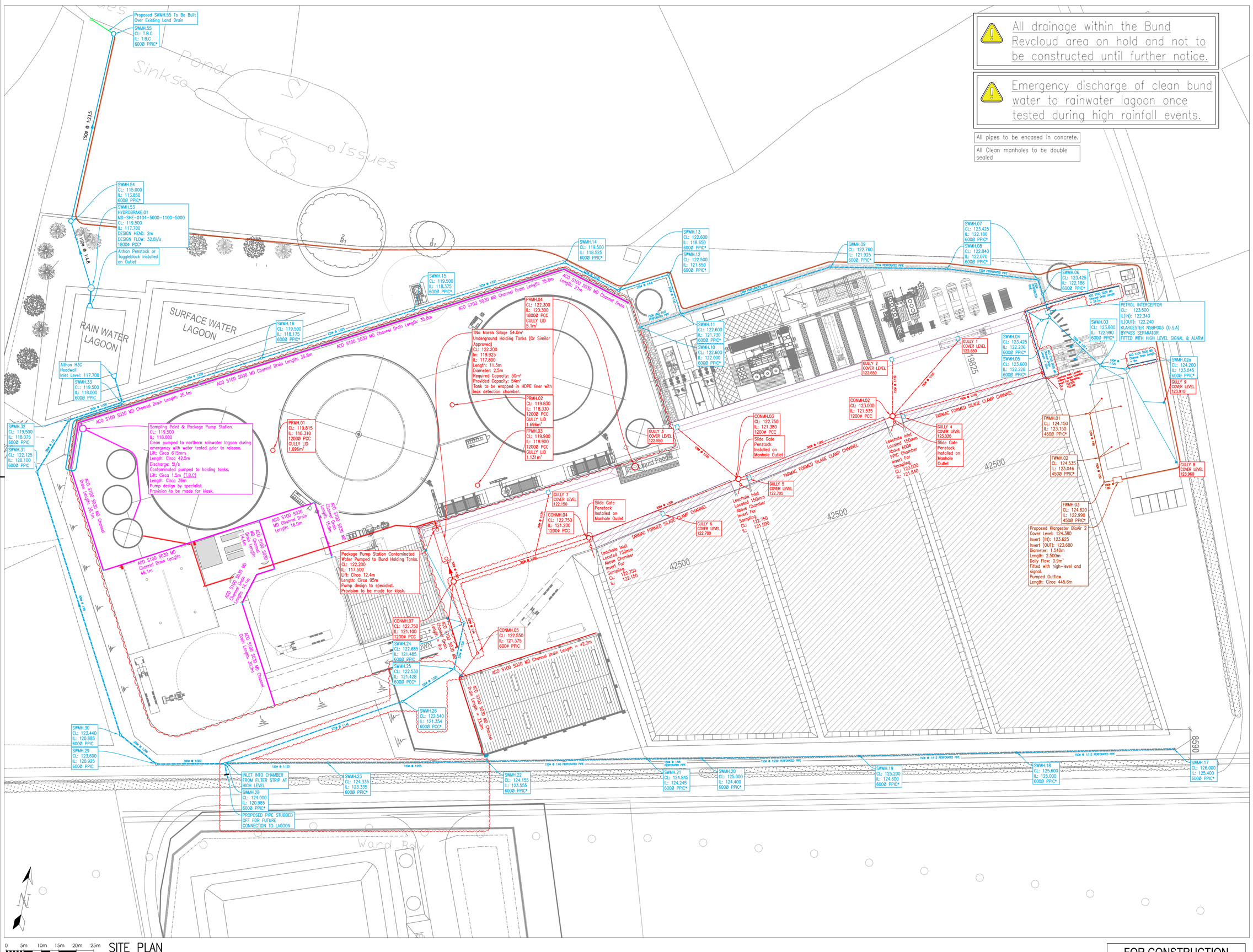
Scale	Date
As Shown	Nov '24

Drawn By	Checked	Approved
SJC	–	–

Drg. No.	Rev
HRCL-LAY-ABE-011	C

PERMIT PLAN
Scale: 1:750 @ A1

Figure 4: Proposed Drainage Layout (GGP-29384-C1-105-C18-Proposed Site Drainage Layout-Main)



0 5m 10m 15m 20m 25m

Scale 1:500 @ A1

SITE PLAN

Scale: 1:500 @ 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 29384/100 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
Foul Water Rising Main
Soil Vent Pipe
Leak Detection Chamber

Rev	Date	Description	DR	CH
C18	09/01/25	Issued For Construction	JT	JHC
C17	18/12/24	Issued For Construction	JT	JHC
C16	05/12/24	Issued For Construction	WD	JHC
C15	14/11/24	Issued For Construction	WD	JHC
C14	11/11/24	Issued For Construction	WD	JHC
C13	25/10/24	Issued For Construction	WD	JHC
C12	15/10/24	Issued For Construction	WD	JHC
C11	20/09/24	Issued For Construction	WD	JHC
C10	11/09/24	Issued For Construction	WD	JHC
C9	09/09/24	Issued For Construction	WD	JHC
C8	06/09/24	Issued For Final Approval	WD	JHC
C7	03/09/24	Issued For Final Approval	WD	JHC
C6	29/08/24	Issued For Final Approval	WD	JHC
C5	28/08/24	Issued For Final Approval	WD	JHC
C4	21/08/24	Issued For Final Approval	WD	JHC
C3	16/08/24	Issued For Final Approval	WD	JHC
C2	15/08/24	Issued For Final Approval	WD	JHC

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Client: acorn

Job Title: AD Plant
Horse Close Green Power

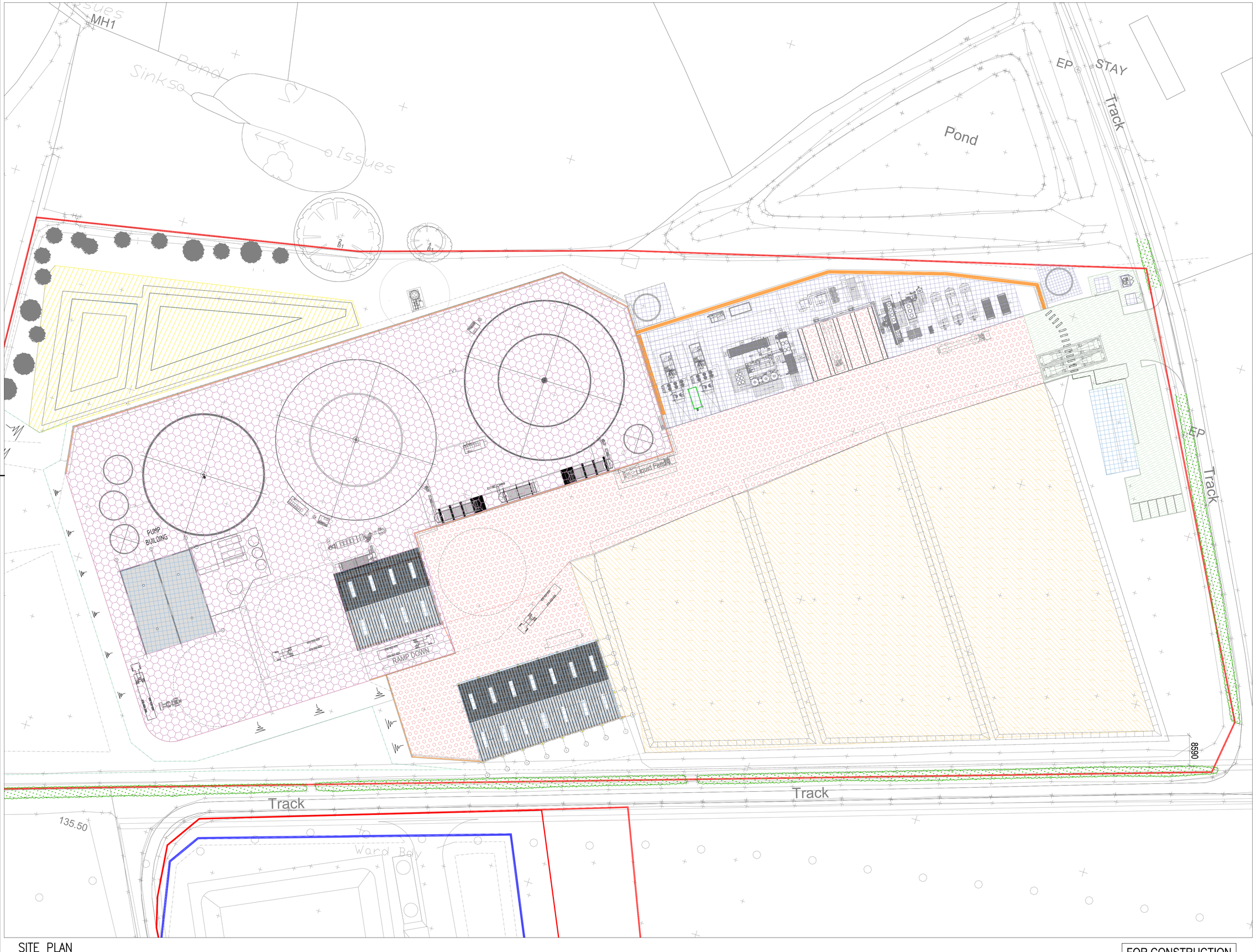
Drawing Title: Proposed Drainage Layout

Status: CONSTRUCTION

Scale: As Noted @ A1
Date: JUN' 2024
Drawn By: MK
Checked: JHC
Approved: JHC

Drg. No.: 29384/C1/105
Rev: C18

Figure 5: Drainage Catchment Plan (GGP-29384-C1-103-C06-Drainage Catchment Plan)



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 29384/100 Series Drawings.
5. All existing invert levels are to be confirmed by contractor prior to construction. Connection subject to approval.

Denotes Site Boundary

Denotes Clean Surface Water Swale Area – 2,548m²

Denotes Clean w/Petrochemicals Hardstanding Runoff Area – 1,304m²

Denotes Clean Equipment Runoff Area – 2,450m²

Denotes Clean/Contaminated Bund Runoff Area – 11,664m²

Denotes Dirty Silage Clamp Runoff Area – 11,714m²

Denotes Contaminated Hardstanding Runoff Area – 5,630m²

Denotes Clean Roof Runoff Area – 2,258m²

Rev	Date	Description	DR	CH
C06	09/01/24	Layout amended	JT	JHC
C05	18/12/24	Layout amended	KW	JHC
C04	12/11/24	Layout amended	MK	JHC
C03	10/09/24	Issued For Construction	WD	JHC
C02	21/08/24	Issued For Final Approval	WD	JHC
C01	16/08/24	Issued For Final Approval	WD	JHC
C1	07/06/24	Issued For Contract	MK	JHC
T2	05/03/24	Layout amended	MK	JHC
T1	03/02/24	Issued For Tender	MK	JHC

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Client: acorn

Job Title: AD Plant
Horse Close Green Power

Drawing Title: Proposed Catchment Plan

Status: FINAL CONSTRUCTION

Scale: As Noted @ A1 | Date: JUN' 2024

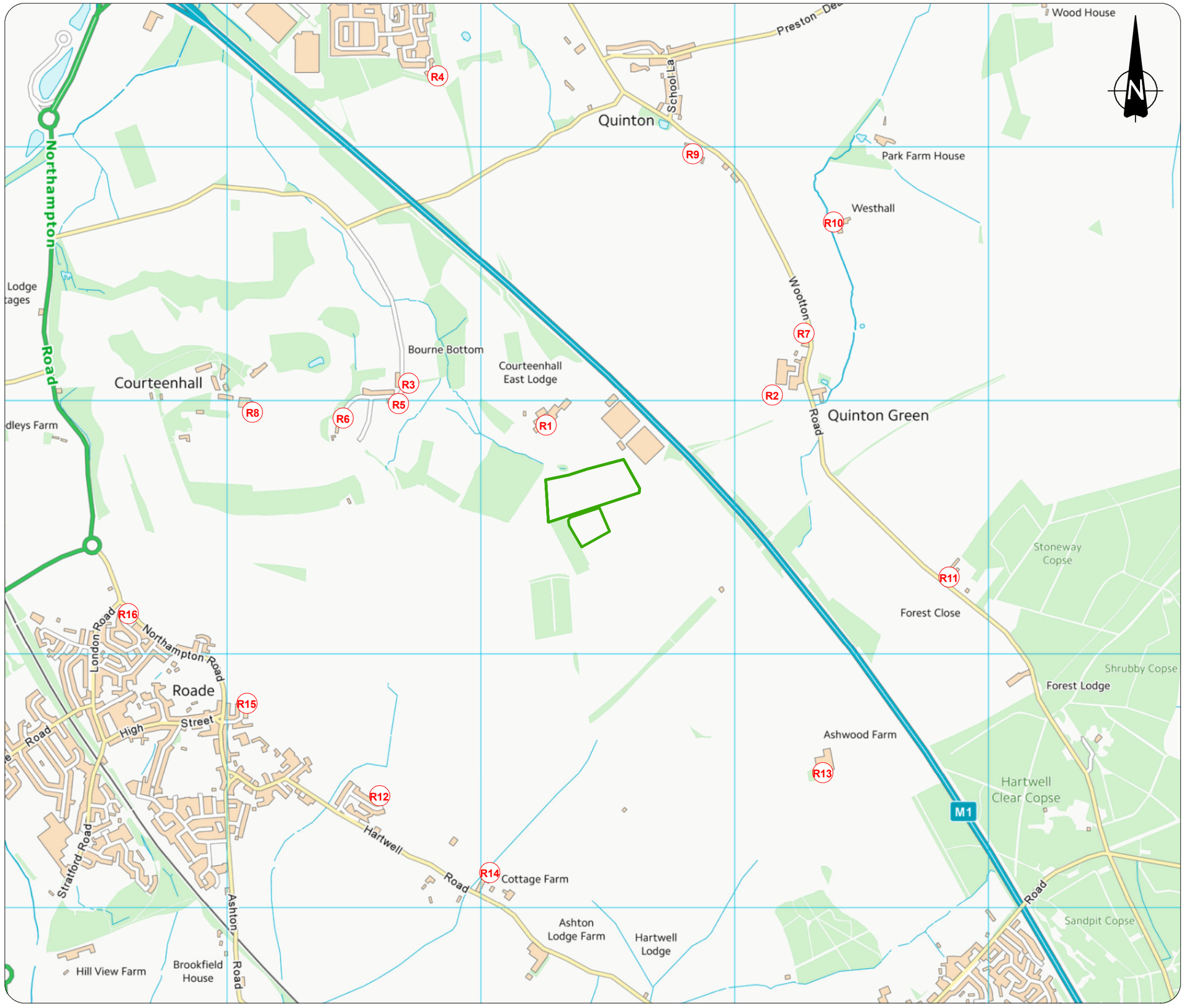
Drawn By: WB | Checked: JHC | Approved: JHC

Drg. No.: 29384/C1/103 | Rev: C06

SITE PLAN
Scale: 1:500 @ A1

FOR CONSTRUCTION

Figure 6: Human Receptor Plan, Earthcare Technical (ETL747_HRCL_HumanReceptors _EPR02)



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	05/02 2025	First Issue	JJ	MF	MF

LEGEND

Permitted Boundary

(H) Receptor location

0 250 500 750 m

Scale at A3: 1:15,000

Client
Acorn Bioenergy Operations Limited

Project
Permit Application

Title
Human Receptor Plan

Earthcare TECHNICAL

Manor Farm
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Tel: 02392 290488

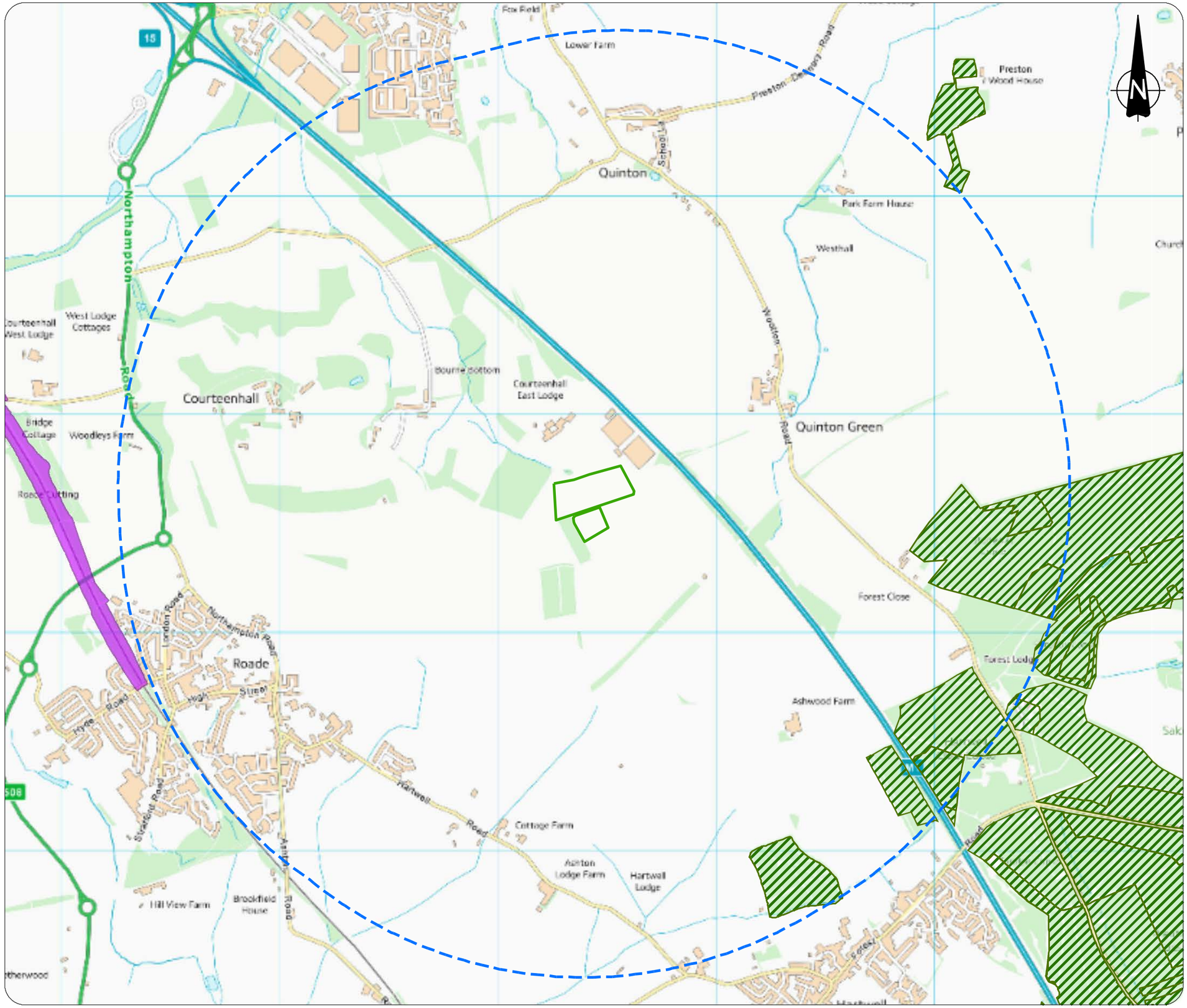
enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2025	1:15,000	A3

Drawing Number	File Reference
ETL747_HRCL_HumanReceptors /EPR02	ETL747.mxd

Figure 7: Ecological Receptor Plan (2km), Earthcare Technical (ETL747_HRCL_Eco Receptors_2km_EPR03)



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REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	05/02 2025	First Issue	JJ	MF	MF

LEGEND

- Permitted Boundary
- 2km buffer
- Ancient Woodland
- Site of Special Scientific Interest (SSSI)

0 250 500 750 m

Scale at A3: 1:17,500

Client: Acorn Bioenergy Operations Limited

Project: Permit Application

Title: Ecological Receptor Plan (2km)

Earthcare TECHNICAL
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www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2025	1:17,500	A3

Drawing Number	File Reference
ETL747_HRCL_Eco Receptors /2km/EPR03	ETL747.mxd

Figure 8: Ecological Receptor Plan (10km), Earthcare Technical (ETL747_HRCL_Eco Receptors _10km_EPR04)

REVISIONS

REV	DATE	DESCRIPTION	DWN	CHK	APP
-	05/02 2025	First Issue	JJ	MF	MF

LEGEND

Permitted Boundary

10km buffer

Ancient Woodland

Ramsar

Special Protection Areas

Site of Special Scientific Inter

0 1,000 2,000 3,000

Scale at A3: 1:85,000

Client
Acorn Bioenergy Operations Limited

Project
Permit Application

Title
Ecological Receptor Plan (10km)

Earthcare TECHNICAL
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enquiries@earthcaretechnical.co.uk
www.earthcaretechnical.co.uk

Drawn	Checked	Approved	Revision
JJ	MF	MF	

Date	Scale	Sheet Size
February 2025	1:85,000	A3

Drawing Number	File Reference
ETL747_HRCL_Eco Receptors /10km/EPR04	ETL747.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 local human population close to the site and to members of the public at locations where they could be regularly exposed. There is a permitted poultry Installation located 10 m to the north east which provides chicken manure for treatment to the AD Plant. Typically the poultry Installation staff are only present for short periods of time (<6 hrs at a time) except during the 7 week cleanout cycle, when equipment is operated over a period of approximately 2 days to remove manure and sanitise the sheds. The closest receptor is Courteenhall East Lodge, which comprises a collection of residential and commercial buildings. Courteenhall East Lodge is located approximately 211m north of the proposed Site boundary and 272 m from the CHP stacks. The CHP stack heights are 8.7m. 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-	Activities will be managed and operated in accordance with a written management system which will include the following measures: • 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 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.	**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?
							term impacts at all receptors can be screened out as not significant.[1] Straw is treated within a dedicated Straw treatment building. The prepared extruded straw is moist and lands in an external bunker and is the fed into the external feed hopper throughout the day as its produced. Solid manures are stored within a dedicated Manure reception building fitted with air handling and emissions abatement. There is a covered bunker to contain the digestate separators and the fibre digestate storage. Digestate liquor is stored within a covered storage lagoon with captured gaseous emissions being passed through a bespoke impregnated carbon filter. These techniques together will significantly abate emissions to air. The tanker off-take points for digestate are each fitted with a carbon filter.	• All pressure relief systems will be inspected and calibrated as per manufacturers recommendations. This will be included within the Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)** and Maintenance Planner **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1**).	

[1] Earthcare Technical Ltd (June 2025) Horse Close AD Plant Air Quality Impact Assessment (Doc ref: ETL747_HRCL_AQIA_V1.1)

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?**
1.2 Local human population.	Release of microorganisms (bio-aerosols).	Harm to human health - respiratory irritation and illness.	Air transport then inhalation.	Medium	Low	**Low**	There is a permitted poultry Installation located 10 m to the north east of the AD Plant. Typically the poultry Installation staff are only present on Site for short periods of time (<6 hrs at a time) and are likely to be within the poultry unit itself and as such unlikely to be exposed to bioaerosols from the AD Plant. The closest receptor is Courteenhall East Lodge, which comprises a collection of residential and commercial buildings. Courteenhall East Lodge is located approximately 211m north of the proposed Site boundary. There is the potential for bioaerosol release when waste is received, from straw / silage 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 hopper throughout the day as its produced. Silage is stored covered and within the silage clamps.	Activities will be managed and operated in accordance with a written management system which will include the following measures: • 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. • Silage is managed in accordance with the Feedstock Management & Loading Procedure **(**HRCL**-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1)**. • Process monitoring to ensure the production of a stable digestate with low residual biogas in accordance with the Process Monitoring Procedure **(HRCL-QUAL-PROCESS MONITORING-WI16-P1)** • Management systems to ensure that digestate fibre doesn't accumulate on site; Digestate Handling Procedure **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1)**.	**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?
							Liquid feedstocks are stored within a covered tank and displaced air will be discharged through a carbon filter. Manures are stored and treated within an enclosed dedicated Manure reception building with air handling and emissions abatement. Digestate liquor is stored within a covered Digestate storage lagoon with emission abatement. Digestate fibre is stored within a covered bunker and is removed continuously from site to destination field heaps. The tanker off-take points for digestate are each fitted with a carbon filter. A Site Specific Bioaerosol Risk Assessment[2] (SSBRA) has been carried out and indicates that the residual risk from all sources associated with the AD Plant 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.		

[2] Bioaerosol Risk Assessment, Horse Close Anaerobic Digestion Plant, Reference: 8876, February 2025

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**	There is a permitted poultry Installation located 10 m to the north east which provides chicken manure for the AD Plant. Typically the poultry Installation staff are only present on Site for short periods of time (<6 hrs at a time) and are likely to be within the poultry unit itself. The closest receptor is Courteenhall East Lodge, which comprises a collection of residential and commercial buildings. Courteenhall East Lodge is located approximately 211m north of the proposed Site boundary. 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 • digestate Liquid feedstocks are stored within a covered tank and displaced air will be discharged through a carbon filter. Manures are stored and treated within an enclosed dedicated Manure reception building with air handling and emissions abatement. Digestate liquor is stored within a covered digestate storage lagoon	An Odour Management Plan **(HRCL-ETL-OMP-RPT-P1**) 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 **(HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1)**. 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-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)** and Feedstock Management & Loading Procedure **(HRCL-QUAL-FEEDSTOCK MANAGEMENT-WI13-P1)**. The Manure reception building emissions abatement plant is inspected and maintained in accordance with manufacturers recommendations. Minimisation of biogas loss as per 1.1 above. Control of emissions from digestate storage as per 1.2 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 ?**
							with emission abatement. Digestate fibre is stored within an enclosed bunker and is removed continuously from site to destination field heaps. The tanker off-take points for digestate are each 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 cause an odour impact at human receptors. **Error! Bookmark not defined.**	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 **(HRCL-QUAL-PROCESS MONITORING-WI16-P1).**	
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. There is a permitted poultry Installation located 10 m to the north east of the proposed AD Plant. Typically the Poultry Installation staff are only present on Site for short periods of time (<6 hrs at a time) and are likely to be within the poultry unit itself. The closest receptor is Courteenhall East Lodge, which comprises a	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 **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1)** and / or Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**, to ensure it is suitably maintained and reduce the likelihood of noise from improper upkeep.	**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?
							collection of residential and commercial buildings, including agricultural premises and an aggregate supplier. Courteenhall East Lodge is located approximately 211m north of the proposed Site boundary. 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 of agricultural by-products and the export of digestate to/from the site to between 0800- and 1800-hours Monday – Friday and 0800 to 1300 Saturday. Except during periods of specific agronomic crop benefit in March, May and July the export of digestate can take place between 0800- and 1800-hours Monday – Sunday.	Emergency flare use will be minimised with operating hours recorded on SCADA. A copy of the Environment Agency's Qualitative Noise Screening Assessment Tool (QNST) has been completed for the Site which concludes that neither a Noise Impact Assessment nor a Noise Management Plan are required at this time. If noise emissions are detected off-site then corrective actions will be taken as soon as possible and a Noise Management Plan (NMP) will be developed, submitted to the EA and implemented.	
2.1 Local human population, livestock and wildlife after gaining unauthorised	Gaining unauthorised access to the installation.	There is a risk of direct physical contact with all on-site hazards such as wastes,	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 **(HRCL-ETL-EMS-MAN-P1)** to prevent unauthorised access. The site will benefit from:	**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?**
access to the installation.		machinery and vehicles. There is a risk of causing injury to humans or livestock.						• 2.4m high anti-climb mesh fencing is installed around the site, with additional safety fencing around the Digestate storage lagoon, Clean water lagoon and Dirty water lagoon. • 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. • The main gate will be locked when the site is not manned. • Any security breaches will be reported to Management. The site specific DSEAR risk assessment **(HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1)** 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 and local environment.	Arson and / or vandalism causing the release of polluting materials to	Respiratory irritation, illness and nuisance to local population.	Air transport of smoke. Spillages and contaminated firewater by direct run-off	Low	Medium	**Medium**	The consequences of an incident whereby substances are released to air, water or land may be serious, affecting both human health and the	As above. An Accident Management Plan Manual **(HRCL-ETL-AMP-RPT-P1**) forms part	**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?
	air (smoke or fumes), water or land.	Injury to staff, fire fighters or arsonists/ vandals. Pollution of water or land.	from site and via surface water drains and ditches.				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. Biogas is flammable, risk of direct physical contact is reduced by activities being carried out within enclosed systems.	of management system (includes fire, biogas release and spillages). The site specific DSEAR risk assessment **(HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1)** 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 **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1)** 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. 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 **(HRCL-ETL-AMP-RPT-P1).** This will include contingencies for waste diversion and	

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 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. 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 **(HRCL-ABL-DSEAR RISK ASSESSMENT-H&S-P1)** including planned maintenance schedules **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1)**. An Accident Management Plan Manual **(HRCL-ETL-AMP-RPT-P1**) forms part of management system (includes fire, biogas release and spillages). A Training procedure **(ABL-QUAL-TRAINING-PRO-P1)** and Overarching Skills and Competency Matrix (**ABL-QUAL-SKILLS & COMPETENCY MATRIX-MAT-P1**) 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	**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 EMS Manual **(HRCL-ETL-EMS-MAN-P1).**	
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 control measures in place and 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 **(HRCL-ABL-LIGHTNING RISK ASSESSMENT-H&S-P1)** 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 with any manufacturers' recommendations. A Fire Risk Assessment will be undertaken for the Site and the required control measures will be implemented.	**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?**
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, non-hazardous liquid waste 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-ENV-FEEDSTOCK ACCEPTANCE & REJECTION-PRO-P1)**. 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-ENV-SAMPLING & ANALYSIS-PRO-P1**)) to ensure it is suitable for application to land and it is applied at an appropriate rate (Digestate Management Plan **(HRCL-ETL-DMP-RPT-P1)**). 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.	Construction Quality Assurance validation will be undertaken on all anaerobic digestion tanks and ancillary tanks where appropriate and reports will be retained. All storage areas and containment are designed and constructed to the relevant industry standard (SSAFO for	**Low**

							The site is within the Nene Catchment and there is a watercourse 28m northwest of the site boundary which feeds into a small inline pond (approximately 50m^2 in area) and then into a tributary of the Wootton Brook (2.9km north of the site). There is a new pond, a biodiversity enhancement feature, to be built and landscaped to the northeastern corner of the site. The site is also within a Drinking Water Safeguard Zone for Surface Water (Anglian_SWSGZ1006,1007,1008,1009,1010_River Nene) 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 checked daily **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**. There will be a documented drainage plan for the site. 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).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 covered storage lagoon with leak detection.	silage clamps & CIRIA 736 for primary and secondary containment). 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 **(HRCL-QUAL-DRAINING MANAGEMENT AND CONTROL-WI23-P1)**. All staff will be trained and conversant with the site's Accident Management Plan Manual **(HRCL-ETL-AMP-RPT-P1)** 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?**
							Oil storage tanks are to be provided with the CHP Engines and are bunded within the container.		
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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)** & Maintenance Planner **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1)**. The Digestate storage lagoon and Dirty water lagoon will be inspected daily and a freeboard of 750mm maintained	**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?**
								within each at all times **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1)**. The transfer of digestate will be supervised and undertaken in accordance with the Digestate Handling Procedure **(HRCL-QUAL-DIGESTATE HANDLING (SOLID AND LIQUID)-WI25-P1)**.	
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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1**) and the digesters are subject to integrity testing every 5 years, which is captured on the Maintenance Planner **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1**). The 1 No. leak detection pot to HDPE layer (under concrete slab) to be inspected every day in accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).** The 3No. leak detection pots for the digesters will be checked daily in	**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?
								accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**	
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 system can be isolated with the use of a penstock stopping any further releases to Clean water lagoon.	Risk management is as set out in 5.1, 5.2 and 6.1. The 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 **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1**). Underground pipework has been avoided where possible and with the exception of drainage pipework is limited to a small stretch of HDPE pipework beneath the farm track, transferring separated liquor digestate to the Digestate Lagoon. The lagoon pipework benefits from secondary containment and leak detection. All drainage within the containment system will be located above the 1.0mm HDPE membrane, with pipes, channels &	**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?
								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 pot on a daily basis will identify any leaks arising from the concrete slab. The sub-surface tanks, namely the Silage Effluent Tank and the Digesters (slightly submerged) benefit from leak detection. Leak detection pots will be inspected daily in accordance with Daily Checks **(HRCL-QUAL-DAILY CHECKS-AQD 24-P1).**	
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. The digesters and ancillary tanks are all covered and gas tight. 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	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 **(HRCL-**	**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?
							reception building with air handling and emissions abatement. Digestate liquor is stored within a covered Digestate storage lagoon with emissions abatement. Digestate fibre is stored within a covered bunker and is removed continuously from site to destination field heaps. The tanker off-take points for digestate are each fitted with a carbon filter.	**QUAL-DAILY CHECKS-AQD 24-P1)**. • Process monitoring of the AD plant will minimise excess biogas production and the likelihood of an overpressure event – Process Monitoring Procedure **(HRCL-QUAL-PROCESS MONITORING-WI16-P1)**. • The emergency flare has a set point lower than that of the PVRVs minimising emissions of unburnt biogas. The operation of the 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. • The Gas holder will be maintained as per manufacturer's recommendations and will be included on the Maintenance Planner **(HRCL-QUAL-MAINTENANCE PLANNER-AQD 27-P1**).	
9. Protected Sites, including National Parks and Areas of Outstanding	Any, but principally NOx and NH_3.	Harm to protected sites:	Any	Low	Low	**Low**	Anaerobic digestion operations may cause harm to and deterioration of nature conservation sites. The site is located:	Control measures as detailed under 1.1, 3.1, 3.2, 3.3, 5.1, 5.2, 6 and 8 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 ?**
Natural Beauty, Marine Conservation Zones, Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas & Ramsar wetland sites		-contamination -nutrient enrichment -leachate - surface water run-off -smothering -disturbance -predation from pests and vermin					>500m from any European site (defined within Regulation 8 of the Conservation of Habitats and Species Regulations 2017) 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, specifically an area designated as Priority Habitat (PHI) deciduous woodland adjacent to the southwest corner of the AD site area and west of the lagoon and a further PHI woodland area around 34m to the northwest of the site boundary. 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.	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. 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 covered lagoon with emissions abatement. There is a carbon filter on both vents 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.[14]

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

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'[15]

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	500kW for biogas (BG), 560 kW for natural gas (NG)	Not applicable	588 (BG)* 659 (NG)*
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.

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

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

Appendix C – Nature and Heritage Conservation Screening Reports

Nature and Heritage Conservation

Screening Report: Bespoke installation

Reference	**EPR/RP3426SN/P001**
NGR	**SP 77433 52673**
Buffer (m)	**190**
Date report produced	**15/03/24**
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 Protection Area (pSPA or SPA) **Upper Nene Valley Gravel Pits**	10	Joint Nature Conservation Committee and Magic map
Ramsar **Upper Nene Valley Gravel Pits**	10	Joint Nature Conservation Committee and Magic map

Local Wildlife Sites (LWS) (see map below) **Roade Disused Railway East, Salcey Forest, Rowley Wood, Preston Wood**	2	Appropriate Local Record Centre (LRC)
Ancient Woodland **Salcey Forest, Rowley Wood**	2	Woodland Trust Forestry Commission Natural England and Magic map

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.

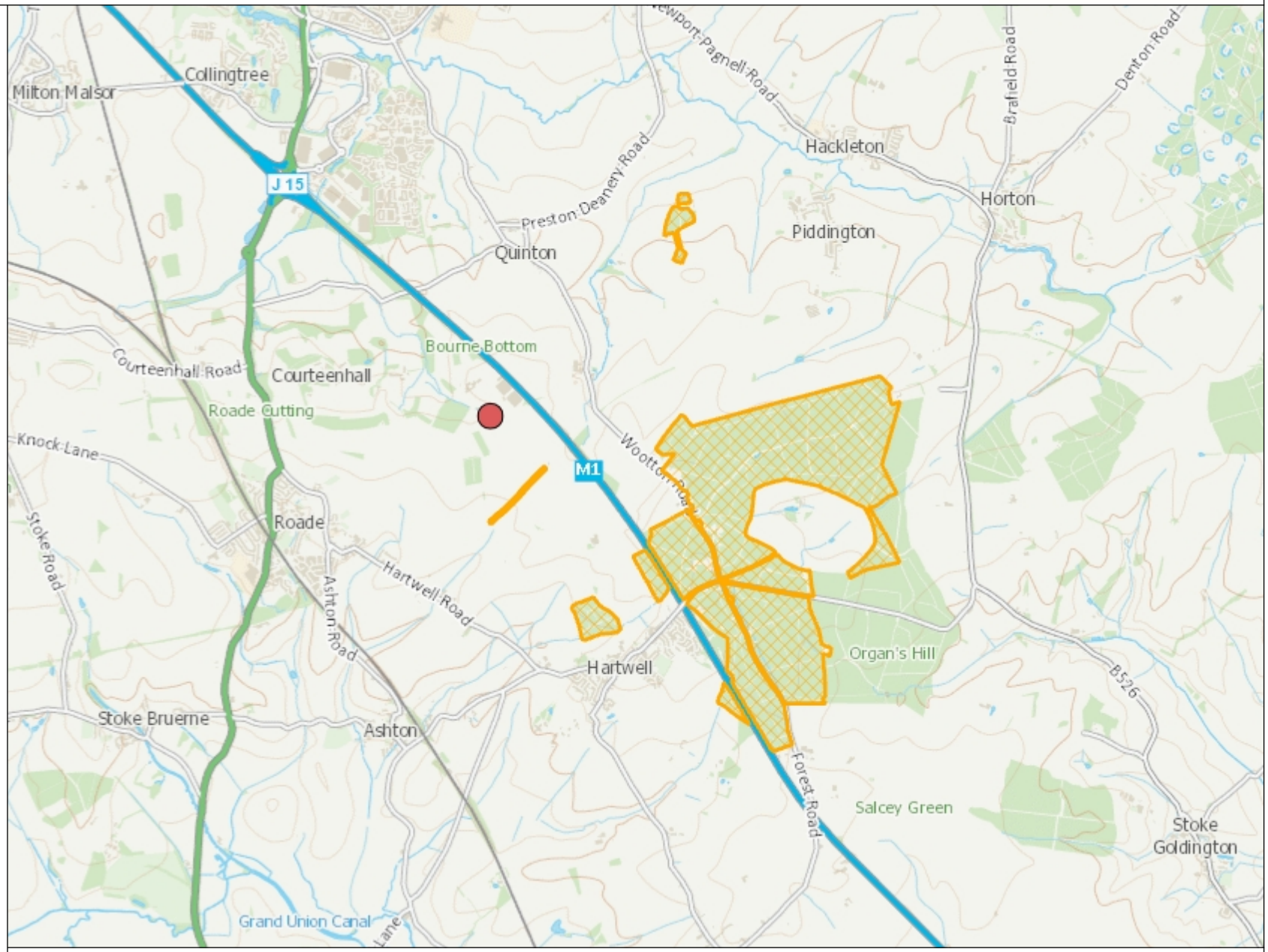
The nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application,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

Local Wildlife Sites

Environment Agency

Legend

Local Wildlife Sites



1: 50,000

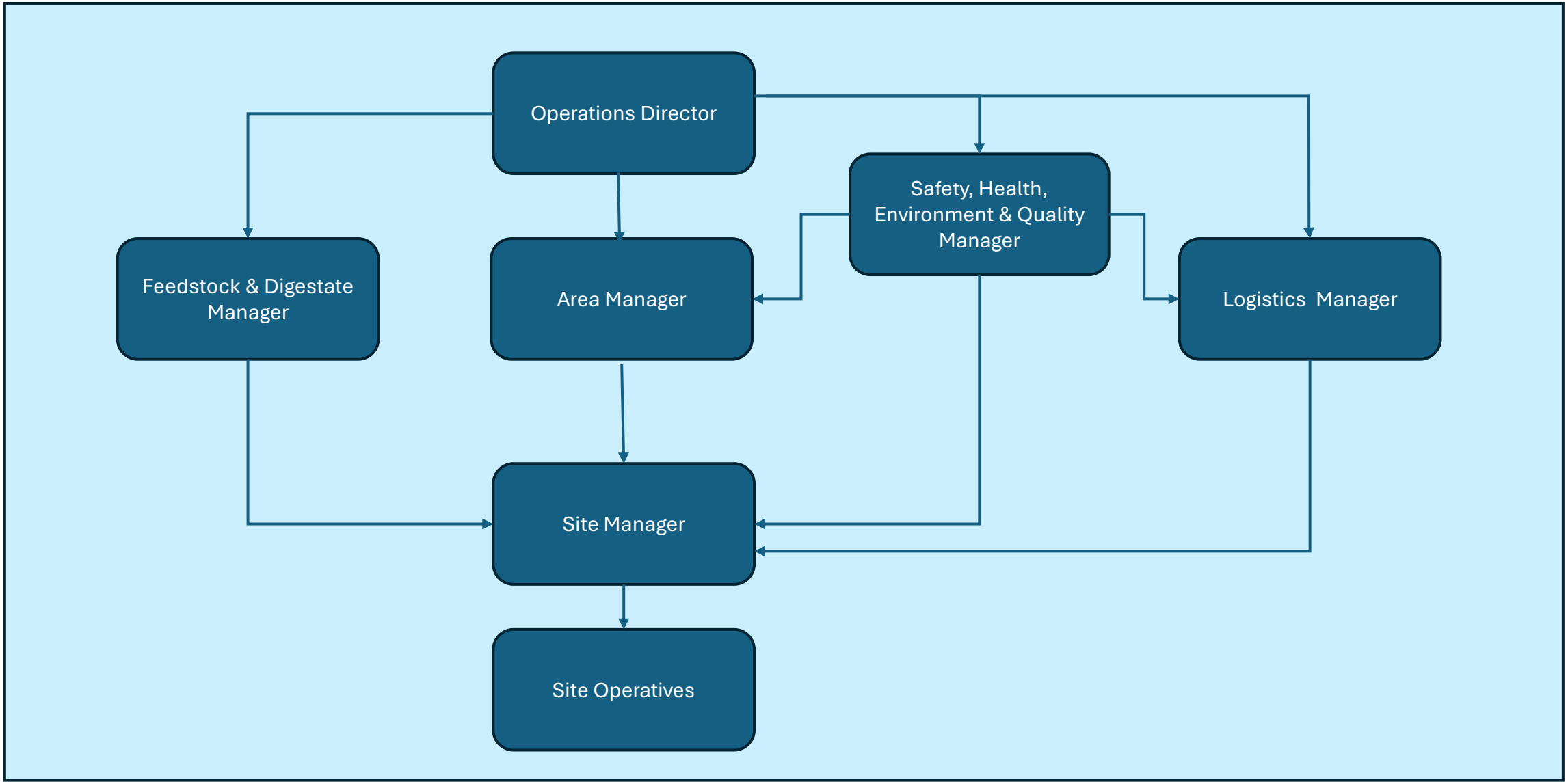
0 1,250

Metres

N W E S

Appendix D – Staff Organogram

HRCL-ABL-Staff Organogram-QUL-P1 Horse Close AD, Staff Organogram V1.0, December 2024



Appendix E - Process Flow Diagram

AS NOTED ON A1 FRAME

MAIN WATER SUPPLY

MAINS WATER BREAK TANK

17.1 WATER DISTRIBUTION SYSTEM - POWER RING I

17.2 WATER DISTRIBUTION SYSTEM - POWER RING II

17.3 WATER DISTRIBUTION SYSTEM - POWER DIGEST

FIRE WATER TANK

30.1 GAS FLARE

19.1 DESULPHURISATION OXYGEN GENERATOR

1.1 SOLID FEEDING SYSTEM 1 - 120m³

STRAW PRE-TREATMENT HALL

USED WATER

STERILISER

FILTER

1.4 LIQUID FEEDING SYSTEM 4-65m³

MANURE BUILDING

1.3 LIQUID FEEDING SYSTEM 3-65m³

1.2 SOLID FEEDING SYSTEM 2-120m³

4.1 5.1 POWER RING 1 45/26/9

(10mB To 12 mB)

4.2 5.2 POWER RING 2 45/26/9

(10mB To 12 mB)

3.1 PUMPING STATION 1

3.2 PUMPING STATION 2

DIGESTATE BUFFER TANK (BIOGEST SUPPLY)

WATER TANK 1 (BIOGEST SUPPLY)

WATER TANK 2 (BIOGEST SUPPLY)

LIQUID FEEDSTOCK TANK (BIOGEST SUPPLY)

24.3 SILAGE WATER SHAFT

21.1 GAS VALVE CHAMBER 1

21.2 CONDENSATE CHAMBER 1

CONDENSATE (BY CLIENT)

DOUBLE MEMBRANE GASHOLDER

12.1 POWER DIGEST 34/9

MDP 7mB

7.1 SEPARATOR

7.2 SEPARATOR

14.1 HYGIENIZED DIGESTATE TANK

32.1 HEAT DISTRIBUTION (AD HEATING)

37.1 HYGENISATION

32.2 HEAT DISTRIBUTION (HYGIENSATION)

10.1 CLEAN WATER LAGOON

DIRTY WATER LAGOON

10.2 LIQUID DIGESTATE LAGOON

24.1 SUMP PIT 1

24.2 SUMP PIT 2

BRIGHT UPGRADER

HEAT REMOVAL

(PR000136-104-PID05-80)

BIOGAS COOLING

(PR000136-104-PID04-60)

BIOGAS FILTRATION

(B0000-PID06-50-A)

DELIVERY

(PR000136-104-PID10-61)

BIOGAS UPGRADING

(PR000136-104-PID10-60)

COMPRESSING SYSTEM

(PR000136-104-PID08-65)

UTILITIES

(B0000-PID11-11)

UTILITIES

(PR000136-104-PID11-10)

CONTAINER ATEX

ATEX CONTROL ROOM (SAFE AREA)

SAFETY BLOW OFF

CO2 TO AIR

BRIGHT CO2 LIQUEFACTION

CO2 AIR COOLING

(C0000-PID09-30)

CO2 REFRIGERATION

(C0000-PID10-30)

CO2 COMPRESSING

(PR000136-104-PID05-30)

CO2 DRYING

(C0000-PID08-30)

CO2 STRIPPING

(PR000136-104-PID07-30)

CO2 FILTRATION

(C0000-PID04-35)

LIQUID CO2 STORAGE

(PR000136-104-PID08-23)

LIQUID CO2 TO TRUCK

GAS RETURN FROM TRUCK

UTILITIES

(PR000136-104-PID11-30)

WATER SUPPLY

VERIFICATION GAS

TRUCK SAMPLING

BIOGAS PRE-TREATMENT

GAS DEHUMIDIFIER & BOOSTER

CARBON FILTRATION

CONDENSATE POT

HEAT & POWER SERVICES

3000L BUFFER VESSEL (HPS)

(ACO-GEN-PID-001)

IMW CNG COMPRESSOR No.1

PROPITATORY PANEL

IMW CNG COMPRESSOR No.2

CNG GAS STORAGE

300Bar WORKING PRESSURE TOTAL STORED GAS @ 15°C 652m3

CNG GAS CHILLER

CNG TRAILER DISPENSER No.1 (SAFE)

CNG TRAILER DISPENSER No.2 (SAFE)

CNG VEHICLE FUELING DISPENSER (SAFE)

32.1 CHP No.1 (TEDOM)

32.2 CHP No.2 (TEDOM)

32.3 BIOGAS BOILER (560kW)

DN150 (SHL St.St.)

NOTES:-

KEY

- BIOGAS
- BIOMETHANE
- BIOMETHANE REJECT
- NATURAL GAS
- CARBON DIOXIDE
- CONDENSATE
- OXYGEN
- HOT WATER
- COLD WATER
- DIGESTATE
- LIQUID WASTE/SUBSTRATE
- FRESH WATER
- WASTE WATER
- SIGNAL CABLE

PIPE IDENTIFICATION

1	PIPE SIZE
2	MATERIAL
3	DESIGNATION
4	FLOW RATE

Rev	Date	Description
B	12/12/24	UPDATED
A	17/06/24	FIRST ISSUE

PRELIMINARY

acorn BIOENERGY

Job Title

AD Plant.
HORSE CLOSE

Drawing Title

PROCESS FLOW DIAGRAM
HORSE CLOSE

Status: PRELIMINARY

Scale: N.T.S.

Date: Jun '24

Drawn By: NDJ

Checked: – –

Drg. No.: HRCL-ABE-PFD-001 B

Appendix F - Drainage Process Flow Diagram

HRCL-ETL-Drainage Process-PFD-P1 Horse Close AD, Drainage Process Flow Diagram V1.0, February 2025