Non-Technical Summary
Variation to Installation Permit

Site name: **Bore Hill Farm Biodigester**

Site address: **Deverill Road, Warminster, Wiltshire, BA12 8FB**

Operator name: **Malaby Biogas Limited**

Written by Emily Pitts, Shann Pitts Consulting, 4th February 2022

Document Ref: SPC0014/Variation/NTS/V1/Malaby Biogas/February 2022

Shann Pitts Consulting Limited

Westbrook Farm, Westbrook, Gillingham, Dorset, SP8 5DT

Mob: 07866 024096

emily@shannpittsconsulting.co.uk

www.shannpittsconsulting.co.uk

Table of Contents

1 Introduction

This Non-Technical Summary has been prepared by Shann Pitts Consulting Limited (SPC) on behalf of Malaby Biogas Limited (Malaby Biogas) to support a substantial variation permit application to vary the existing bespoke waste operation permit to a bespoke installation permit for the anaerobic digestion (AD) plant at Bore Hill Biodigester, Deverill Road, Warminster, Wiltshire, BA12 8FB herein termed 'the Site'.

The application has been prepared by SPC in conjunction with and on behalf of the Operator Malaby Biogas.

Basic pre-application advice has been sought from the Environment Agency with respect to this permit variation application (Reference EA/EPR/AB3036RT/V005).

A full Environmental Risk Assessment has been carried out and is provided as a supporting document to the permit application.[1] This Non-Technical Summary highlights the key control measures that will be employed to minimise any impacts from the operational site and signposts the reader to the key supporting documents.

The site planning permission has been reviewed and the proposed increase in permitted annual tonnage doesn't impact compliance with the site planning permission (Wiltshire Council, Application Reference W/10/03967/WCM).

2 Permitting

2.1 Permitting history

On 21st February 2012, Malaby Biogas were issued with the original bespoke waste operation permit to regulate the operation of Bore Hill Biodigester (EPR/AB3036RT).

Since its issue, the permit has been varied three times;

- In December 2014 for the inclusion of European Waste Catalogue (EWC) code 19 05 99;
- In April 2016 to increase the permitted maximum annual waste throughput from 22,000 tonnes to 28,000 tonnes; and
- In January 2017 to add EWC code 19 02 03 and remove EWC code 02 04 99 from the permit. As part of this variation, there was an Environment Agency initiated variation to add a standard fire prevention permit condition.

2.2 Current permit

The current bespoke waste operation permit authorises the treatment of up to 28,000 tonnes per annum of biodegradable food wastes from source separated commercial and industrial sources, including Category 3 Animal By-Product (ABP) wastes such as catering wastes, blood and animal flesh and Category 2 ABP waste (paunch contents only) as well as manures and slurries.

[1] SPC0014/Variation/ERA/V1/Malaby Biogas February 2022

2.3 Proposed changes

2.3.1 Listed Activities

The regulated facility now requires a bespoke installation permit for two reasons:

- To reflect a treatment capacity of the AD plant of over 100 tonnes per day. This activity falls under S5.4 Part A(1)(b)(i) of the Environmental Permitting Regulations 2016 - *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 100 tonnes per day involving biological treatment*. The treatment capacity calculations are in Appendix B.
- To remove the current 10 tonnes per day limit for animal waste; a revision to up to 100 tonnes per day is requested. This activity falls under S6.8 Part A(1)(c) of the Environmental Permitting Regulations 2016 - *Disposing of or recycling animal carcasses or animal waste, other than by rendering in a small waste incineration plant, at a plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste or both in aggregate.*

The proposed Listed Activities and Directly Associated Activities, along with the relevant waste codes are detailed within the supporting Permitted Activities document.[2]

2.3.2 Tonnages

The substantial permit variation is required to reflect an increase in the maximum permitted annual tonnages of waste accepted from 28,000 tonnes per annum (tpa) to 40,000 tpa, due to a revised feedstock balance including more liquid waste streams and waste streams with a lower biogas potential which became evident during the pandemic. As a response to changes in market conditions (as evidenced by covid-19) as well as ongoing process efficiencies such as improved biological capacity, mechanical improvements and an increased policy focus on innovation and resource efficiency, the site needs to ensure it is able to manage its operational activity to meet external demands safely.

2.3.3 Permitted Area

It is proposed to increase the permitted area to the north to incorporate a future development area to include the following Directly Associated Activities:

1. Upgrading of excess biogas to biomethane for use as a flexible and transportable renewable fuel and associated storage of biomethane;
2. Capture, use and/or storage of carbon dioxide derived from the biogas upgrading process;
3. Treatment of digestate. Whilst the detail for this has not been determined, it is requested that it is retained as permitted activity.

It is also proposed to use the future development area to undertake field-based extension services linked to process optimisation and technical improvement and development including:

- feedstock selection and pre-treatment to improve digestibility (e.g., heat, pressure, mechanical, chemical intervention);
- biological process improvements (e.g., bacterial speciation, metagenomics, biomethanisation etc);
- energy conversion improvements;

[2] SPC0014/Variation/Permitted Activities/V1/Malaby Biogas February 2022

- GHG emissions reduction (e.g., CO2 conversion, carbon capture, use and/or storage, ammonia reduction);
- air borne emissions reduction techniques (e.g., reduction of direct and indirect particulates, ammonia, odour); and
- Digestate quality improvement (e.g., tertiary treatment, microscreening, dewatering).

The proposed permit boundaries are shown in Figure 3 – Proposed Permitted Area and Emission Points (MBLDOC-029 ISS1) (Appendix A). The current permitted area is approximately 0.8 hectares (2.0 acres) in extent. The proposed permit variation is to extend the regulated facility by 0.5 hectares (1.1 acres) to create a regulated facility with an area of approximately 1.3 hectares (3.1 acres) to encompass the proposed future development area. The Site Condition Report which supports this application describes the current condition of the additional proposed permitted area.[3]

2.3.4 Waste Codes

There are no proposed additional European Waste Catalogue (EWC) codes.

It is requested to remove EWC codes 03 03 02, 03 03 08 and 07 02 13 in line with Appendix B of the Anaerobic Digestion Quality Protocol[4] as the acceptance of these currently permitted waste streams would compromise the producer status of Malaby Biogas under the Biofertiliser Certification Scheme. They have not been accepted as feedstocks to date.

2.3.5 Waste Storage

The variation is requested to allow the storage of undamaged, packaged, palletised and wrapped food waste on the external yard area in front of the Reception Hall (up to 200 tonnes at any one time). There is no change to maximum tonnages or maximum residence times for solid waste within the Reception Hall or liquid waste in the Feedstock Buffer Tank.

The proposed waste storage on site is shown in Table 1:

Table 1 – Proposed waste types, storage arrangements, tonnages and residence times

Type of waste	Storage location	Maximum tonnage at any one time (tonnes)	Maximum residence time
Loose or packaged food waste	Bay in Reception Hall	60	72 hours
Packaged, palletised and wrapped food waste	Concrete apron	200	28 days
Liquid waste	Feedstock Buffer Tank	300	5 days
Total storage capacity		560	

The relevant proposed control measures for the storage of undamaged, packaged, palletised and wrapped food waste on the external concrete yard area are detailed in Section 5 – Control of Emissions to Land and Water.

[3] SPC0014/Variation/SCR/V1/Malaby Biogas February 2022
[4] Anaerobic Digestion Quality Protocol, Wrap & Environment Agency, LIT 5020, January 2014

2.3.6 Miscellaneous

A new back-up generator is being installed to be used when there is a power failure.

It is also requested to correct the site postcode to BA12 8FB as the current permit incorrectly states BA12 8BD.

3 Site Details

3.1 Location

Site Address: Bore Hill Biodigester, Deverill Road, Warminster, Wiltshire, BA12 8FB

National Grid Reference: ST 86707 43640

Local Authority: Wiltshire County Council

3.2 Site Sensitivities

3.2.1 Human Receptors

Table 2 – Human Receptors

Receptor ID	Description	National Grid Reference	Distance from site boundary (m)	Direction from AD plant
R1	Residential – Deverill Road	ST 86754 43705	Adjacent	North-east
R2	Residential – Butler's Coombe Farm	ST 86964 43587	217	East
R3	Residential – A350	ST 86789 43385	200	South- east
R4	Farm – A350	ST 86712 43329	280	South
R5	Residential – Bradley Close	ST 86501 43830	210	North - west
R6	Residential – Ludlow Close	ST 86589 43880	190	North- west
R7	Residential - Ludlow Close	ST 86757 43867	119	North
R8	Residential – Ashley Place	ST 86811 43845	127	North-east
R9	Residential – Ashley Coombe	ST 86941 43873	244	North- east

R1 is owned by the operator and therefore is classified as a sensitive receptor for potential health impacts but not for potential amenity impacts.

3.2.2 Surface Water

The site is not within a Drinking Water (Surface Water) Protected Area or Drinking Water (Surface Water) Safeguard Zone.[5]

[5] https://magic.defra.gov.uk/MagicMap.aspx Accessed 19th January 2022

There are no recorded surface water features within 500m of the site. The river Wylye runs in a northerly direction 652m to the east of the site. The site is within the Wylye (Headwaters) Water Framework Directive catchment which assigned an overall rating of poor in 2019. There are two current surface water abstractions from the River Wylye 738m and 752m southeast of the site respectively; the abstracted water is used for hydroelectric power generation. These abstractions are upstream of the site. [6]

3.2.3 Groundwater

There is a secondary undifferentiated superficial aquifer of high vulnerability at southern end of the site, largely to the south of the secondary containment area within the existing permitted area. The rest of the site footprint including the new proposed permitted area is not underlain by a superficial aquifer. The bedrock aquifer across the whole site is a principal aquifer of high vulnerability.

The site is within the Upper Hampshire Avon Water Framework Directive groundwater body which was assigned an overall rating of poor in 2019.

The site is outside any groundwater source protection zones and there are no licensed groundwater or potable abstractions within 500m.[6]

The site is not within a Drinking Water (Groundwater) Safeguard Zone.[7]

3.2.4 Flood Risk

The site is within a Flood Zone 1 which is defined as land and property having a less than 1 in 1,000 annual probability of river or sea flooding.[8]

There is however a risk of surface water flooding at the southern end of the site, outside the waste storage and treatment areas. The highest risk of surface water flooding at greater than 1.0m is 1 in 30 years.

[6] Enviro Insight Report, Groundsure, GS-8454171, January 2022
[7] https://magic.defra.gov.uk/MagicMap.aspx Accessed 19th January 2022
[8] https://flood-map-for-planning.service.gov.uk Accessed 19th January 2022

3.2.5 Ecological Receptors

The nature and heritage conservation sites identified through a screening report provided by the Environment Agency in February 2019[9], identifies the sites in Table 3 below for consideration within the permit variation application:

Table 3: Nature and Heritage Conservation Sites within relevant screening distance

Site name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site
Special Areas of Conservation (cSAC or SAC)	**1000**		
River Avon SAC		650	east
Sites of Special Scientific Interest (SSSi)	**1000**		
River Avon System (SSSI)		650	east
Deciduous Woodland	**500**		
Wooded area within A36 road cutting - southwest side of trunk road		35	west

The screening report with maps is in Appendix C. The impact of the proposed changes upon these receptors has been assessed through a Nature and Heritage Conservation Risk Assessment which forms Appendix D.

3.2.6 Air Quality Management Areas

The closest Air Quality Management Area is in Westbury 7.2km to the north of the site.

3.3 Process Summary

This section should be read with reference to the Simplified Flow Diagram (Appendix E).

Subject to waste pre-acceptance procedures, solid and liquid waste is accepted over the weighbridge. Solid waste is deposited in the Reception Hall. The fast-acting roller shutter doors are only open to allow vehicles to enter and leave the building. Packaged food waste is loaded from its reception bay into the depackaging plant within the Reception Hall; the resulting residual waste is stored in the Reception Hall pending removal off-site for recovery (energy from waste). Loose food waste is loaded from its reception bay into a hopper within the Reception Building. The two solid waste streams are macerated and mixed with liquid waste as required and pumped into the Feedstock Buffer Tank ($300m^3$) which is within the secondary containment area.

There is a proposal to store undamaged, packaged, palletised and wrapped food waste on the external yard area in front of the Reception Hall (up to 200 tonnes at any one time). This waste will be moved to the Reception Hall for unpacking and treatment.

Liquid waste deliveries are dispatched via a sealed and pumped direct pipe connection at the liquid waste dispatch point, which is on the external concrete apron, and is fed directly into the Feedstock Buffer Tank.

[9] Nature and Heritage Conservation Screening Report, EPR/AB3036/V005, Environment Agency, 19/02/2019

The prepared feedstock is pumped from the Feedstock Buffer Tank into one of two primary digester tanks, each with a working capacity of 1,420m^3. These digester tanks are gas mixed. The average hydraulic retention time in the digesters is 30 days. Digestate is then screened via a 10mm screen before entering the pasteurisation unit which treats the digestate at least 70^{0}C for one hour. The resulting pasteurised digestate is then stored in the digestate storage tank which has a working capacity of 1,420m^3.

Biogas is collected in the gas holders above the digesters and the digestate storage tank.

Digestate is taken off site in tankers for use as an agricultural fertiliser which is managed under contract. Biogas is burnt in the two Combined Heat and Power engines (499kW and 530kW) to produce electricity and heat which are both used in the anaerobic digestion plant. There are two back-up boilers (both 300kW) which are used to provide additional heat if required. There is a surplus gas burner (flare) for use during abnormal or emergency operating conditions only. Any electricity produced which is in excess of the anaerobic digestion plant requirements is exported to the National Grid.

There is a trickling bed biofilter which treats air from the reception hall, displacement air from liquid waste deliveries into the feedstock buffer tank, displacement air from tankers removing liquid digestate and the screener.

There is a proposal for the installation of a modularised green gas fuel (GGF) production plant to provide additional processing capacity to support CHP utilisation of biogas from the plant. The GGF system will initially act as a backup system for the two CHPs and boilers and become the preferred route to use of biogas ahead of the surplus gas burner (flare). It will also act to support increased gas production resulting from the increased biological efficiency of the AD plant. GGF plant will be installed to optimise biomethane production in parallel with electrical generation from the biogas produced. Carbon dioxide will be captured, used and/or stored as appropriate technology is developed to do so.

The modularised upgrading consists of carbon filters and water wash columns/membranes used to clean residual contaminants from the already cleaned biogas produced on site and then dissolve/filter the carbon dioxide out of the biogas to produce biomethane. The biomethane is then dried and compressed using a 3-stage hydraulic compression system before being stored in compressed biomethane storage modules before being dispensed into vehicles for removal off site.

3.4 Infrastructure

3.4.1 Existing infrastructure

The existing site infrastructure comprises:

- Liquid waste dispatch point
- Reception hall with fast acting roller shutter doors and air handling system containing
    - Storage bays for loose and packaged waste
    - Feed hopper for loose solid waste
    - Depackaging plant (attritor)
- Secondary containment system containing:
    - Feedstock buffer tank (working capacity 300m^3)
    - 2 No. Primary digesters (working capacity 1,420m^3 each)
    - 1 No. Digestate storage tank (working capacity 1,420m^3)
    - Vibrating screen separator
    - Pasteurisation unit
- Digestate dispatch point
- Compressors
- No. Combined heat and power engines (499kW and 530kW)
- 2 No. back-up boilers (300kW each)
- Surplus gas burner
- Odour abatement plant and associated air handling and stack dispersion systems
- Clean and dirty drainage system including a soakaway for clean water

3.4.2 Proposed infrastructure

Proposed infrastructure comprises:

- Back-up generator
- Biogas upgrade plant
- Compressors for biomethane
- Storage for compressed biomethane
- Storage for carbon dioxide

4 Management

The operations on-site are controlled through an accredited ISO14001 and 9001 integrated management system which covers all aspects of operation including preventative maintenance, staff competence and training and effective management of incidents and accidents.

There are two Technically Competent Managers as detailed in Part C2 of the application form. This allows contingency for holiday and absence periods.

Roles and responsibilities are summarised within the Staff Organogram which forms Appendix F.

5 Control of Emissions to Land and Water

5.1 Overview

The key control measures will remain unchanged as a result of the proposed variation. They are summarised within the Environmental Risk Assessment.[1]

5.2 Tonnages

The increase in annual tonnages up to a maximum of 40,000 tpa is to reflect a change in the feedstock make-up as less high energy solid food wastes are accepted in favour of more low dry matter, lower gas yield liquid wastes. As described in the process summary, liquid wastes are all dispatched into the Feedstock Buffer Tank which sits within the secondary containment system. The transfer process is via a dedicate pipe connection, pump and valve system controlled by trained site staff. Minor spills arising from connection and disconnection of the pipe from the delivery tanker are contained by use of moveable, large area drip drays which are managed by site staff. All liquid deliveries are supervised by trained site staff and dedicated spill kits and clean up equipment are located in the dispatch area.

A report on the design of the secondary containment system in line with C736 Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises[10] was commissioned in January 2022. The report forms Appendix G.

Uncontrolled spillages are avoided by use of large volume drip trays at the connection point and supervision of connections and operation of transfer pump and valves by trained and experienced site staff. Large spills and breaches are controlled via containment within the concrete dispatch area, clean up using readily accessible equipment and use of dedicated spill kits. Drainage gullies are located at the opposite end of the yard (50m) to ensure containment and controlled clean-up is possible before spills enter the drains.

5.3 Waste Storage

Palletised food waste will be handled in accordance with proposed standard operating procedures which will ensure the following measures are employed:

- All palletised waste will be inspected upon receipt and only totally undamaged, packaged, palletised and wrapped food waste will be stored on the external yard area in front of the reception hall. Any pallets containing damaged containers will be stored within the reception hall.
- The pallets will be stored in a dedicated location away from vehicle movements and protected by visible demarcation equipment (e.g., cones, barricades, bollards).
- Waste will be moved from the external yard into the reception hall using a first-in first out procedure where possible and accounting for other waste inputs that are more time critical. Movements will be carried out using existing standard operating procedures to ensure that the roller shutter doors are only opened whilst vehicles are entering and leaving the building.
- A maximum of 200 tonnes will be stored in the yard at any one time and the maximum residence time will be 28 days.

[10] Containment systems for the prevention of pollution: Secondary, tertiary and other measures for industrial and commercial premises, C736, Walton, I. L. W, CIRIA, 2014

- The waste stored in the external yard will be subject to a daily inspection for signs of damage or spillages. Any pallets containing damaged containers will be moved immediately to the reception hall. Small spillages will be managed in accordance with Standard Operating Procedure Spillages (SOP101). Large spillages will be managed in accordance with Section 5 of the Emergency Action Plan (MBLSOP999).
- The drainage for the external yard falls to an integrated gully, sump and discharge system which includes a rapid reaction soakaway isolation valve to isolate the drainage system from underground discharge of contaminated material. This isolates the drainage system to provide containment and safe disposal of contaminated material. The gullies and rapid reaction valve are inspected and checked for proper positioning every day as part of daily site inspection procedures.

5.4 Future Development Area Drainage

The drainage for the future development area will employ the same design philosophy as the existing yard area. Hard surfacing will drain to a sump. There are no chemical additives required for the proposed gas upgrading process and as such there will be no storage of potentially polluting materials in this area. If required, any potentially polluting materials will be stored within bunded areas.

6 Control of Emissions to Air

There are no changes to control of emissions to air as a result of the proposed changes.

A Site Specific Bioaerosol Risk Assessment has been carried out (January 2022) and supports this permit application.[11] However, there is no increased risk of bioaerosols as a result of the proposed changes.

An Air Quality Assessment (AQA) was carried out to support the original permit application to assess the potential impact on human health and ecological receptors from point source emissions on site including the two CHPs and the two back-up boilers.[12] The proposed changes do no impact emissions to air and therefore there has been no further assessment of impacts of emissions to air.

With reference to the proposed GGF facility, as technical solutions are developed, carbon dioxide from the biogas upgrade plant will be captured, used and/or stored. Emission point EP7, a carbon dioxide vent has been included to support intermediate venting.

7 Control of Amenity Impacts

The existing control measures in relation to dust, noise, odour, litter, mud on road, scavenging animals and pests are all considered within the Environmental Risk Assessment.[1] There are no perceived required changes to the existing control measures in light of the proposed changes.

The Odour Management Plan (MBLDOC-026) has been updated to reflect odour monitoring in line with BAT 8 and BAT 34 but has not been submitted as part of the permit variation application as the odour risk as a result of the changes is reduced.

Note vehicle movements via the roller shutter doors have been reduced in recent years with changing operational activity and feedstock profiles thus lowering the odour risk from waste acceptance and storage.

[11] Bioaerosol Risk Assessment, Redmore Environmental, 5141r3, 19th January 2022
[12] Collation of Air Quality Information, Air Quality Consultants, 1000/4/F, 30th November 2011

8 Operating Techniques

In relation to question 3a within Part C3 of the permit application form, the Operating Techniques table within the existing permit (Table S1.2) refers to documents submitted as part of the original permit application in 2011 and 2012. Table 3 below replicates Table S1.2 and details the relevance of the documents limited within it.

Table 3 – Operating Techniques referenced in existing permit

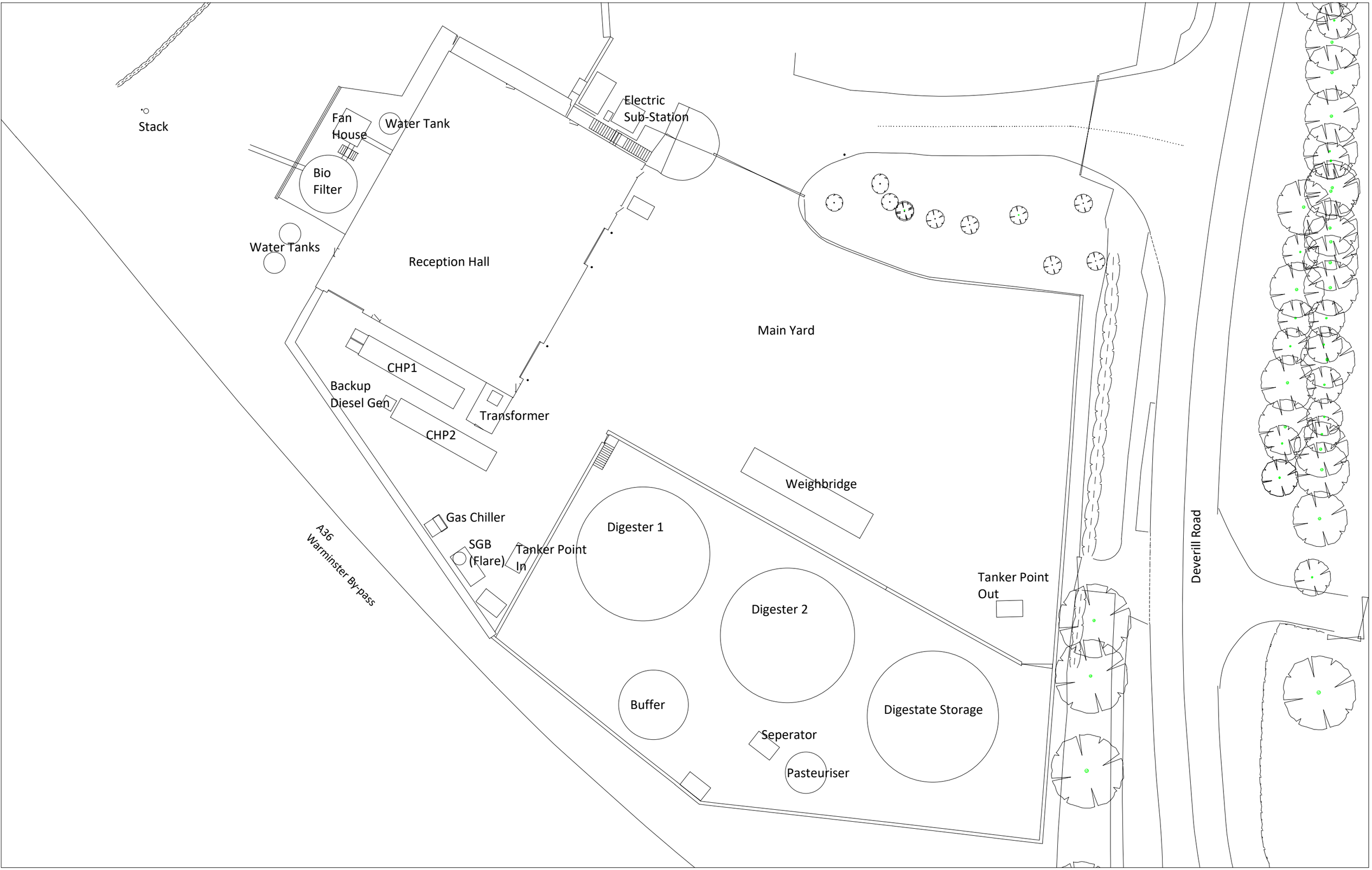
Description	Parts	Date Received	Current Relevance
Application	Part B4, Table 3a – Technical Standards	12/08/2011	This is superseded by the Technical Standards within Part C3, Table 3.
Application	Part B2, Section 6c – Non-Technical summary – October 2011	03/10/2011	The control measures detailed within this document are still relevant. Additional control measures relating to the proposed variation are detailed within Sections 4-7 inclusive of this Non-Technical Summary.
Response to Schedule 5 Notice dated 30/11/2011	Response to question 1 – Surface water drainage	19/12/2011	Still relevant.
	Response to question 4 – Odour Management Plan – dated January 2012	07/02/2012	The Odour Management Plan is an operational document that forms part of the site environmental management system. The current version is Revision G (February 2022).
Additional information	Report – Collation of Air Quality Information by Air Quality Consultants – December 2011	02/12/2011	As discussed in section 6 of this Non-Technical Summary, this document is still relevant.
	Odour Management Improvement Scheme Design Specification and Odour Dispersion Modelling – Recogen August 2011	03/10/2011	This document is still relevant in terms of odour dispersion modelling. The design element of the report has subsequently been reviewed and updated, most recently in Autumn 2021.

Appendix A – Site Plans

Figure 1 – Primary Work Areas (MBLDOC-027 ISS1)

Figure 2 - Emission Points (MBLDOC-028 ISS1)

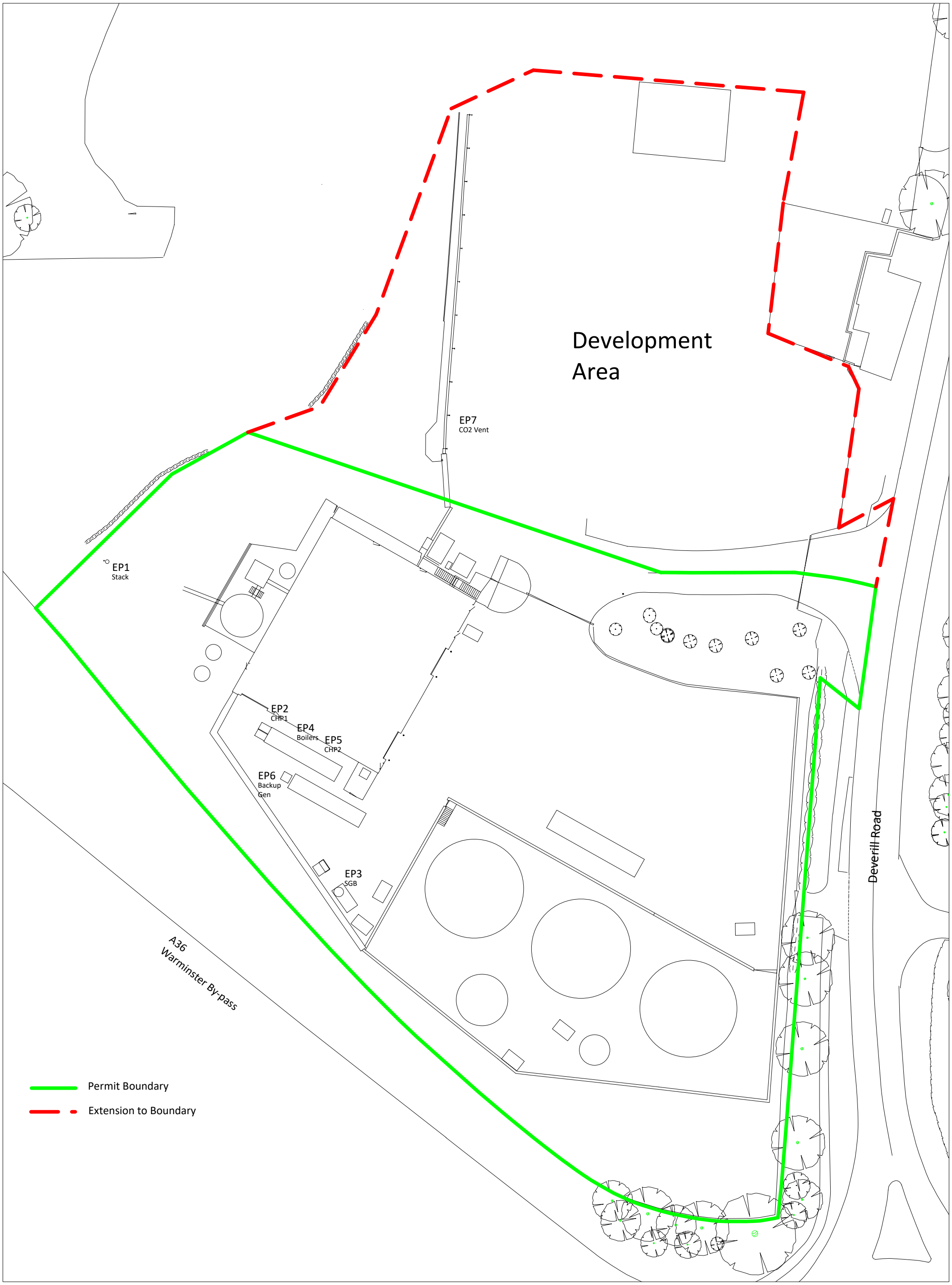
Figure 3 - Proposed Permitted Area and Emission Points (MBLDOC-029 ISS1)



Malaby Biogas Ltd

Annotated Site Diagram - Primary Work Areas

MBLDOC-027 ISS1 - Document redrawn and updated as a controlled document 12/01/22



Malaby Biogas Ltd

Annotated Site Diagram - Emission Points

MBLDOC-028 ISS1 - Document redrawn and updated as a controlled document 12/01/22

N

Development Area

EP7
CO2 Vent

EP1
Stack

EP2
CHP1

EP4
Boilers

EP5
CHP2

EP6
Backup Gen

EP3
Flare

A36 Warminster By-pass

Deverill Road

Permit Boundary

Malaby Biogas Ltd

Annotated Site Diagram - Proposed Permitted Area and Emission Points

MBLDOC-029 ISS1 - Document redrawn and updated as a controlled document 12/01/22

Appendix B – Treatment Capacity Calculations

Table 4 – Treatment Capacity Calculations

Tank with gas collection and mixing	(A) Working capacity (m3)	(B) Minimum hydraulic retention time (days)	(A/B) Treatment capacity (tonnes per day*
Feedstock Buffer Tank	300	3	100
Digester 1	1,420	30	47.3
Digester 2	1,420	30	47.3
Digestate store	1,420	15	94.6
Total Treatment Capacity			**289.2**

* Assume that $1m^3$ is equivalent to 1 tonne

Therefore the treatment capacity of this AD plant is above the Environmental Permitting Regulations threshold of 100 tonnes per day and requires an Installation permit.

Appendix C - Nature and Heritage Conservation Screening Report & Maps

Nature and Heritage Conservation

Screening Report: Bespoke waste

Reference	**EPR/AB3036RT/V005**
NGR	**ST 86705 43631**
Buffer (m)	**70**
Date report produced	**19 February 2019**
Number of maps enclosed	**3**

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

Nature and heritage conservation sites	Screening distance (m)	Further Information
Special Areas of Conservation (cSAC or SAC) **River Avon (SAC)**	1000	Joint Nature Conservation Committee
Sites of Special Scientific Interest (SSSI) **River Avon System (SSSI)**	1000	Natural England

Protected Habitats	Screening distance (m)	Further Information
Deciduous Woodland	up to 500m	Natural England

Please note we have screened this application for protected and priority sites, habitats and species 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.

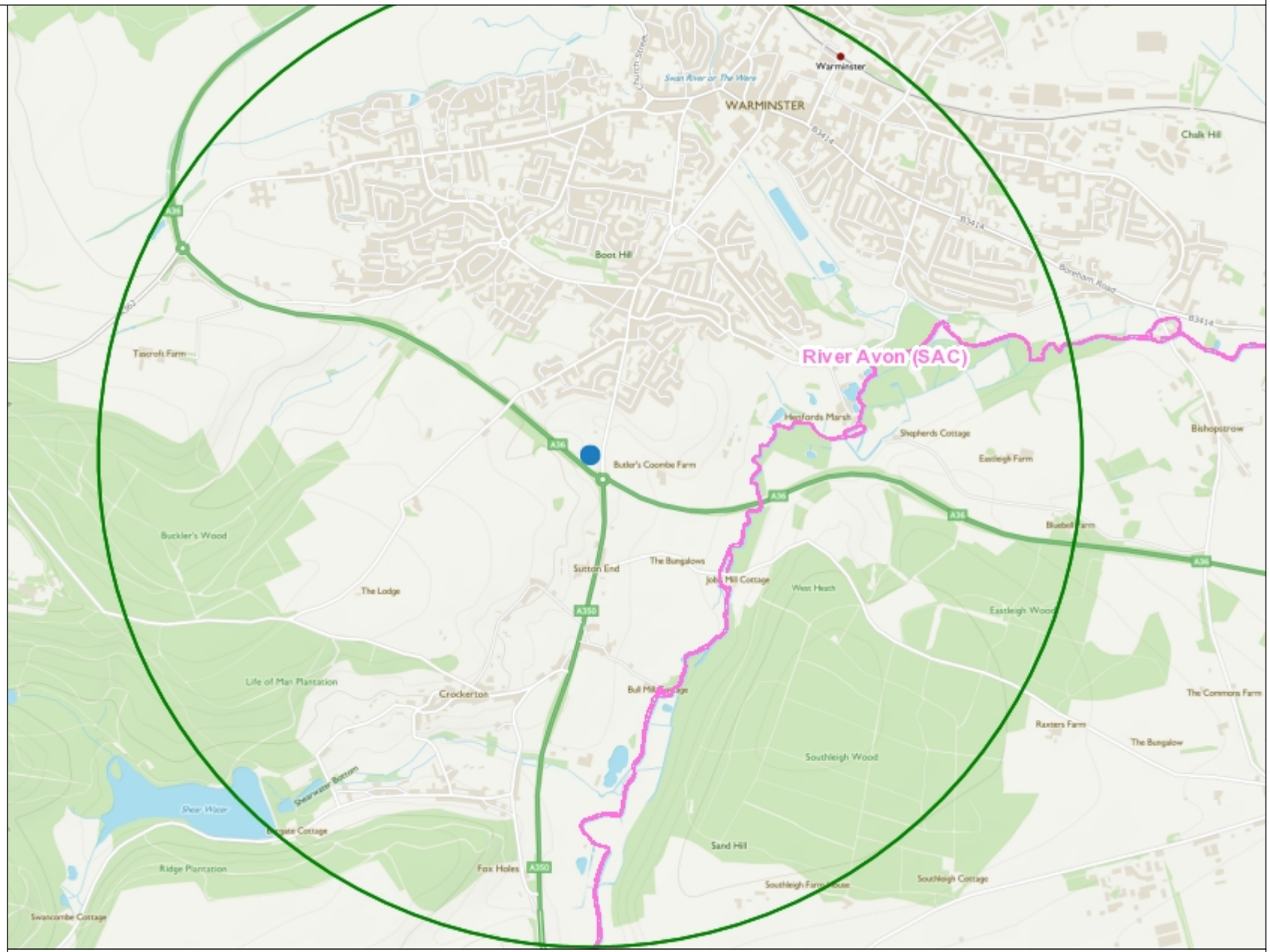
Please note, the enclosed pre-application map(s) is valid for a period of **6 months**. If you plan to submit your application more than 6 months after the map(s) was generated, you must request that the screen is re-run. This will ensure that you have used the most current information on heritage and nature conservation interests in your application.

SAC

Environment Agency

Legend

- SAC (England)
- SAC (Wales)



0 238 477 715

Metres

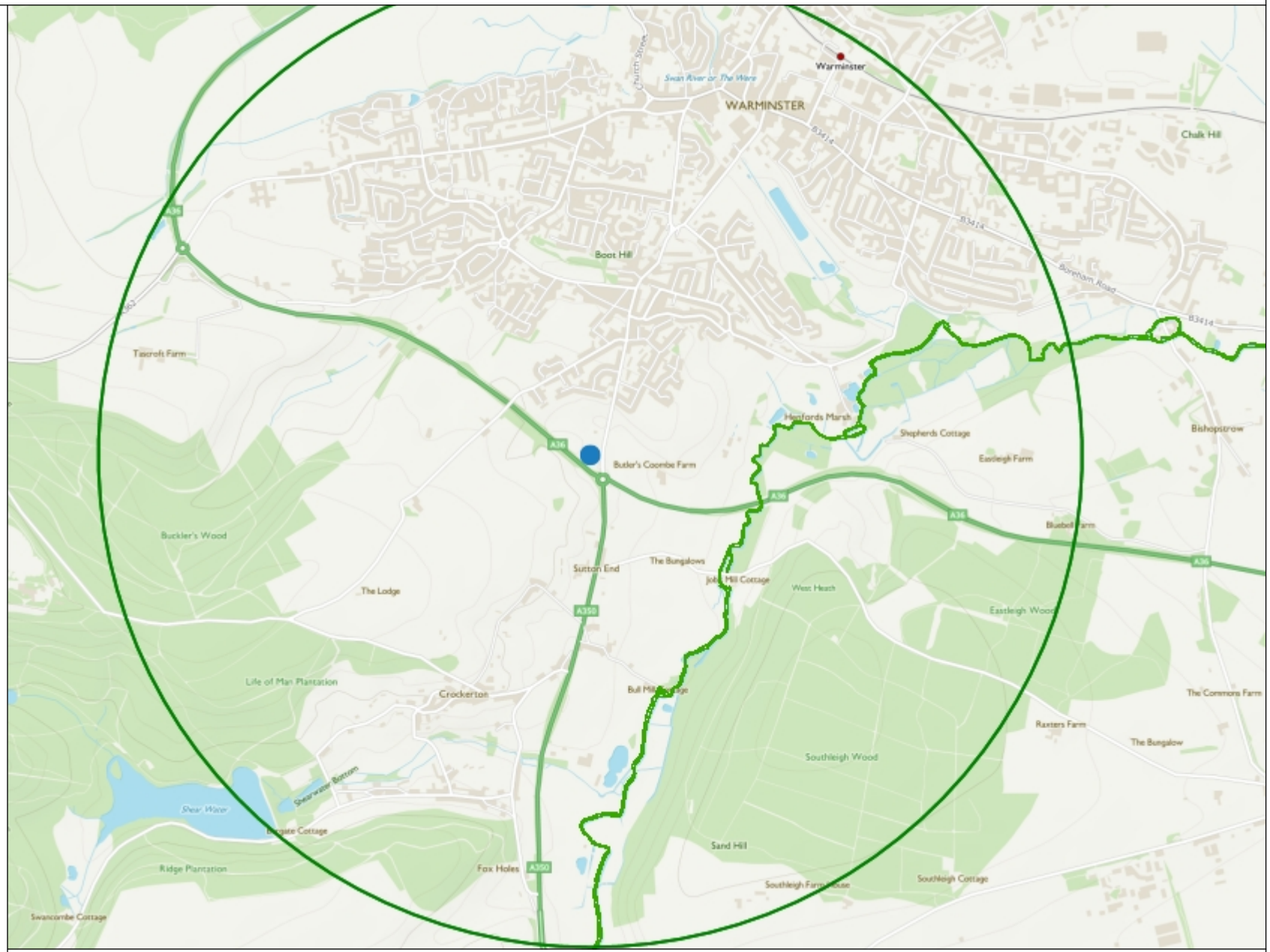
N
W E
S

SSSI

Environment Agency

Legend

- SSSI (England)
- SSSI (Wales)



0 238 477 715

Metres

N
W E
S

Protected Habitats

Environment Agency

Legend

Protected Habitats screened for Env Permits

0 30 60 89

Metres

N
W E
S

Appendix D - Nature and Heritage Conservation Risk Assessment

Site name and type	Screening distance (m)	Distance from site boundary (m)	Direction from site	Assessment of risk upon protected site from proposed changes
Special Areas of Conservation (cSAC or SAC)	**1000**			
River Avon SAC		650	east	There are no emissions to surface water and no change to emissions to groundwater (soakaway) as a result of the permit variation. The risks of waste storage and spillages have been addressed in the Environmental Risk Assessment.[1]
Sites of Special Scientific Interest (SSSi)	**1000**			
River Avon System (SSSI)		650	east	As above
Deciduous Woodland	**500**			
Wooded area within A36 road cutting - southwest side of trunk road		35	west	There are no changes to emissions to air as a result of the proposed variation.

Appendix E- Simplified Flow Diagram

All storage tanks are contained within the primary bund.

Feedstock route
Digestate route
Air extraction route
Water route
Biogas route
Rainwater route

Filtered Air Extraction Stack

Bio Filter and Air extraction Fans

Reception Hall - full air extraction

300m3 feedstock buffer tank

250m3 Biogas Membrane 8mb

1420m3 Digestion tank 1 38degs

Solids Seperator 10mm

130m3 Pasteurisation Tank 71.1degs for 70minutes

Gas Chiller

Gas Boiler 1

Gas Boiler 2

CHP1 500KW

CHP2 530KW

SGB Flare

Domestic Heating and Water

250m3 Biogas Membrane 8mb

1420m3 Digestion tank 2 38degs

250m3 Biogas Membrane 8mb

1420m3 BioDigestate Storage tank

Foul

Clean

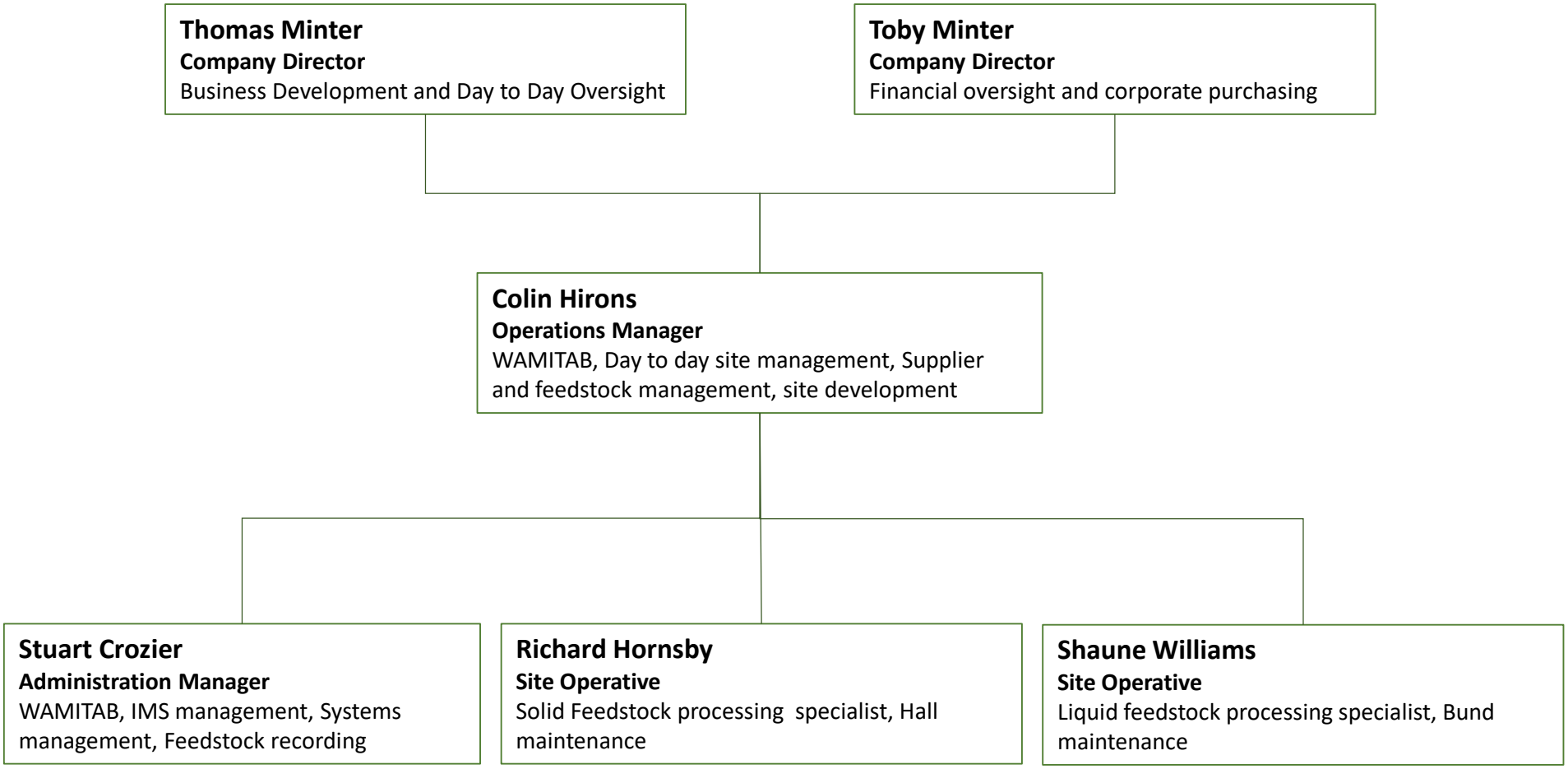
Soakaway

Bund Sump

Malaby Biogas
Simplified Site Diagram
12/12/2021 iss1 - Full update and Re-issue

Appendix F – Staff Organogram

Roles and Responsibilities



Appendix G - Secondary Containment Report

Geological & Geotechnical Consultants

Bore Hill Farm Biodigester

Site condition report

Preliminary review of:
AD Plant Secondary Containment

Prepared for: Malaby Biogas Ltd

Date: January 2022

Geological & Geotechnical Consultants

Key GeoSolutions Ltd
Nova House
Audley Avenue Enterprise Park
Newport
Shropshire
TF10 7DW

Tel. 01952 822960
Fax. 01952 822961

email info@keygs.com
web www.keygs.com

Job Number: 22-008

Report Number: 22-008-R-001

MALABY BIOGAS LTD

Bore Hill Farm Biodigester

Site condition report

Preliminary review of: AD Plant Secondary Containment

Prepared by:

J Ash BSc MSc CEng MIMMM FGS .....

Approved by:

B Duthie BEng CGeol FGS MIQ .....

Report Distribution List

Name	Copies	Rev.	Date	Copies	Rev.	Date	Copies	Rev.	Date
C. Hirons	1 (pdf)	DRAFT	03/02/22	1 (pdf)	FINAL	04/02/22			
T. Minter	1 (pdf)	DRAFT	03/02/22	1 (pdf)	FINAL	04/02/22			
E. Pitts	-	-	-	1 (pdf)	FINAL	04/02/22			

CONTENTS

1.0 INTRODUCTION

Key GeoSolutions Ltd (KeyGS) have been requested by Malaby Biogas Ltd to undertake a review of the secondary containment area at their Bore Hill Farm Biodigester site, located on the south side of Warminster, Wiltshire.

Malaby Biogas intend to apply to the Environment Agency (EA) for increased tonnage throughput at the site and, as part of the permit variation, this report has been produced to confirm that the existing construction meets the requirements set-out in CIRIA C736 and the European Commission Best Available Techniques (BAT) Reference Document for Waste Treatment (see Section 2.0 of this report for full document references).

It is currently proposed to increase tonnage through the plant from 28,000tpa at present to 40,000tpa.

The work undertaken by KeyGS as part of the review of the secondary containment facility at the Bore Hill Farm Biodigester is summarised below:

- Site inspection
- Review of background information, surveys, construction records etc
- Review and assessment of secondary containment storage capacity (including 3D modelling to assess capacity and compare with CIRIA requirements)
- Review of freeboard capacity against required standards
- Review of jetting risk around perimeter of containment area
- Review of ground permeability (integrity of secondary containment area)
- Review of any “breaches” in containment area (underground pipes / drains etc)
- Review of clean water handling and discharge facility

The subsequent sections of this report summarise the preliminary findings of a data review and site inspection carried out by KeyGS (J.Ash) on 14 January 2022.

2.0 AVAILABLE INFORMATION

The following information has been provided to KeyGS to assist preparation of this report:

- SLR Consulting. Drawing No. 402.2953.01/105 (Revision C1) "*RC Bund. General Arrangement*" (January 2021). (Copy included as Appendix 1 of this report.)

- Marches Biogas Ltd. Drawing No. MB403301 "Tank Base Setting Out Arrangement" (September 2011). (Copy included as Appendix 2 of this report.)

- Marches Biogas Ltd. Drawing No. MB403323 "*Drainage Plan*" (January 2012). (Copy included as Appendix 3 of this report.)

- Unreferenced pdf drawing. File name entitled: "*Malaby Biogas Layout Drawing 1*". (Copy included as Appendix 4 of this report.)

- Unreferenced pdf drawing. File name entitled: "*Malaby Biogas Layout Drawing 2 Bund calc*". (Copy included as Appendix 5 of this report.)

- CAD file (dwg) reference JAN22 REVISED SITE MASTER.dwg

- A number of photographs taken by Malaby Biogas showing the construction of a number of the tank foundations.

- Specification data for the hydrophilic water stops and the construction joint sealant used during construction of the foundation slab and retaining walls around the perimeter of the secondary containment area.

- Additional e-mail and verbal information provided by Mr. Colin Hirons (Operations Manager, Malaby Biogas Ltd) and further e-mail comments from the original plant installer confirming various aspects of construction.

In addition, the following sources of information have been referred to:

- CIRIA C736 *Containment Systems for the Prevention of Pollution* (London, 2014)

▪ European Commission	*JRC Science for Policy Report (ref: EUR 29362-EN) Best Available Techniques (BAT) Reference Document for Waste Treatment. Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)*
▪ www.bgs.ac.uk	*BGS (British Geological Survey) website*
▪ www.defra.gov.uk	*Defra website (Magic Map data)*
▪ https://environment.data.gov.uk/farmers	*Environment Agency website (providing details of NVZ areas)*

3.0 SITE DESCRIPTION

3.1 Site location and overview

The Bore Hill Farm Biodigester site is located on the south side of Warminster, Wiltshire, at the junction of the A36 and Deverill Road. The site is accessed from Deverill Road.

The site, which has been operating for approximately 10 years, comprises the AD Plant within a bunded (walled) containment area along the southern margin of the site. The CHP power plant lies to the west of the AD Plant, adjacent to a large building which accommodates the plant control units, a workshop, the site offices and a depackaging / processing area at the central part of the building.

A large hardstanding area is located to the immediate north of the AD Plant and east of the process building and site offices. The hardstanding area slopes to the east, where rainwater enters a series of gullies and drains northwards to a soakaway, which is located between the hardstanding area and the site entrance.

The northern part of the site is largely disused, comprising the car parking area and a number of storage units.

The nearest residential properties are approximately 250m north of the AD Plant.

Drawing No. 22-008-D-001 shows the layout of the site.

3.2 AD Plant area – construction details

The following provides a summary of the various elements reviewed, based on discussion with the Plant Operations Manager (Mr. Colin Hirons), with reference to the available design information, layout drawings and a number of photographs taken at the time of construction, comments from the original installers and the findings of the recent site inspection by KeyGS.

Photos 1-17, which are included at the back of this report, show the main elements of AD Plant (the biodigester area) and the surrounding secondary containment area.

3.2.1 Secondary Containment Area Foundation

The entire floor of the secondary containment area is constructed of reinforced concrete. Photos 1+2 show the construction of a number of the tank bases and the adjacent floor during construction.

The original installers have advised that all concrete was placed with a Visqueen damp proof membrane (DPM) layer under the slabs with 2 layers of reinforcing mesh.

An expansion bead (SikaSwell®) was placed along all expansion / construction joints formed within the concrete floor slab to ensure a waterproof seal. A number of these joints were closely inspected by KeyGS during the January 2022 inspection and were seen to be in good condition and continuing to provide an adequate seal and waterproof barrier (see Photos 3+4).

The elevation of the concrete foundation slab is c.132mAOD (see SLR Drawing No. 402.2953.01/105).

3.2.2 Perimeter Bund Walls

Photos 3 and 5-11 show various sections of the concrete retaining walls around the perimeter of the secondary containment area.

With the exception of a small access gate at the north-eastern corner of the containment area, the entire perimeter bund is formed of a reinforced concrete retaining wall. No element of the containment area relies on earth bund structures.

The perimeter retaining walls are tiered, with the top of the walls reducing from a high point of c.137mAOD at the south-western margin of the containment area to a low point of c.133.7mAOD along the eastern part of the containment area. Photos 1, 6 and 17 show the tiered nature of the perimeter (northern and southern) walls, with Photo 9 showing the low point along the eastern margin and in the vicinity of the access gate.

The tiered nature of the perimeter walls reflects the original easterly sloping nature of the ground in the vicinity of the plant site. The SLR Drawing No. 402.2953.01/105 shows the various configuration and elevations of the perimeter bund walls, and also indicates the profile of the original sloping ground (shown as the red line on the cross-sections).

As a result of the original sloping ground profile, and as can be seen from the SLR drawing and the various photographs included at the back of this report, the perimeter bund walls represent a combination of cut and fill, with some freestanding walls and some representing retaining structures with higher ground on the outside of the bund.

KeyGS are advised that, during construction, a hydrophilic waterproofing strip (Swellseal® 3V) was used to seal the interface between the base of the concrete retaining wall and the foundation slab. (Swellseal® 3V is a hydrophilic waterproofing strip made from a combination of an elastomer and a hydrophilic resin. When confined, it will swell in contact with water and build up a waterproofing pressure inside the joint to seal the joint against water leaks.) (See Photo 7.)

Photos 9-11 show the access gate located at the north-eastern corner of the secondary containment area. As shown on Photo 11, rubber strips around the perimeter of the gate allow a watertight seal to be formed when the gate is clamped closed. The gate always remains closed, other than for occasional plant / machinery access for essential maintenance works.

Other than the gate at the north-eastern corner of the site, the only other means of access into the secondary containment area is via pedestrian steps located at the north-western corner.

3.2.3 Digesters and Associated Tanks

A total of 5 no. tanks comprise the AD Plant at the Bore Hill Farm site.

These comprise 2 no. primary digesters, a digestate store, a buffer tank and a pasteuriser tank. Photos 3, 5, 6, 8, 12 and 17 show the various tanks. Drawing No. 22-008-D-001 show their location and configuration.

Summary details of each of the tanks comprising the AD Plant, all of which are wholly contained within the bunded (walled) secondary containment area, are provided below:

Tank	Internal dia (m)	External dia (m)	Typical operating liquid level (m)	Maximum capacity (m^3)
Digester 1	14.570	14.776	8.4	1,400
Digester 2	14.570	14.776	8.4	1,400
Digestate Store	14.570	14.776	7.5	1,400
Buffer tank	7.686	7.692	6.6	300
Pasteuriser	4.311	4.517	6.7	100

Malaby Biogas have advised that all tanks are constructed of glass fused steel and were manufactured by Permastore® and erected by a registered installer (Marches Biogas Ltd).

The digesters and pasteuriser are clad with plastic coated steel cladding over insulation. The digestate store and buffer tank are uninsulated.

The digesters and the digestate store have fabric membrane roofs. The buffer and pasteuriser tanks have sectional steel roofs.

There are 8 no. whessoe valves on the gas pipework to counter any over / under pressure.

It is noted that there are no valves (or other obvious potential points of weakness) along the outer edges of the tank walls immediately adjacent to the perimeter bunds.

3.2.4 Service pipework

A number of pipes sit on a concrete pad located to the south of the digester tanks (see Photo 12) and the original installers have advised that all gas pipes were encased in concrete within the slabs during construction.

KeyGS understand that the only other underground pipes within the secondary containment area relate to the collection and management of surface water (rainwater) run-off. This is described further in Section 3.2.5 below.

The only breach point in the perimeter retaining bund lies along the western margin of the site, where a number of pipes and cables enter/exit the site, linking the AD plant to the main control room (see Photo 14) and the CHP power plant.

Recent inspection indicated that the liquid and gas inlet/outlet pipes are encased in concrete, with the electrical cables housed in UPVC ducting encased in concrete all the way to the control room (see Photo 14).

3.2.5 Surface water (clean water) collection and management

There are several gullies located around the floor of the secondary containment area to facilitate the drainage, collection and discharge of rainwater accumulating in the area. This is essential to

the ongoing operation of the AD plant as the site could potentially flood during rainstorm events if rainwater could not be efficiently collected and discharged off-site.

One such example of a rainwater gully is shown on Photo 9.

The original installers have advised that all drainage gullies were encased in concrete, with the pipework comprising sealed UPVC backfilled with pipe bedding to allow ground movement. (This was done to allow for some flexibility / movement in the pipe, as if they were directly encased in concrete there would be a risk that the pipes could shear and crack at the interface joints.) All bends in the pipework were encased in concrete to act as thrust blocks to provide strengthening for future maintenance works (eg rodding).

The Marches Biogas Ltd. Drawing No. MB403323 shows the drainage plan for the secondary containment area. All surface water collector gullies and sub-surface pipework drain to a central collection sump, located between Digester 2 and the Buffer and Pasteuriser tanks (see Photo 15).

Clean water that collects in the sump is discharged off-site via a pumped rising main located in the north-eastern corner (see Photos 9 and 17). From here, the clean water enters a drain running northwards across the eastern margin of the hardstanding yard and enters the soakaway located to the immediate north of the yard where it percolates to ground.

It is important to note that the sump pump which discharges clean water off-site is manually operated and does not run on an automatic float switch. The water contained in the sump therefore requires to be inspected and confirmed as being clean (uncontaminated) prior to discharge.

By way of further back-up and an additional pollution prevention measure, the soakaway has a manual shut-off valve, such that the valve can be closed in the event that any contamination is identified within the yard area or otherwise entering the outfall drains.

4.0 GROUND CONDITIONS

4.1 Geology, Hydrogeology and Hydrology

Geology – The 1:50,000 British Geological Survey (BGS) mapping data indicates the site to be underlain by sandstone belonging to the Shaftesbury Sandstone Member of the Creataceous Period (formed approximately 101-113 million years ago).

Hydrogeology – Although the sandstone underlying the site is likely to represent an aquifer, the site does not fall within an area designated by the Environment Agency as a Source Protection Zone.

Hydrology – There are no significant water courses in close proximity to the Bore Hill Farm Biodigester site. The nearest significant surface water feature is the River Wylye, located approximately 660m to the east of the site.

4.2 Environmental protection

In addition to the above information, KeyGS understand that the site lies within a surface water NVZ (nitrate vulnerable zone).

There are no other records of any source protections or drinking water safeguard zones in the vicinity (source of information www.defra.gov.uk (Magic map data)).

4.3 Site specific information

There is no additional site specific ground investigation information available for the Bore Hill Farm site.

5.0 CONSTRUCTION STANDARDS – COMPLIANCE CRITERIA

5.1 Reference documents – CIRIA C736 and European Commission BAT Reference Document

The purpose of secondary containment is to provide emergency storage capacity in the event of catastrophic tank failure within the AD plant area and to prevent pollution off-site.

CIRIA C736 *Containment Systems for the Prevention of Pollution* is typically used as a basis for the design and construction of secondary containment facilities for industrial and commercial premises in the UK. The Environment Agency commonly require that AD plant containment areas be constructed in general accordance with the requirements of CIRIA C736.

CIRIA C736 provides guidelines for emergency storage volumes for secondary containment areas, minimum heights for retaining bunds and walls (to prevent loss of fluid via dynamic surge or "jetting" effects) and minimum acceptable permeability for the foundations and retaining structures within such areas. The specific requirements of the CIRIA document are set-out in further detail in Section 5.2 of this report.

The European Commission BAT report discusses more generally the best practices that should be adopted during operation of AD plants and other waste facilities. The document does not add significantly to the specific detail provided in the CIRIA report and deals mainly with matters such as optimising feedstocks, methodology, the efficient use of water and energy etc and minimising the risk of emissions to air and water by optimising the processes and methods.

The most relevant information relating to the management of emissions to water is included in Section 6.1.5 of the BAT report.

The following excerpts from Section 6.1.5 are relevant to the review of AD secondary containment areas:

- <u>Impermeable Surfaces:</u>
  Depending on the risks posed by the waste in terms of soil and / or water contamination, the surface of the whole waste treatment area (eg waste reception, handling, storage, treatment and dispatch areas) should be made impermeable to the liquids concerned.

- <u>Techniques to reduce the likelihood and impact of overflows and failures from tanks:</u>
  Depending on the risks posed by the liquids contained in the tanks in terms of soil and/or water contamination, techniques such as those outlined below may be adopted:

- Overflow detectors;
- Overflow pipes that are directed to a contained drainage system (ie the relevant secondary containment or another vessel);
- Tanks for liquids that are located in a suitable secondary containment; the volume is normally sized to accommodate the loss of containment of the largest tank within the secondary containment;
- Isolation of tanks, vessels and secondary containment (eg closing of valves).

- Segregation of water streams and adequate drainage infrastructure:

  Each water stream (eg surface run-off water, process water) should be collected and treated separately.

  Rainwater falling on treatment and storage areas should be collected in the drainage infrastructure along with washing water, occasional spillages, etc and, depending on the pollutant content, recirculated or sent for further treatment.

- Design and maintenance provisions to allow detection and repair of leaks:

  Regular monitoring for potential leakages should be risk-based, and, when necessary, equipment should be repaired.

  The use of underground components should be minimised. When underground components are used, and depending on the risks posed by the waste contained in those components in terms of soil and/or water contamination, secondary containment of underground components should be put in place.

5.2 Construction Requirements (CIRIA and BAT guidelines)

The following summarises the construction requirements and recommendations set-out in the CIRIA and BAT documents that have been used as a basis for the current inspection and audit of the secondary containment area at the Bore Hill Farm Biodigester site.

The technical detail and recommendations provided in CIRIA is generally more applicable to the design, operation and management of secondary containment areas and so the review has been checked primarily against the CIRIA guidelines. Notwithstanding this approach, it should be recognised that the requirements to adhere to the CIRIA standard were introduced after a number of AD plants, including the Bore Hill Farm Biodigester, had become operational.

5.2.1 Storage capacity (110% and 25% Rules) (ref: Section 4.2.1; CIRIA C736):

Where two or more tanks are installed within the same bund, the recommended capacity of the bund should be the greater of:

a) 110% of the capacity of the largest tank within the bund
b) 25% of the total capacity of all the tanks within the bund, except where tanks are hydraulically linked in which case they should be treated as if they were a single tank

5.2.2 Freeboard in perimeter retaining walls / bunds (ref: Section 4.4; CIRIA C736):

Freeboard is the increased height allowed in the design of structures to account for uncertainty. In the context of the CIRIA C736 guidance, the freeboard represents an increase in the height of a containment wall or bund to provide additional capacity over and above the minimum design volume requirement to allow for such things as rainwater and the surge effects that may result from catastrophic tank failure.

The following freeboard requirements are provided in CIRIA C736:

Type of structure	**Allowance**
In-situ reinforced concrete walls and blockwork bunds	250mm
Earthwork bunds	750mm

5.2.3 Allowance for Jetting effects (ref: Section 6.3.1; CIRIA C736):

The failure of a storage tank through, for example, a rupture of the sidewall or failure of a valve/pipework, could result in the escape of a jet of liquid with sufficient force that it projects over the perimeter bund wall. The potential for failure through jetting is minimised by:

a) keeping primary storage tanks as low as possible
b) increasing the height of the bund wall
c) building the bund walls as far away from the tank as necessary

The following provides the method for calculating bund geometry, as outlined in CIRIA C736:

Box 6.1 Method for calculating bund geometry to prevent jetting

For a small diameter sharp edged discharge orifice, it can be demonstrated that:

$l^2 = 4\ C_v^2\ (z-h)\ (H-z)$

where C_v = coefficient of velocity

In practice, $C_v \cong 0.99$. Assuming $C_v = 1$ leads to the conservative solution:

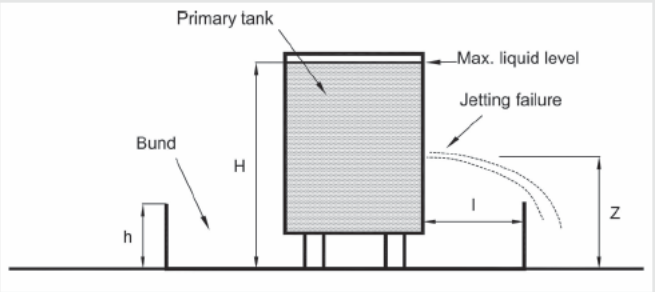
$l^2 = [4(z-h)(H-z)]^{0.5}$

For a given value of h, it may be shown the l is a maximum when:

$z = 0.5H + 0.5h$

which leads to the solution:

$l_{max} = H-h$



5.2.4 Ground permeability within containment area (ref: Section 8.7.1; CIRIA C736):

The permeability of soils underlying the site and forming any earthwork retaining bunds within the containment area should not exceed the recommended permeability of 1 x 10^{-9} m/sec.

Various other physical characteristics are also outlined in CIRIA C736 and should be considered in the design process.

5.2.5 Underground pipes & infrastructure

Although specific requirements in relation to AD plants and underground pipework are not set-out in CIRIA C736, the EA generally recommend that new pipework installations be placed above ground, such that any breaches or leaks would be contained within the secondary containment area.

For existing plant sites that have underground pipework installations already operational, the EA would normally require these pipes to be located in trenches lined with impermeable material. If such secondary containment (ie lined pipe trenches) was not installed during construction (or it cannot be proven), it is generally considered acceptable to test and confirm the integrity of the pipework by regular condition surveys and pipe testing.

The European Commission BAT report states that adequate secondary containment should be maintained for underground components where there is a risk of soil and/or water contamination.

Any surface “breaches” within the floor of the secondary containment area should be adequately sealed, such that there is no preferential drainage pathway around the exterior of any pipework, manhole or other structure.

6.0 BORE HILL FARM BIODIGESTER SECONDARY CONTAINMENT AREA – COMPLIANCE

The following provides a summary of the current situation and compliance of the Bore Hill Farm Biodigester secondary containment area with the relevant CIRIA standard and BAT report (as set out in Section 5.2).

Where the current situation is deemed to be non-compliant with the CIRIA standard, recommendations for further investigation and / or remedial action is provided.

Requirement	**Current situation / Compliance with CIRIA C736**	**Comments / Recommendations**
Storage capacity (110% Rule)	Based on the digester tank volumes, the required storage (spill) capacity to be accommodated in the secondary containment is equivalent to 110% of the capacity of the largest tank. This equates to a volume of 1,540m³. Using scaled CAD data for the existing plant site and secondary containment area, "flood risk" modelling shows that a spillage of liquid equivalent to a volume of 1,540m³ will result in a "flood level" of 133.4mAOD within the secondary containment area (assuming a floor elevation of 132mAOD within the secondary containment area). This is equivalent to a "flood depth" of 1.40m. See Drawing No. 22-008-D-002. The lowest point on the perimeter retaining bund is 133.7mAOD. The maximum predicted flood level is lower than the lowest point on the perimeter retaining bund and so the existing secondary containment area has adequate storage capacity. **The storage capacity is compliant with CIRIA C736**	No recommendations for improvement works. In line with current practices, the gate at the north-eastern corner of the site should remain securely closed at all times, other than those limited occasions when machine / plant access is required into the secondary containment area for maintenance works.
Freeboard in perimeter retaining walls / bunds	The "flood risk" modelling indicates there is sufficient freeboard capacity within the existing secondary containment area. The minimum freeboard, where the bund is at its lowest elevation of 133.7mAOD, equates to 300mm, which	None.

	exceeds the minimum freeboard requirement of 250mm **The freeboard requirement is compliant with CIRIA C736**	
Jetting risk mitigation	A series of analyses to assess the "jetting risk" at the site, in accordance with the method set-out in Section 6.3.1 of CIRIA C736 (see Section 5.2.3 of this report) have been undertaken. The findings of these analyses are presented in Appendix 6 of this report. The analyses indicate there is a hypothetical risk of fluid jetting over the perimeter retaining bund (and therefore beyond the confines of the secondary containment area) adjacent to the: ▪ North + West margin of Digester 1 ▪ North margin of Digester 2 ▪ North, East + South margin of Digestate Store ▪ South margin of Pasteuriser Tank ▪ South margin of Buffer Tank However, there are considered to be a number of mitigating factors that would greatly reduce (or remove) the potential pollution risk associated with jetting failures at these locations. These include: 1. The robust construction of the various tanks (glass fused steel) and in particular the lack of any obvious weaknesses or potential failure points (such as valves / outlet pipes etc) along the sides of the tanks adjacent to the perimeter retaining bunds. 2. The impermeable hardstanding area (providing additional emergency spillage / storage capacity) located to the north of the Digester Tanks and the Digestate Store. (Any spillages onto the hardstanding area will accumulate at the base of the sloping yard along the eastern margin of the site. In the event of any spillage (jetting) of liquid along this margin, the drains to the soakaway can be isolated so as to prevent the discharge of any potentially polluting liquid to ground.)	It is not considered necessary to raise the height of any of the perimeter bund walls adjacent to the various tanks. The risk of any significant loss of potentially contaminating liquid beyond the confines of the secondary containment area is considered to be low.

	3. The limited volume of liquid stored at a height at which jetting liquid could project over the adjacent wall within the Pasteuriser and Buffer tanks along the southern margin of the site. **The perimeter bund walls do not comply with CIRIA C736** due to the hypothetical risk of jetting**.** (The "non-compliance" does not relate to the original method or materials used in construction). However, the current configuration is deemed to be of low risk and acceptable (see comments).	
Ground permeability (integrity of containment)	The concrete surfaces forming the floor and perimeter bunds of the secondary containment area are deemed to provide a sufficiently low permeability interface that will prevent the loss of potentially polluting fluids in the event of a spillage. On recent inspection and review of the construction records, it would appear that the construction joints in the floor of the secondary containment area have been adequately sealed and a hydrophilic water bar was installed at the interface between the base of the concrete retaining walls and the foundation slab. These measures will minimise the risk of any potentially polluting liquid entering the ground (and groundwater) surrounding the site and allow rapid clean-up to take place. The metal access gate at the north-eastern corner of the site has a rubber seal around its perimeter. The default situation is that the gate remains clamped shut (unless access is required when the gate is opened for the shortest time practicable). The gate essentially forms an impermeable barrier. The permeability of the floor and retaining bund around the perimeter of the containment area is **compliant with CIRIA C736.**	None.

Security of buried pipework and service "breaches" in perimeter bund wall.	All gas pipes located on or within the base of the secondary containment area are encased in concrete. The only other underground pipes within the secondary containment area relate to the collection and management of surface water (rainwater) run-off (see below). The only breach point in the perimeter retaining bund lies along the western margin of the site, where a number of pipes and cables enter/exit the site, linking the AD plant to the main control room and the CHP power plant. The liquid and gas inlet/outlet pipes are encased in concrete, with the electrical cables housed in UPVC ducting encased in concrete all the way to the control room. The current arrangement is deemed to be acceptable and **compliant with the general requirements of the European Commission BAT report.**	None.
Clean water segregation and management	All surface water drainage gullies within the secondary containment area are encased in concrete, with the pipework comprising sealed UPVC backfilled with pipe bedding. Water drains to a central sump and is subsequently removed via a pumped rising main located in the north-eastern corner. From here, it enters the wider site drainage system and is discharged to ground via a soakaway. The sump pump which discharges clean water off-site is manually operated and requires confirmation of water quality prior to operation. Additionally, by way of further back-up and an additional pollution prevention measure, the soakaway has a manual shut-off valve, such that the valve can be closed in the event that any contamination is identified within the yard area or otherwise entering the outfall drains. The current arrangement is deemed to be acceptable and **compliant with the general requirements of the European Commission BAT report.**	No recommendations for improvement works. Maintain manual pumped discharge of clean water from collection sump.

7.0 SUMMARY

This report has been prepared by KeyGS on behalf of Malaby Biogas Ltd and provides a review of site conditions in relation to the secondary containment facility at their Bore Hill Farm Biodigester site.

Malaby Biogas intend to apply to the Environment Agency (EA) for increased tonnage throughput at the site and, as part of the permit variation, this report has been produced to confirm that the existing construction meets the requirements set-out in CIRIA C736 and the European Commission Best Available Techniques (BAT) Reference Document for Waste Treatment.

The findings of a site inspection undertaken by KeyGS on 14 January 2022 and a review of the available construction data has been used during compilation of this report. The various documents that have been reviewed are referenced in this report.

Based on inspection and data review, it is considered that the secondary containment facility at the Bore Hill Biodigester site is largely compliant with the requirements of CIRIA C736 and the European Commission BAT report.

The only area of slight deviation from the CIRIA requirements concerns the localised potential for jetting along the margins of a number of the tanks comprising the AD plant. However, it is considered by KeyGS that there are sufficient mitigation factors in place to suggest that the potential risk of significant pollution associated jetting failure would be low and, as such, no remedial measures are considered necessary or have been recommended at this stage.

When considering the suitability of the secondary containment area, it should be recognised that the requirements to adhere to the CIRIA standard were introduced after the Bore Hill Farm Biodigester had become operational. By way of general comment, KeyGS consider the Bore Hill operation to be a well-run site, even when compared to more modern facilities, with the risks reduced through well managed operational controls and activities.

PHOTOGRAPHS

Photo 1. Digester 1 base (during construction)

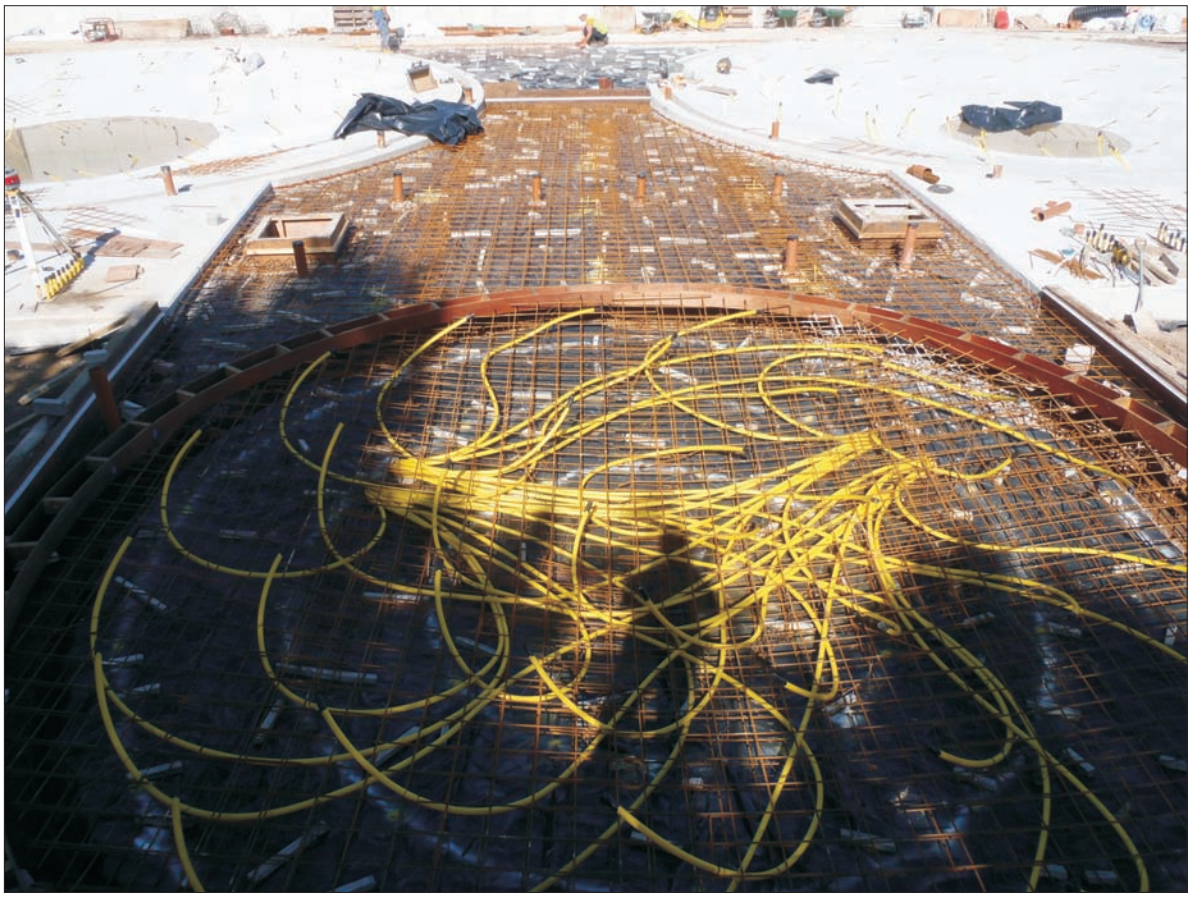


Photo 2. Buffer Tank base (during construction)

Photo 3. Base of secondary containment area along northern margin of digester tanks

Photo 4. View of construction joint on base of secondary containment area

Photo 5. Retaining bund (wall) along northern margin of site

Photo 6. Retaining bund (wall) along southern margin of site

Photo 7. Retaining bund (wall) along northern margin of site

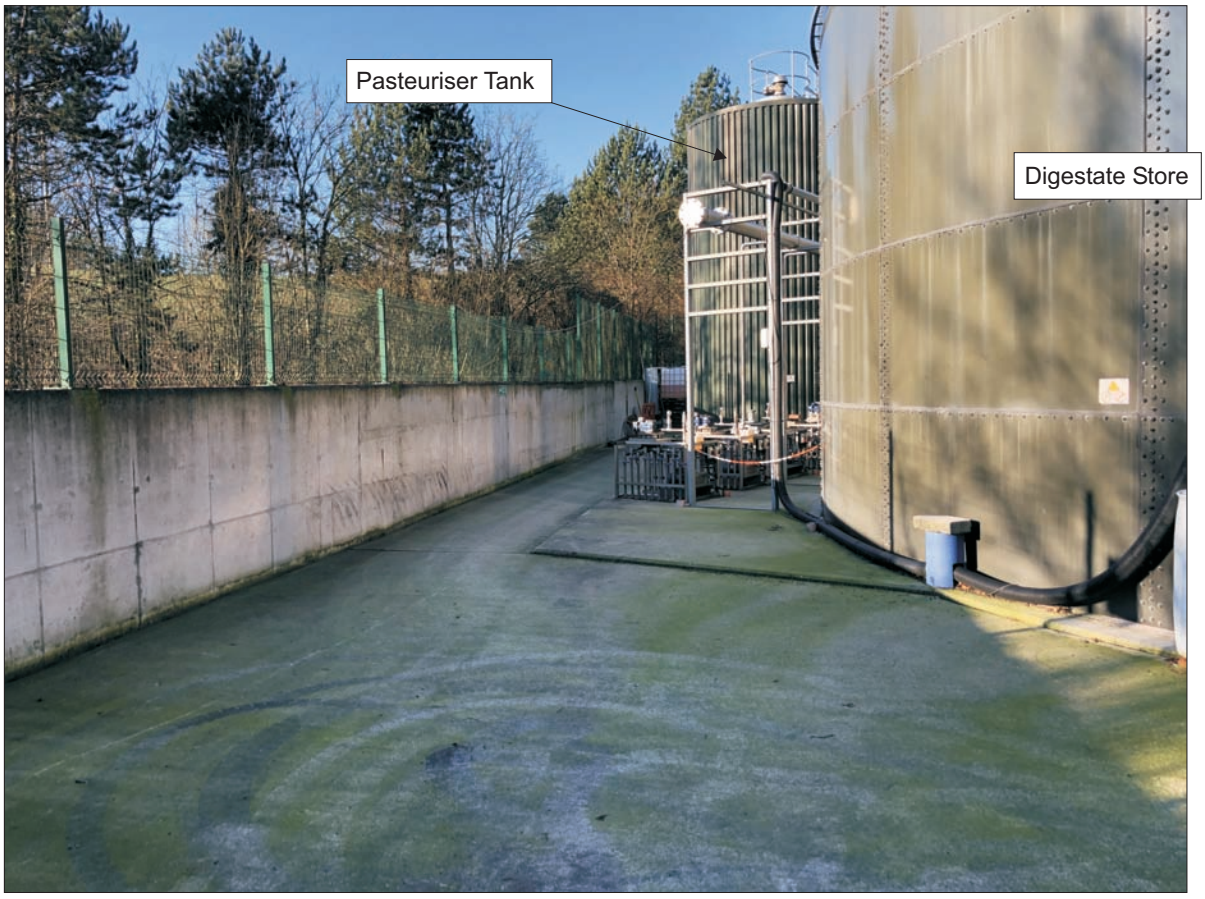


Photo 8. Retaining bund (wall) along southern margin of site

Photo 9. Retaining bund (walls) and sealed gate at north-eastern corner of site

Photo 10. Sealed gate at north-eastern corner of site

Photo 11. Access gate at north-eastern corner of site

Photo 12. Buffer Tank

Photo 13. Pipes and cables entering bunded area along western margin of site

Photo 14. Cables entering control room from AD Plant area (cables linked to Photo 13 area)

Photo 15. Clean water sump (collection chamber)

Photo 16. Control panel for pump in clean water sump (manual switch controls)

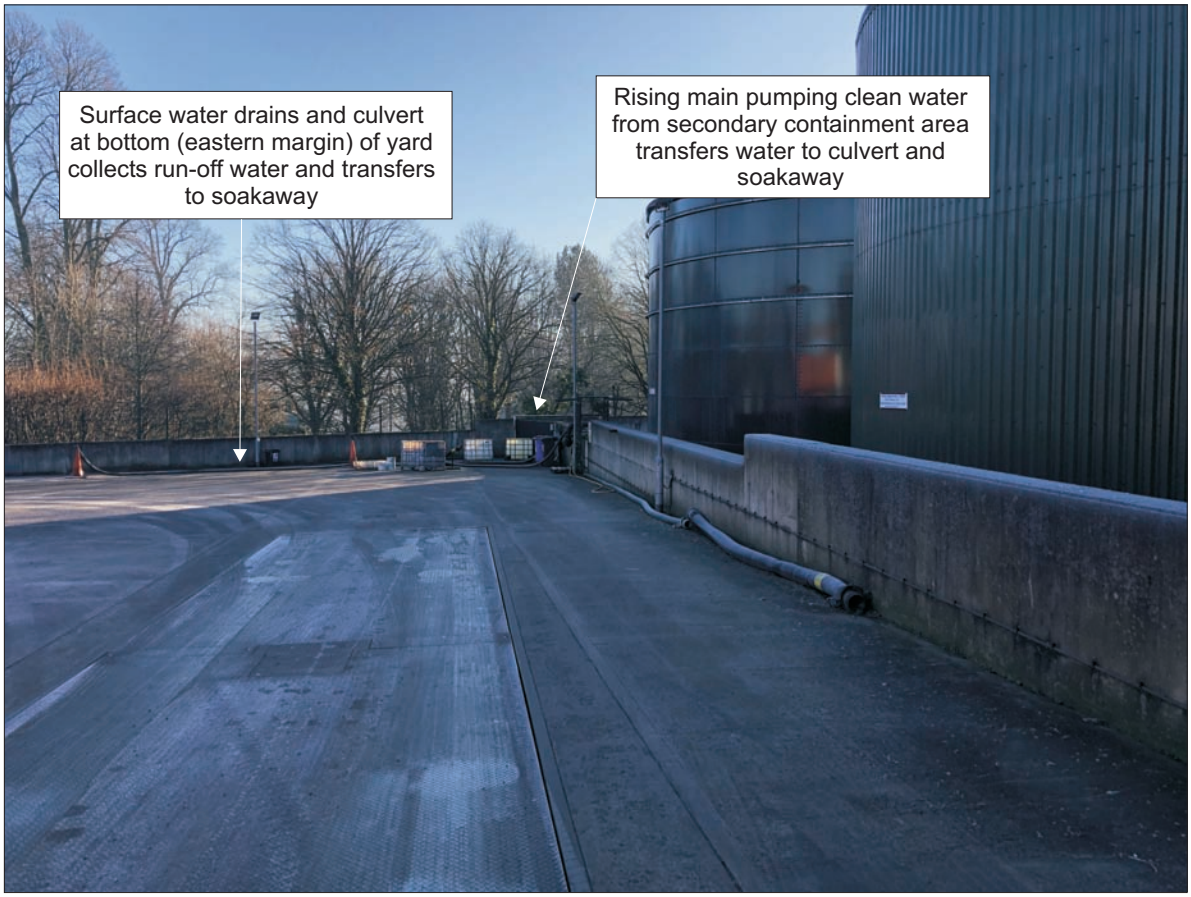
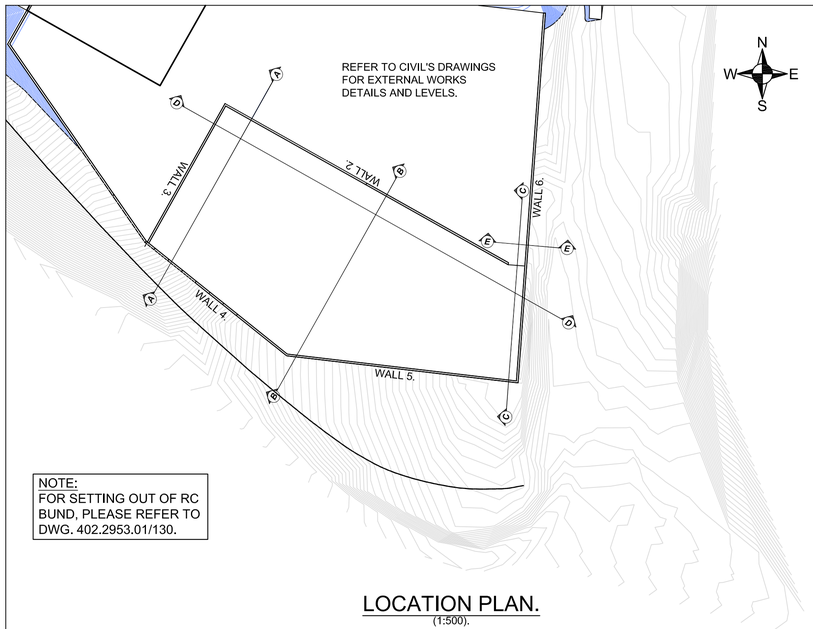


Photo 17. Sloping hardstanding yard to immediate north of AD Plant and secondary containment area

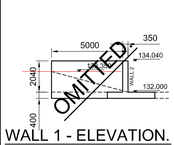
APPENDICES 1-6

APPENDIX 1

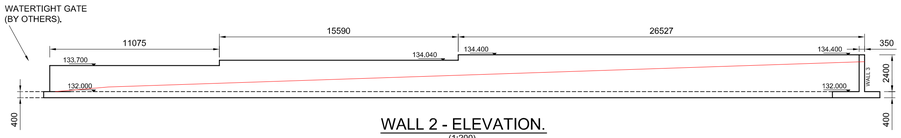


NOTE:
FOR SETTING OUT OF RC BUND, PLEASE REFER TO DWG. 402.2953.01/130.

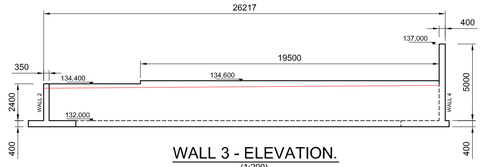
LOCATION PLAN.
(1:500).



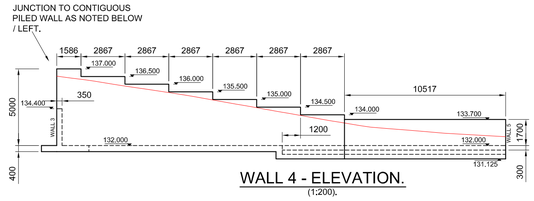
WALL 1 - ELEVATION.
(1:200).



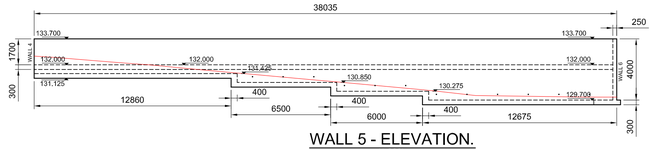
WALL 2 - ELEVATION.
(1:200).



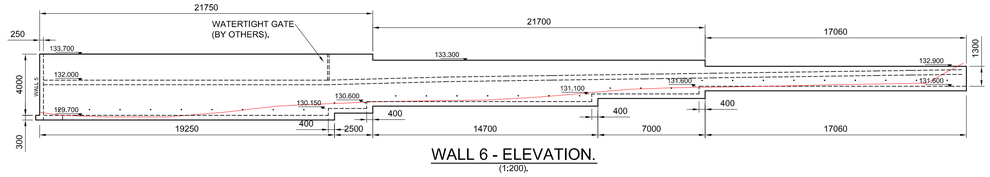
WALL 3 - ELEVATION.
(1:200).



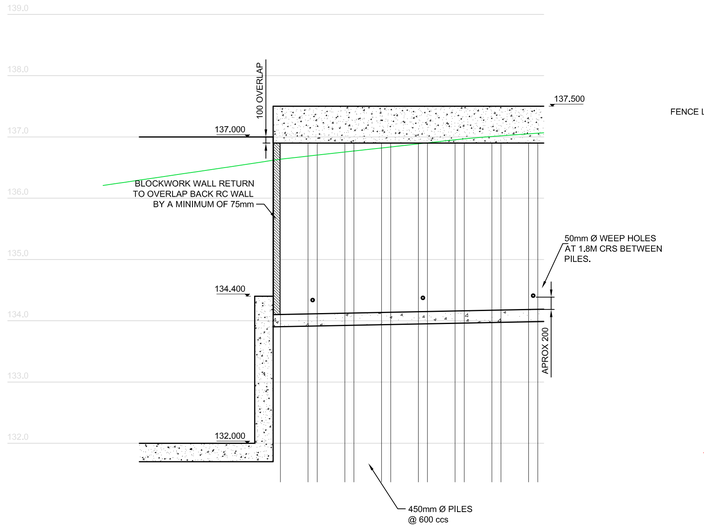
WALL 4 - ELEVATION.
(1:200).



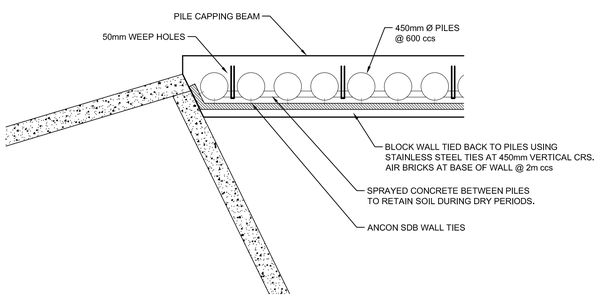
WALL 5 - ELEVATION.
(1:200).



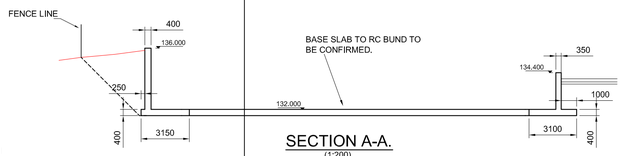
WALL 6 - ELEVATION.
(1:200).



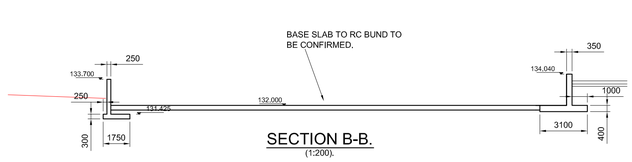
JOINT BETWEEN PILED AND RC WALLS - ELEVATION.
(1:50).



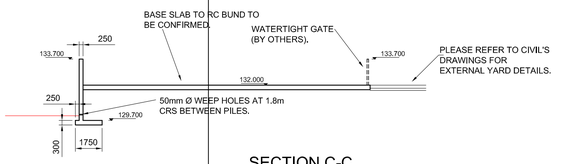
JOINT BETWEEN PILED AND RC WALLS - PLAN.
(1:50).



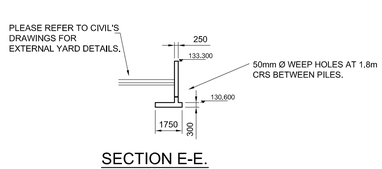
SECTION A-A.
(1:200).



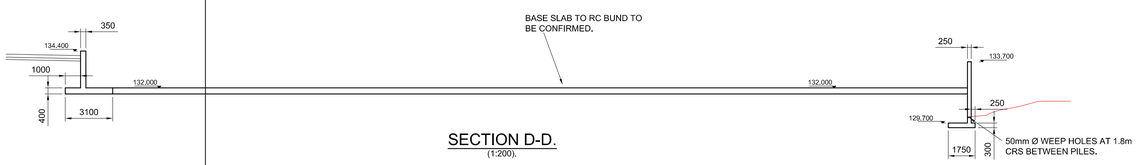
SECTION B-B.
(1:200).



SECTION C-C.
(1:200).



SECTION E-E.
(1:200).



SECTION D-D.
(1:200).

NOTES

1. DO NOT SCALE THIS DRAWING.
2. ALL DIMENSIONS SHOULD BE SITE CHECKED BY THE CONTRACTOR OR RELEVANT SUB-CONTRACTOR.
3. CONCRETE GRADES ARE TO BE IN ACCORDANCE WITH BS8500-1: 2002 AND BS8500-2 :2002 PLACED, COMPACTED AND PROTECTED IN ACCORDANCE WITH THE NATIONAL STRUCTURAL CONCRETE SPECIFICATION FOR BUILDINGS.
4. THE DESIGN OF THE RC BUND IS BASED UPON THE STORAGE TANKS BEING HYDRAULICALLY ISOLATED FROM EACH OTHER AND THE SITE BEING CLASSIFIED AS 'NON-SENSITIVE'.
5. 1000 GAUGE POLYTHENE TO BE PLACED OVER THE BLINDING TO PREVENT EXCESSIVE WATER LOSS FROM THE INSITU CONCRETE BUND.
6. CONCRETE TO BUND WALLS AND BASE TO BE C35A TO BS 8007.
7. CONCRETE FOR BLINDING TO BE C20.
8. MINIMUM COVER TO ALL REINFORCEMENT TO BE 40mm.
9. THE DESIGN HAS BEEN BASED UPON A SAFE GROUND BEARING PRESSURE OF NOT LESS THAN 250KN/m². GROUND TO COMPRISE OF A SINGLE CONSISTENT MATERIAL. ALL TO BE VERIFIED ON SITE.
10. THE AREA UNDER THE BUND IS TO BE PROOF ROLLED - SPECIFICATION TO BE CONFIRMED.
11. THE TEMPORARY STABILITY OF THE SURROUNDING TERRAIN DURING ALL STAGES OF THE CONSTRUCTION WORK IS THE RESPONSIBILITY OF THE CONTRACTOR. A METHOD STATEMENT IS TO BE PROVIDED.

LEGEND: PLAN

- 129 — EXISTING GROUND CONTOURS
- 133 — PROPOSED CONTOURS
- RETAINING WALL
- GROUND LEVEL

Revision	By	Chk'd By	Date	Comments
C1	SDE	SDE	MAY 11	Yard level reference updated.
C0	SDE	SDE	MAY 11	Construction Issue.
P4	SDE	SDE	May 11	Weep hole crs updated. Wall 3 elevation updated.
P3	SDE	SDE	APR 11	Section E-E added
P2	IMR	SDE	MAR 11	RC wall base amended to accommodate tank foundations.
P1	DH	SDE	MAR 11	External ground levels amended.
P0	SDE	SDE	FEB 11	Initial issue for comment only.

SLR
TREENWOOD HOUSE
ROWDEN LANE
BRADFORD-ON-AVON
WILTS. BA15 2AU
T: 01225 309400
F: 01225 309401

Client
MALABY MARTIN LTD

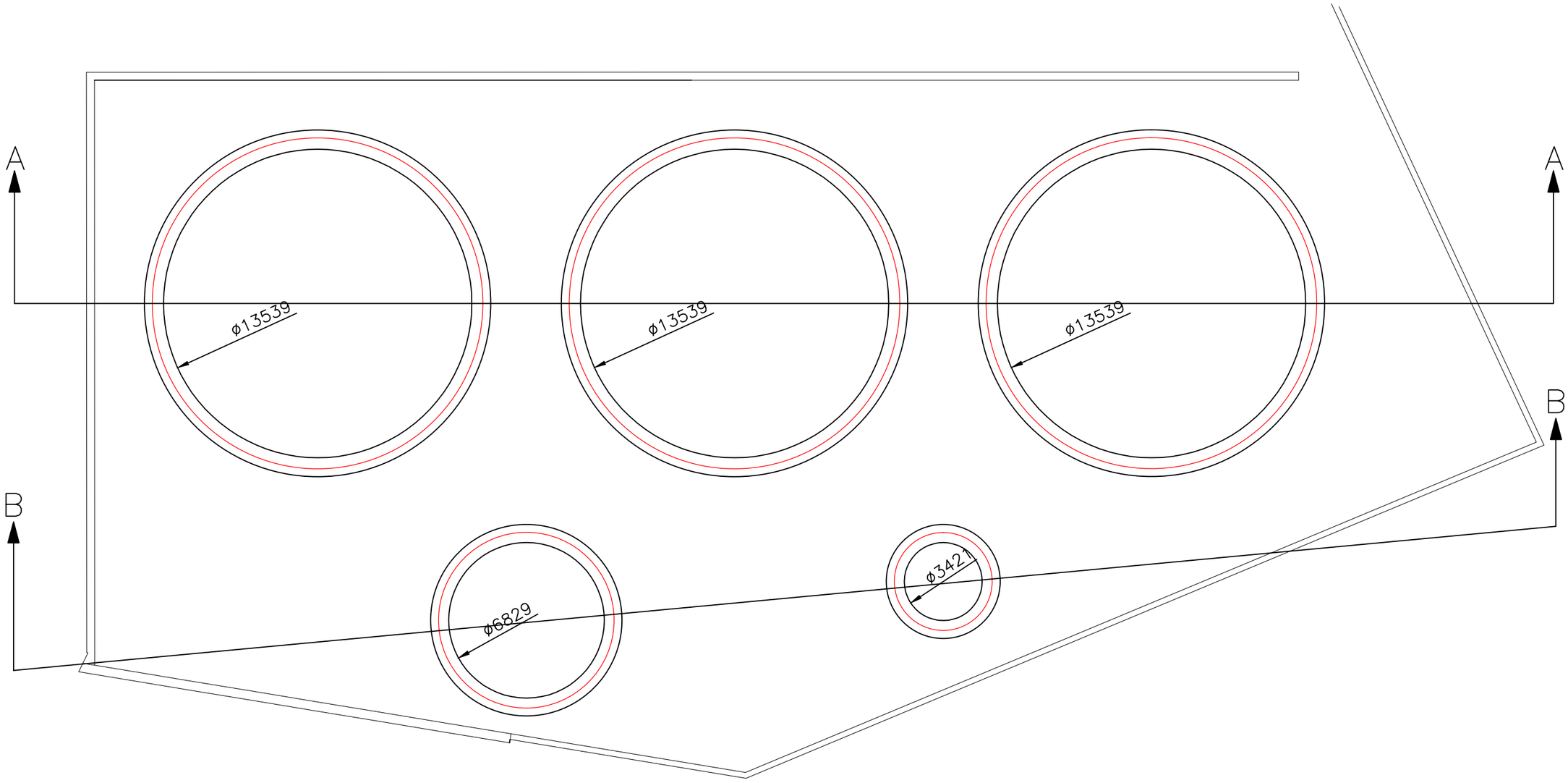
Project
BORE HILL FARM

Drawing Title
RC BUND.
GENERAL ARRANGEMENT.

Project File Reference	Drawn By
2953.00001.03.01.105	SDE
Scale: AS SHOWN @ A1	Date: JANUARY 2010 — Chk'd By: SDE
Drawing Number: **402.2953.01/105**	Revision: **C1**

CONSTRUCTION

APPENDIX 2



MARCHES BIOGAS
ANAEROBIC DIGESTION ENGINEERING

Marches Biogas Ltd
Unit 8, Lower Barns Business Park, Ludlow,
Shropshire SY8 4DS
Tel. No. 01584 879666

Rev.	Issue Details	Date
–	Issued for Construction	21.09.11

Scale: 1:200/A3

Drawn: RM

Checked:

Approved:

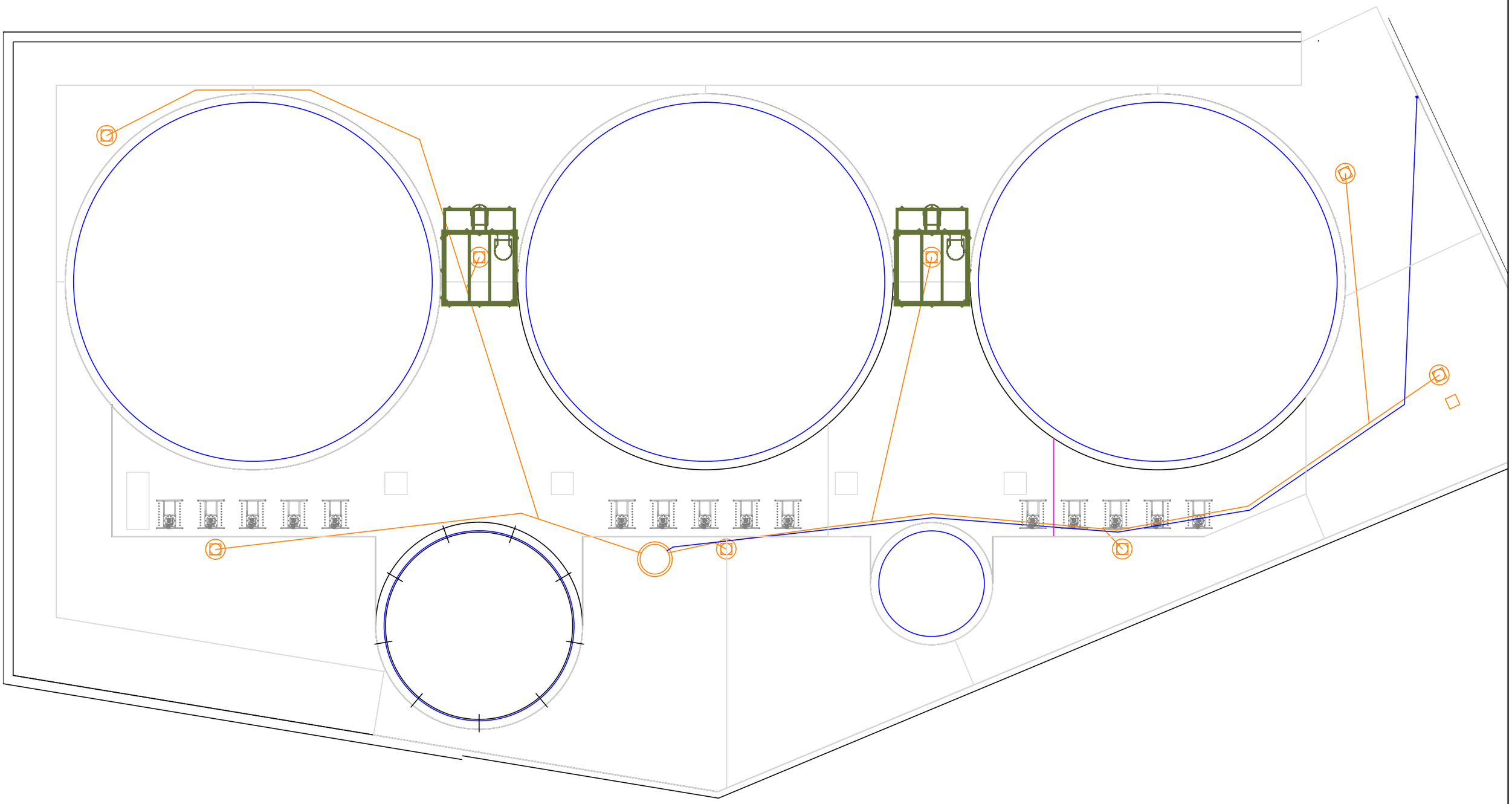
Client: MALABY BIOGAS

Project: BORE HILL FARM ANAEROBIC DIGESTION FACILITY

Title: TANK BASE SETTING OUT ARRANGEMENT

Drawing No.: MB403301

APPENDIX 3



MARCHES BIOGAS
ANAEROBIC DIGESTION ENGINEERING

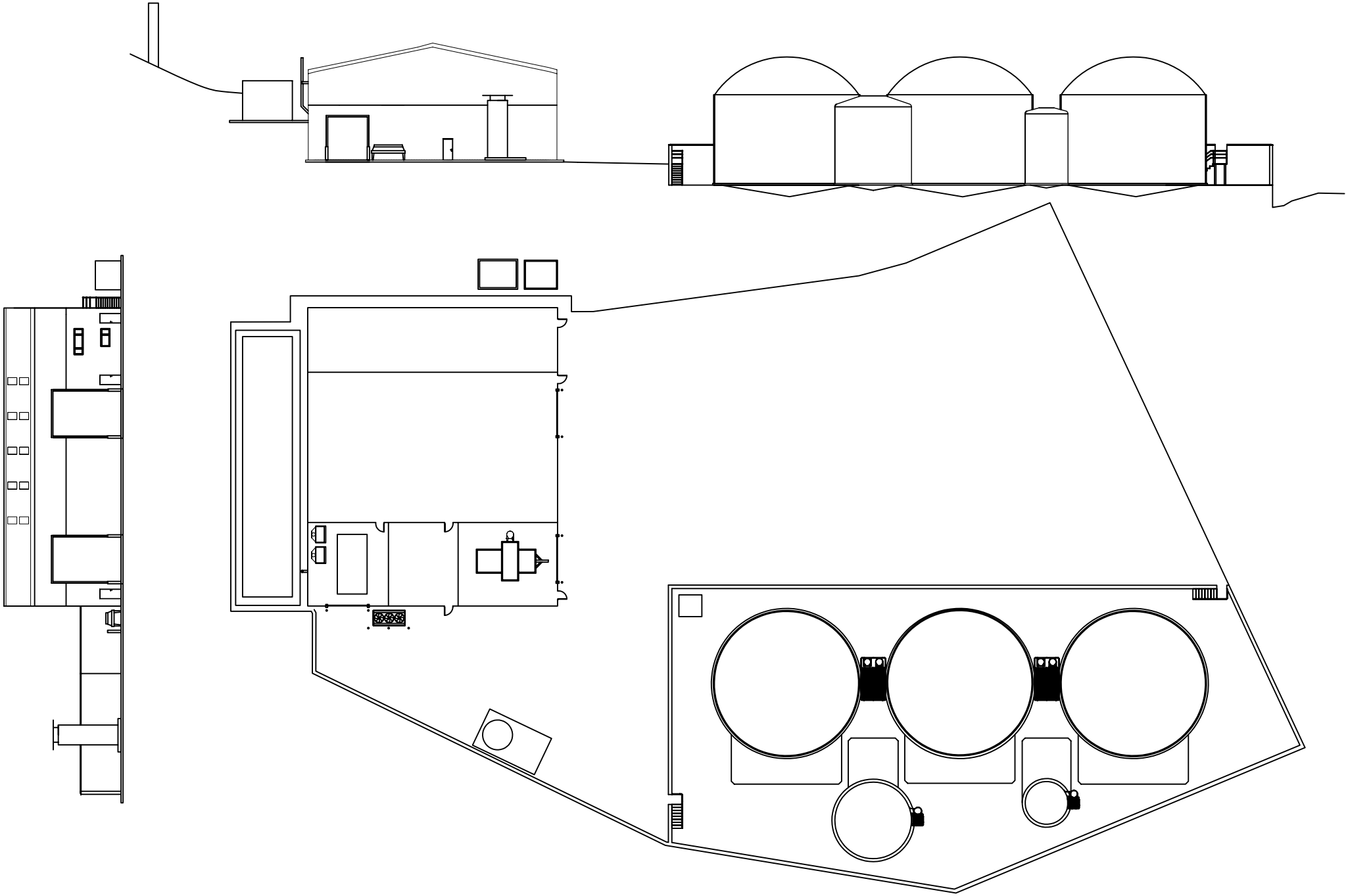
Marches Biogas Ltd
Unit 8, Lower Barns Business Park, Ludlow,
Shropshire SY8 4DS
Tel. No. 01584 879666

Rev	Issue Details	Date
-	Issue for Information	27.01.12

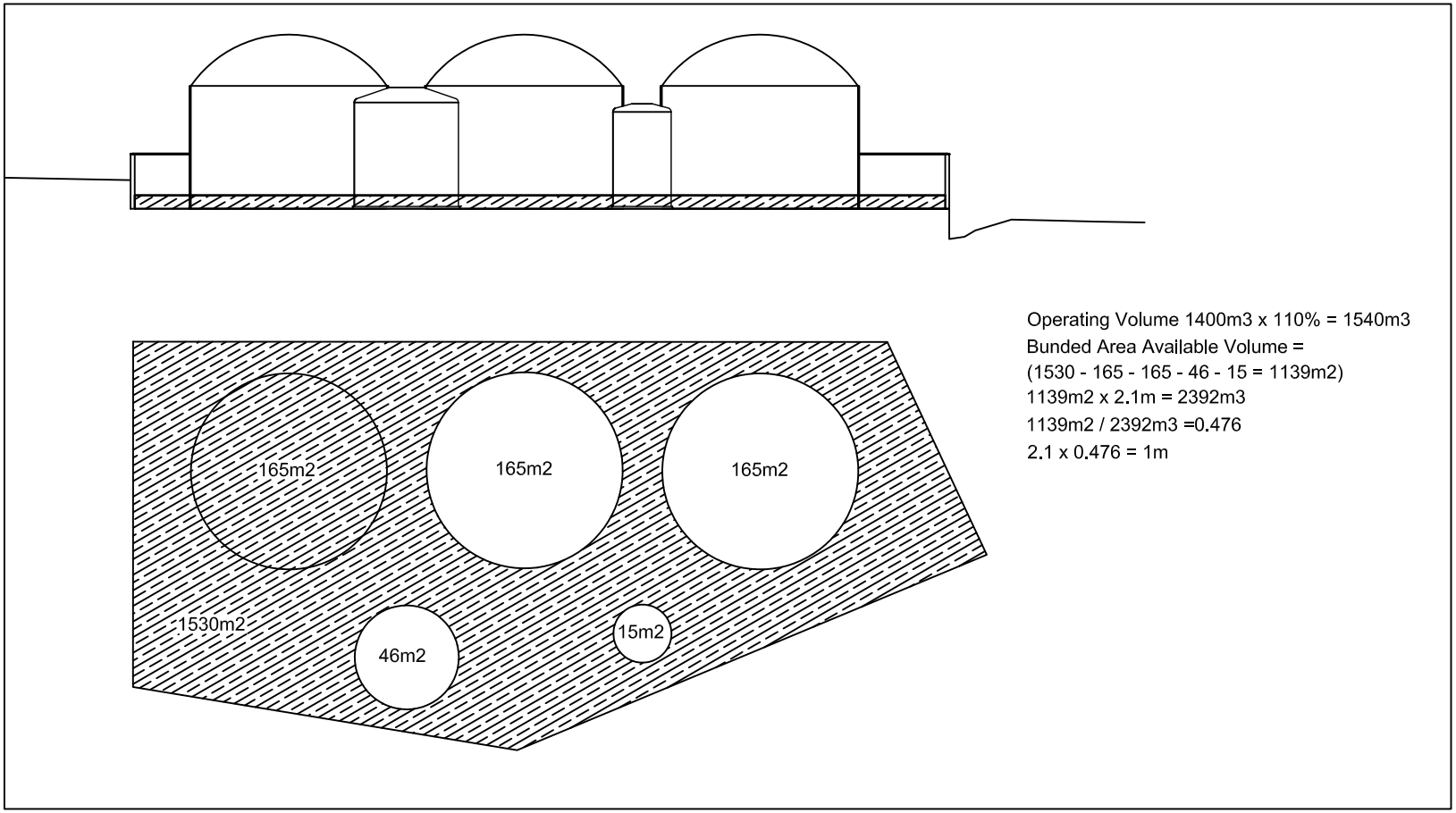
Scale: 1:150 @ A3
Drawn: SC
Checked:
Approved: RM

Client: Malaby Biogas
Project: Anaerobic Digestion Facility
Title: Drainage Plan
Drawing No.: MB403323
Rev: -

APPENDIX 4



APPENDIX 5



Operating Volume 1400m3 x 110% = 1540m3
Bunded Area Available Volume =
(1530 - 165 - 165 - 46 - 15 = 1139m2)
1139m2 x 2.1m = 2392m3
1139m2 / 2392m3 =0.476
2.1 x 0.476 = 1m

APPENDIX 6

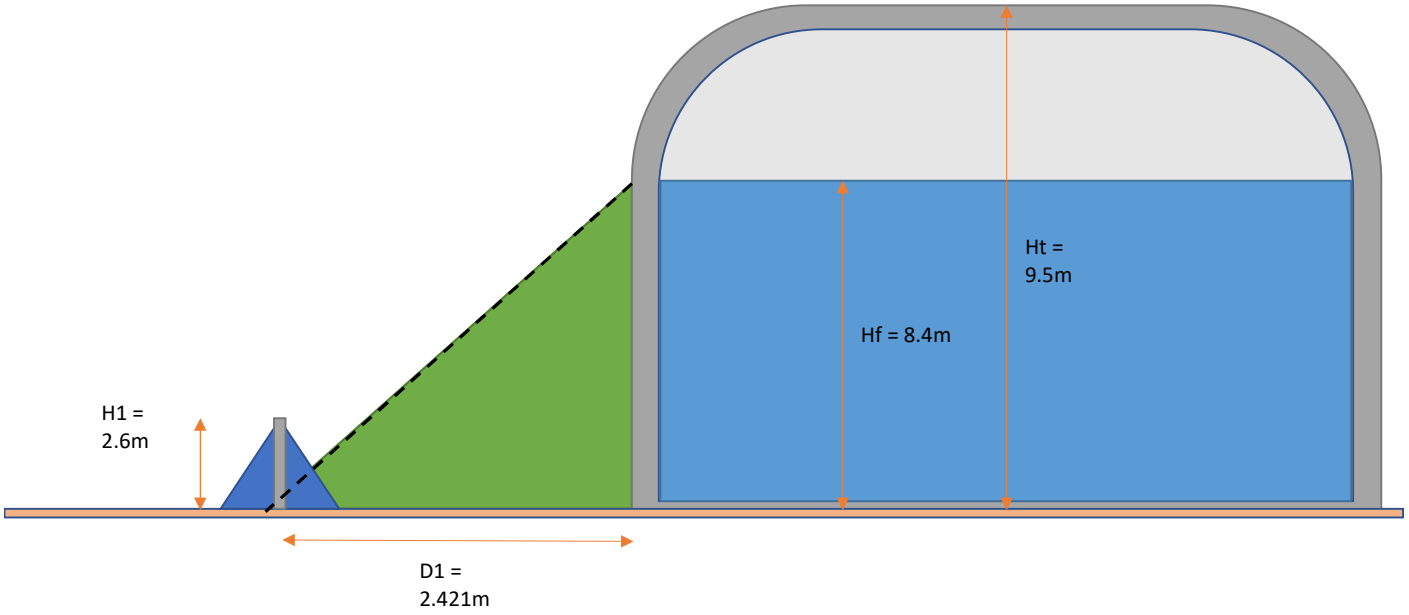
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 1
Tank Reference	Digester No1

Internal Ø	14570		
External Ø	14776		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	8.4	Hf	Hf = 8.4m
Distance From Wall/Bund Crest	2.421	D1	D1 = 2.421m
Height of Wall/Bund Crest	2.6	H1	H1 = 2.6m

Distance Fixed		
Required Height	5.979	Hr
Difference from Existing Height	3.4	Bund/Wall needs to be raised by 3.4m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



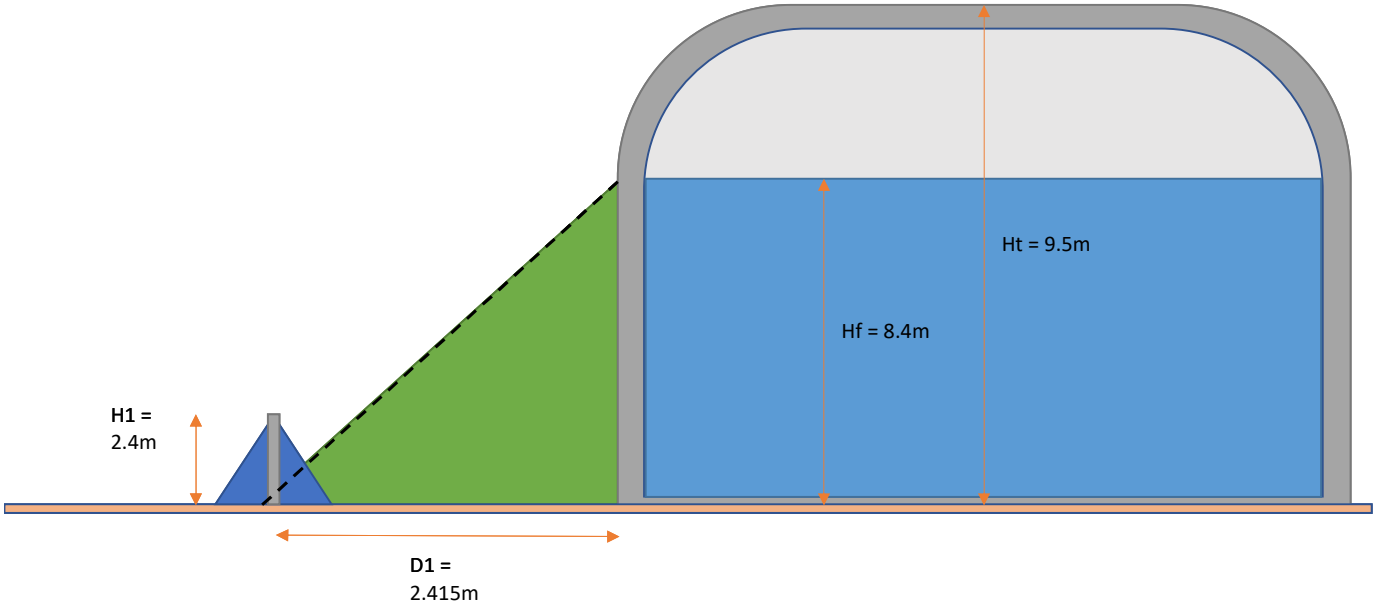
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 2
Tank Reference	Digester No1

Internal Ø	14570		
External Ø	14776		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	8.4	Hf	Hf = 8.4m
Distance From Wall/Bund Crest	2.415	D1	D1 = 2.415m
Height of Wall/Bund Crest	2.4	H1	H1 = 2.4m

Distance Fixed		
Required Height	5.985	Hr
Difference from Existing Height	3.6	Bund/Wall needs to be raised by 3.6m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



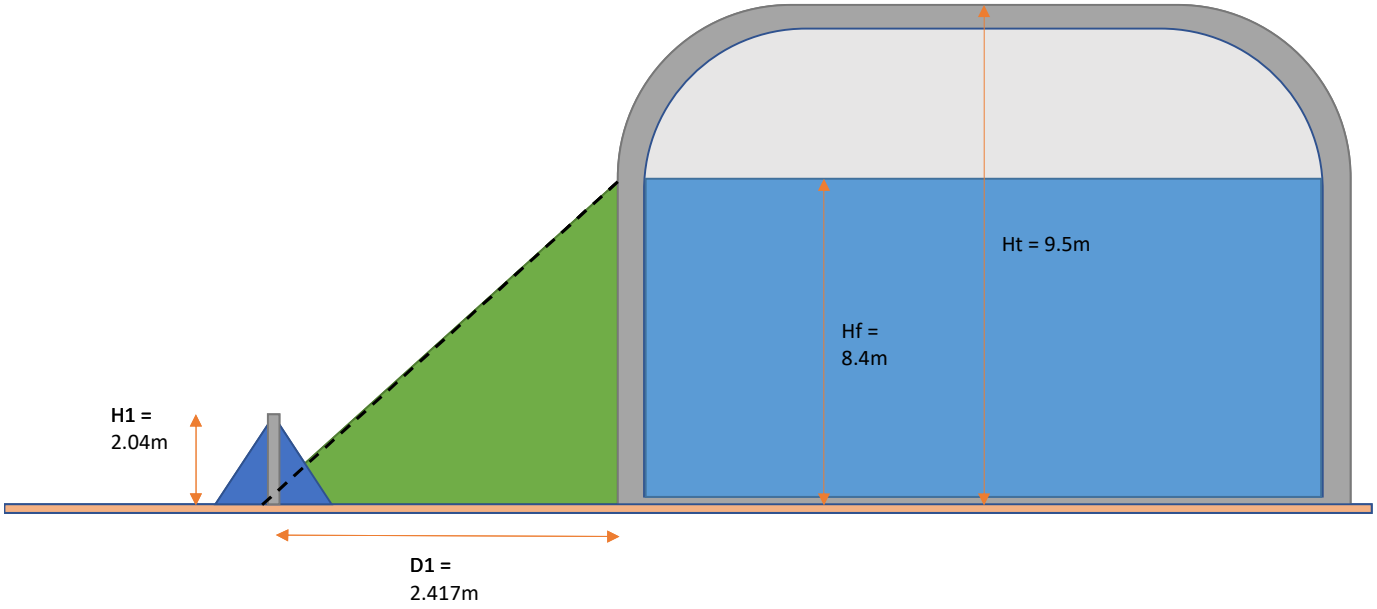
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 3
Tank Reference	Digester No2

Internal Ø	14570		
External Ø	14776		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	8.4	Hf	Hf = 8.4m
Distance From Wall/Bund Crest	2.417	D1	D1 = 2.417m
Height of Wall/Bund Crest	2.04	H1	H1 = 2.04m

Distance Fixed		
Required Height	5.983	Hr
Difference from Existing Height	4.0	Bund/Wall needs to be raised by 4m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



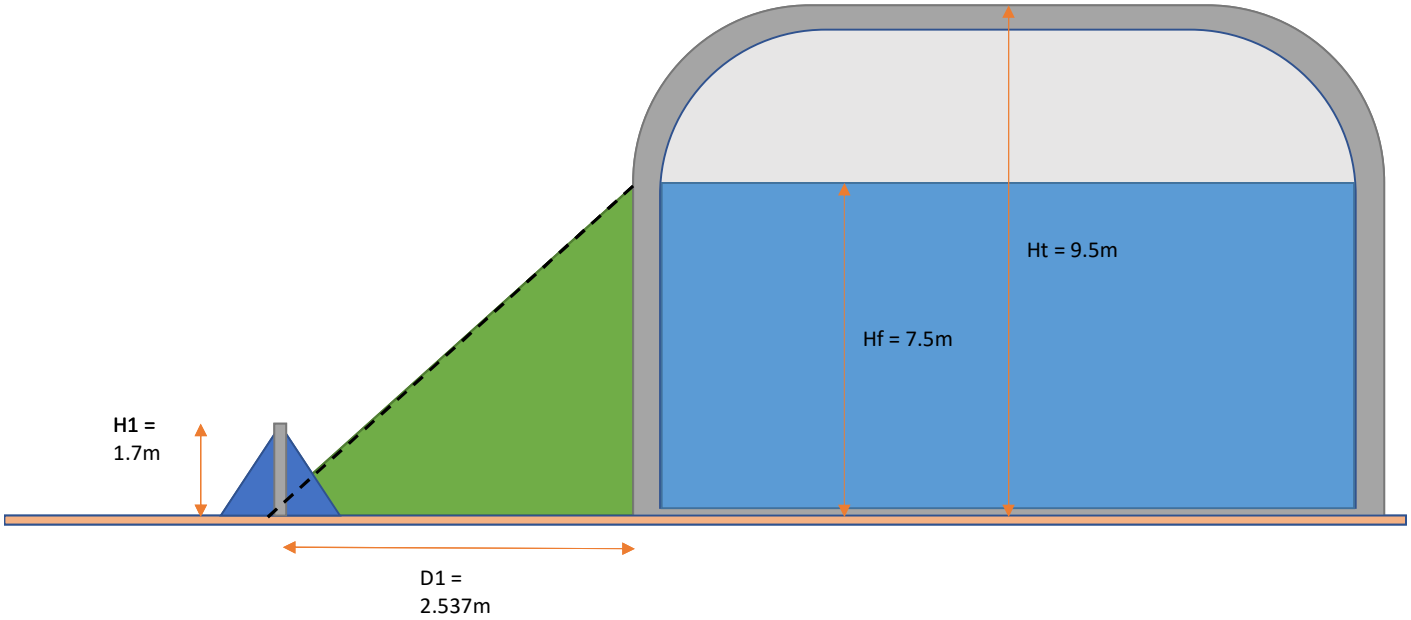
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 4
Tank Reference	Digestate Storage

Internal Ø	14525		
External Ø	14531		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	7.5	Hf	Hf = 7.5m
Distance From Wall/Bund Crest	2.537	D1	D1 = 2.537m
Height of Wall/Bund Crest	1.7	H1	H1 = 1.7m

Distance Fixed		
Required Height	4.963	Hr
Difference from Existing Height	3.3	Bund/Wall needs to be raised by 3.3m

(CIRIA C736 l = H - h ==> Dr = Hf - H1)
h = H - l ==> Hr = Hf - D1



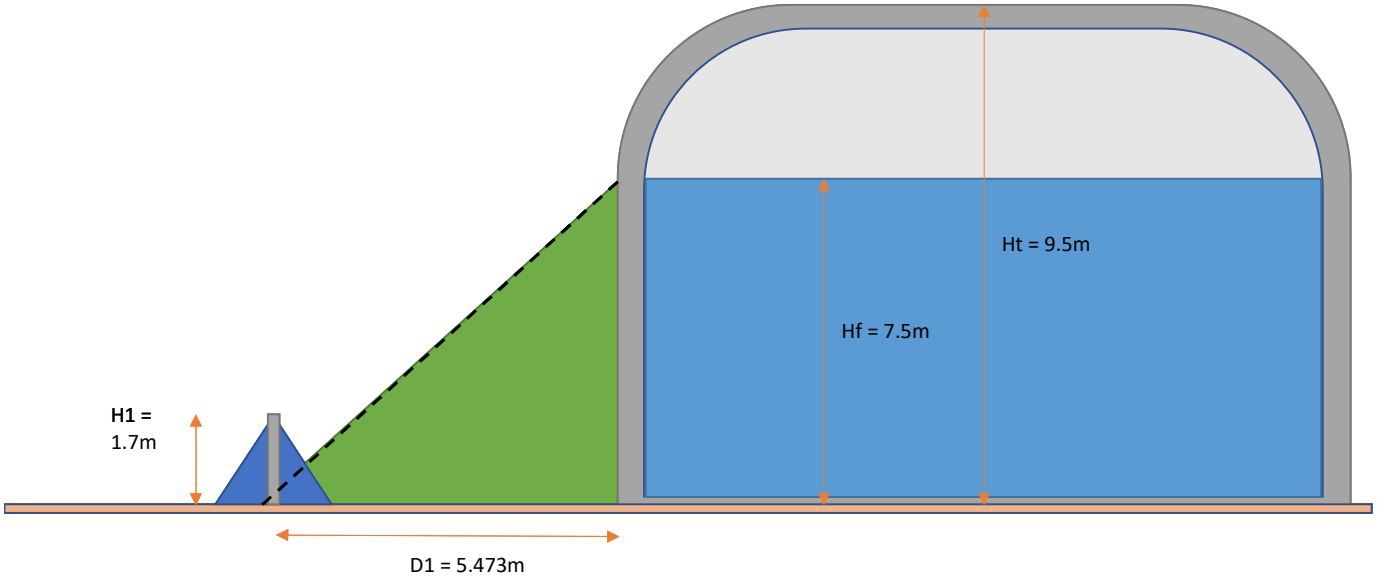
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 5
Tank Reference	Digestate Storage

Internal Ø	14525		
External Ø	14531		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	7.5	Hf	Hf = 7.5m
Distance From Wall/Bund Crest	5.473	D1	D1 = 5.473m
Height of Wall/Bund Crest	1.7	H1	H1 = 1.7m

Distance Fixed		
Required Height	2.027	Hr
Difference from Existing Height	0.4	Bund/Wall needs to be raised by 0.4m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



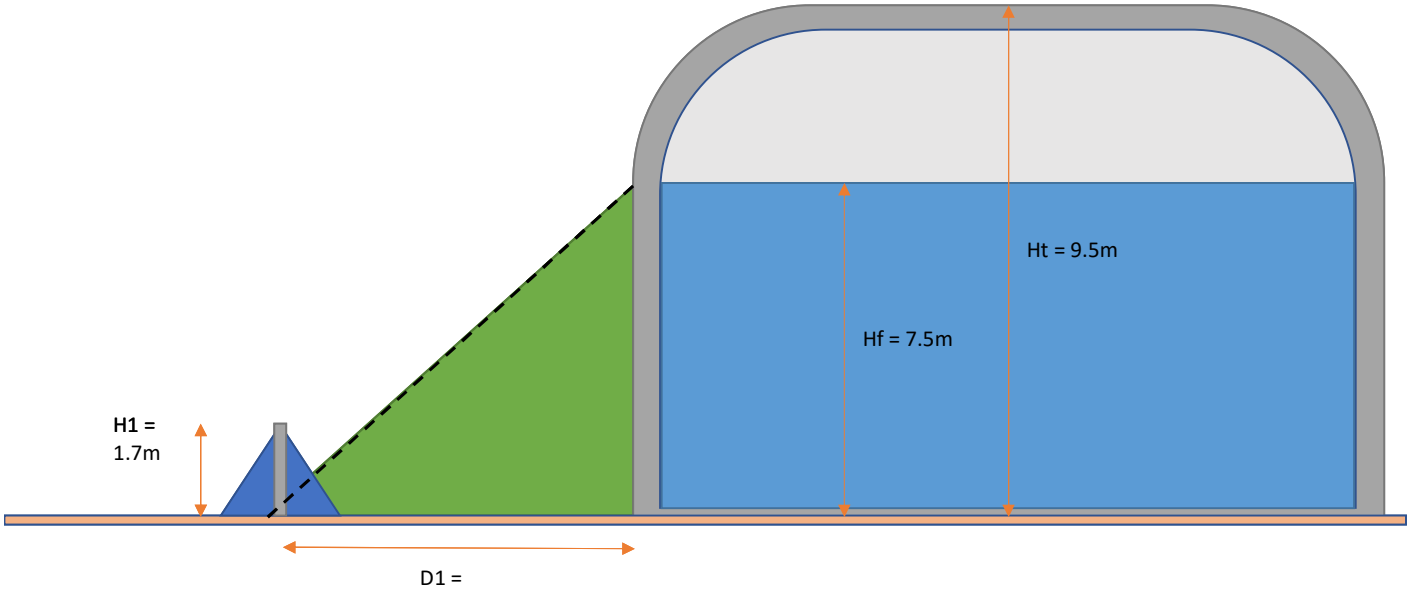
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 6
Tank Reference	Digestate Storage

Internal Ø	14525		
External Ø	14531		
Tank Height	9.5	Ht	Ht = 9.5m
Fill Height	7.5	Hf	Hf = 7.5m
Distance From Wall/Bund Crest	4.867	D1	D1 = 4.867m
Height of Wall/Bund Crest	1.7	H1	H1 = 1.7m

Distance Fixed		
Required Height	2.633	Hr
Difference from Existing Height	1.0	Bund/Wall needs to be raised by 1m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



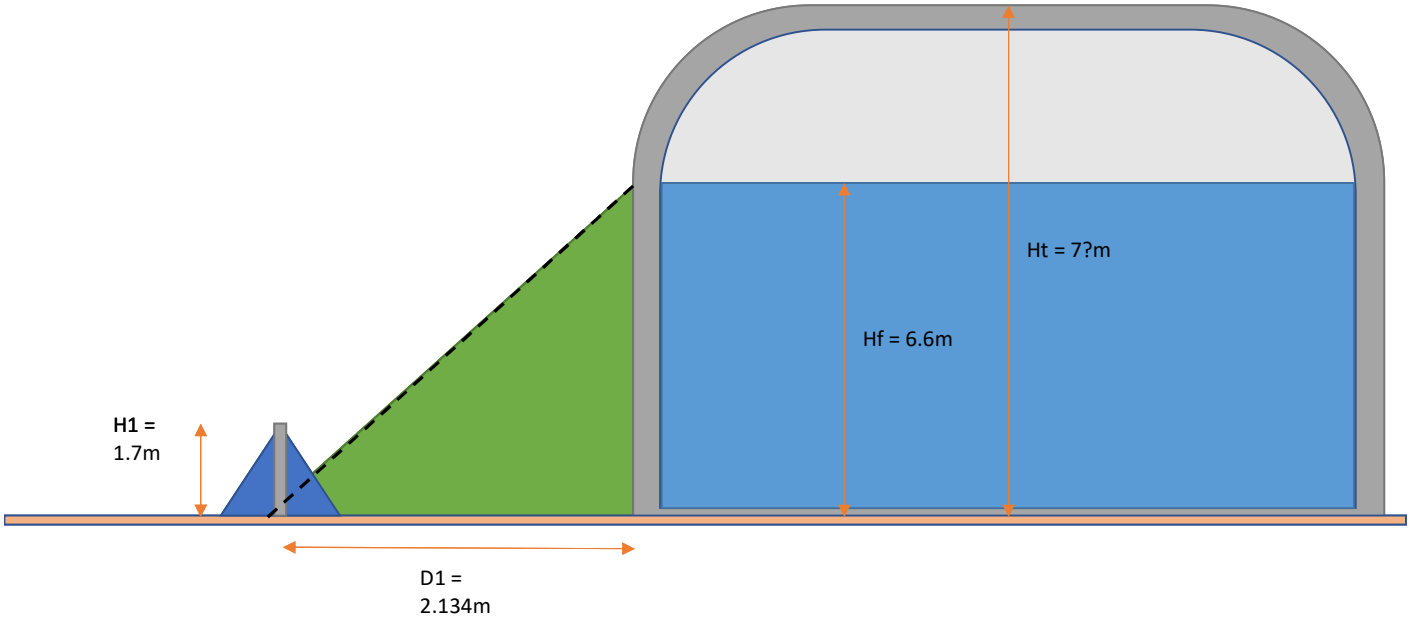
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 7
Tank Reference	Pasturiser

Internal Ø	7686		
External Ø	7692		
Tank Height	7?	Ht	Ht = 7?m
Fill Height	6.6	Hf	Hf = 6.6m
Distance From Wall/Bund Crest	2.134	D1	D1 = 2.134m
Height of Wall/Bund Crest	1.7	H1	H1 = 1.7m

Distance Fixed		
Required Height	4.466	Hr
Difference from Existing Height	2.8	Bund/Wall needs to be raised by 2.8m

(CIRIA C736 l = H - h ==> Dr = Hf - H1)
h = H - l ==> Hr = Hf - D1



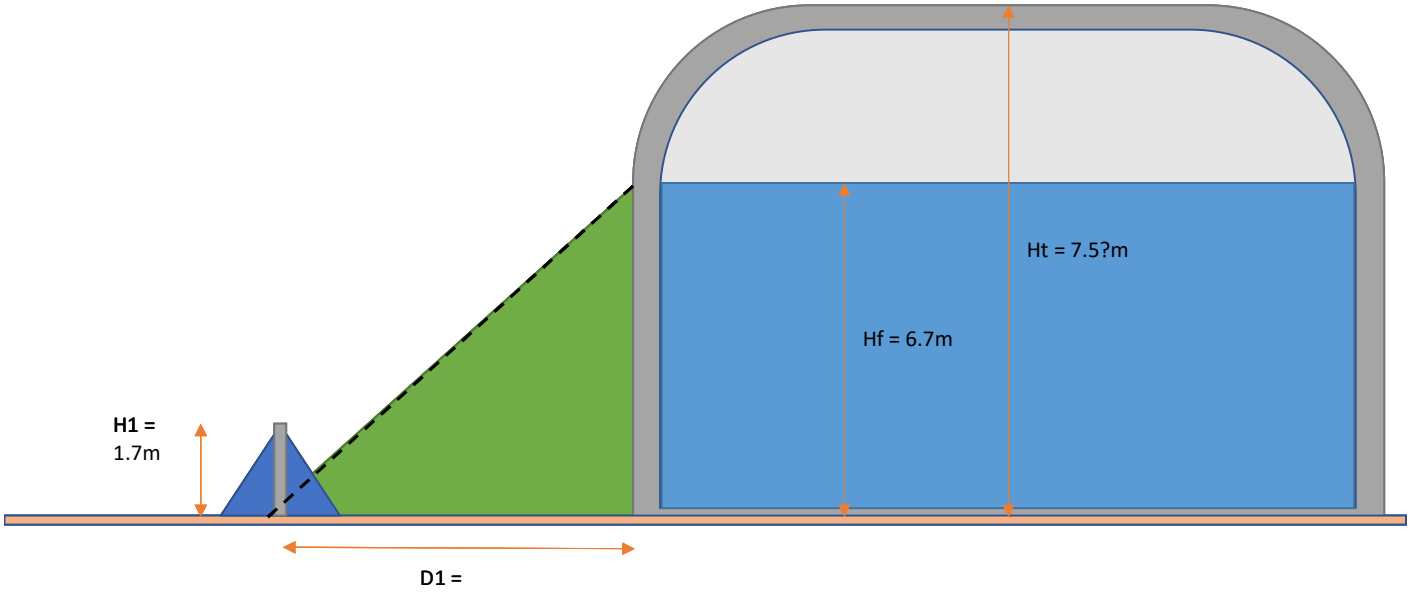
Jetting Analyses

Site Name	Malaby Biogas
Section Number	Section 8
Tank Reference	Buffer

Internal Ø	4311		
External Ø	4517		
Tank Height	7.5?	Ht	Ht = 7.5?m
Fill Height	6.7	Hf	Hf = 6.7m
Distance From Wall/Bund Crest	1.182	D1	D1 = 1.182m
Height of Wall/Bund Crest	1.7	H1	H1 = 1.7m

Distance Fixed		
Required Height	5.518	Hr
Difference from Existing Height	3.9	Bund/Wall needs to be raised by 3.9m

(CIRIA C736 I = H - h ==> Dr = Hf - H1)
h = H - I ==> Hr = Hf - D1



DRAWINGS

HPI

TRANSFORMER

CHP2

MAIN YARD

ACCESS STAIRS

SECTION 2

SECTION 1

WEIGHBRIDGE

SECTION 3

GAS CHILLER

SGB (FLARE)

TANKER POINT IN

DIGESTER 1

TANKER POINT OUT

SECTION 4

DEVERILL ROAD

FLOOR LEVEL 132.0MAOD

DIGESTER 2

FLOOD GATE

A36 WARMINSTER BY-PASS

BUFFER

SEPERATOR

DIGESTATE STORAGE

SECTION 5

SECTION 8

FLOOR LEVEL 132.0MAOD

PASTEURISER

SECTION 7

SECTION 6

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

KEY

SECTION 1 — CROSS SECTIONS LOCATIONS FOR JETTING ANALYSES

N

Rev.	Revision Detail	Drawn	Date
01	First Issue	WR	02/02/21

CLIENT:

MALABY BIOGAS LTD

PROJECT:

BORE HILL FARM BIODIGESTER

TITLE:

SITE PLAN

DRAWN:	CHECKED:	DATE:
WR	JA	JAN '22
SCALE:	ORIGINAL SHEET SIZE:	STATUS:
1:250	A3	DRAFT

DRAWING NO.: 22-008-D-001

REVISION: 01

KEY GEOSOLUTIONS LTD

NOVA HOUSE
AUDLEY AVENUE
NEWPORT
SHROPSHIRE TF10 7DW

TEL. 01952 822960
E-MAIL. INFO@KEYGS.COM
WEB. WWW.KEYGS.COM

HPI

CHP2

TRANSFORMER

MAIN YARD

ACCESS STAIRS

WEIGHBRIDGE

GAS CHILLER

SGB (FLARE)

TANKER POINT IN

DIGESTER 1

FLOOD LEVEL 133.40MAOD

FLOOR LEVEL 132.0MAOD

DIGESTER 2

FLOOD LEVEL 133.40MAOD

TANKER POINT OUT

DEVERILL ROAD

FLOOD GATE

BUFFER

DIGESTATE STORAGE

SEPERATOR

PASTEURISER

FLOOR LEVEL 132.0MAOD

A36 WARMINSTER BY-PASS

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

KEY

POTENTIAL FLOODED AREA EQUIVALENT TO A "FLOOD DEPTH" OF 1.40M

TANK/STRUCTURE FOOTPRINT NOT AVAILABLE TO BE FLOODED.

N

Rev.	Revision Detail	Drawn	Date
01	First Issue	WR	02/02/21

CLIENT:
MALABY BIOGAS LTD

PROJECT:
BORE HILL FARM BIODIGESTER

TITLE:
PRELIMINARY FLOOD RISK PLAN

DRAWN:	CHECKED:	DATE:
WR	JA	JAN '22
SCALE:	ORIGINAL SHEET SIZE:	STATUS:
1:250	A3	DRAFT

DRAWING NO.: 22-008-D-002

REVISION: 01

KEY GEOSOLUTIONS LTD
NOVA HOUSE
AUDLEY AVENUE
NEWPORT
SHROPSHIRE TF10 7DW
TEL. 01952 822960
E-MAIL. INFO@KEYGS.COM
WEB. WWW.KEYGS.COM