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Project No: 314766

Drainage Strategy:
Storage Lagoons - Crugmore Farm, Penparc, Cardigan

Prepared for:

Stepside Agricultural Contractors

Daniel James
Stepside Farm,
Gwbert Road,
Cardigan
SA43 1PH

Contents Amendment Record

This report has been issued and amended as follows:

Revision	Description	Date	Signed
1.0	First Issue	18/12/2024	Tiago Henriques
2.0	Second Issue	24/01/2025	Tiago Henriques
3.0	Third Issue	04/02/2025	Tiago Henriques

Acknowledgement

Appointment

This report has been prepared for the sole and exclusive use of Stepside Agricultural Contractors in accordance with the scope of work presented in Mabbett & Associates Ltd (Mabbett) Letter Agreement (314766/YP/091024/4.0 09 October 2024. This report is based on information and data collected by Mabbett. Should any of the information be incorrect, incomplete, or subject to change, Mabbett may wish to revise the report accordingly.

Mabbett was instructed to complete a Drainage Strategy (DS) at Crugmore Farm, Penparc, Cardigan, SA43 1QY (the site) to inform a planning application on the expansion of the adjacent existing AD facility to provide two covered storage lagoons, maturation tank and associated infrastructure.

This report has been prepared by the following Mabbett personnel:

MABBETT & ASSOCIATES LTD

_____
Tiago Henriques, BEng (Hons)
Civil Engineer

This report has been reviewed and approved by the following Mabbett personnel:

MABBETT & ASSOCIATES LTD

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Lucy Antell, BSc (Hons) MCIWEM
Senior Flood Risk and Drainage Consultant

MABBETT & ASSOCIATES LTD

_____
Gary Mackintosh BSc
Principal Engineer

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Appendices

1.0 Introduction

1.1 Project Understanding

1.1.1 The aim of this report is to assess the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk (if required). This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) revised in December 2023, the National Planning Practice Guidance (NPPG) Flood Risk and Coastal Change, and Schedule 3 of the Flood and Water Management Act (2010) implemented in January 2019.

1.1.2 Ceredigion County Council as the SuDS Approving Body (SAB) and Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all new developments of more than 1 house or floor space greater than 100m^2, a Drainage Strategy (DS) is to be attained, and Sustainable Drainage Systems (SuDS) implemented. The aim of the Sustainable Drainage Strategy is to identify water management measures, to provide surface water runoff reduction and treatment.

1.1.3 This report takes into account the following national and local policies:

- National Planning Policy Framework (NPPF) (2023)[1];
- National Planning Practice Guidance (NPPG) (2022)[2];
- CIRIA Guidance: The SuDS Manual (C753) (2017)[3];
- Schedule 3 of the Water Flood Management Act (2018); and
- Ceredigion County Council Local Development and Planning Policies.

1.2 Sources of Information

1.2.1 The following sources of information have been reviewed and assessed for the purpose of this DS:

- NRW online flood maps[4];
- British Geological Society (BGS) Interactive Map[5];
- MAGIC Interactive Map[6];
- Terra Firma (Wales) Ltd. Ground Investigation (2014 Ground Investigation);
- Statutory Standards for Sustainable Drainage Systems for Wales – designing, constructing, operating and maintaining surface water drainage systems (2018), and
- Cardigan Local Development Plan (2013 LDP).

1.3 Project Limitations

1.3.1 The wider Mabbett limitations are contained within Appendix A.

1 https://assets.publishing.service.gov.uk/media/65829e99fc07f3000d8d4529/NPPF_December_2023.pdf
2 http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/
3 https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx
4 https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default
5 http://mapapps.bgs.ac.uk/geologyofbritain/home.html
6 http://www.magic.gov.uk/

2.0 Site Details

The aim of this section of the report is to outline key environmental information associated with the baseline environment.

Area (approx.)	1.92ha	**National Grid Reference (NGR)**	220140, 247130

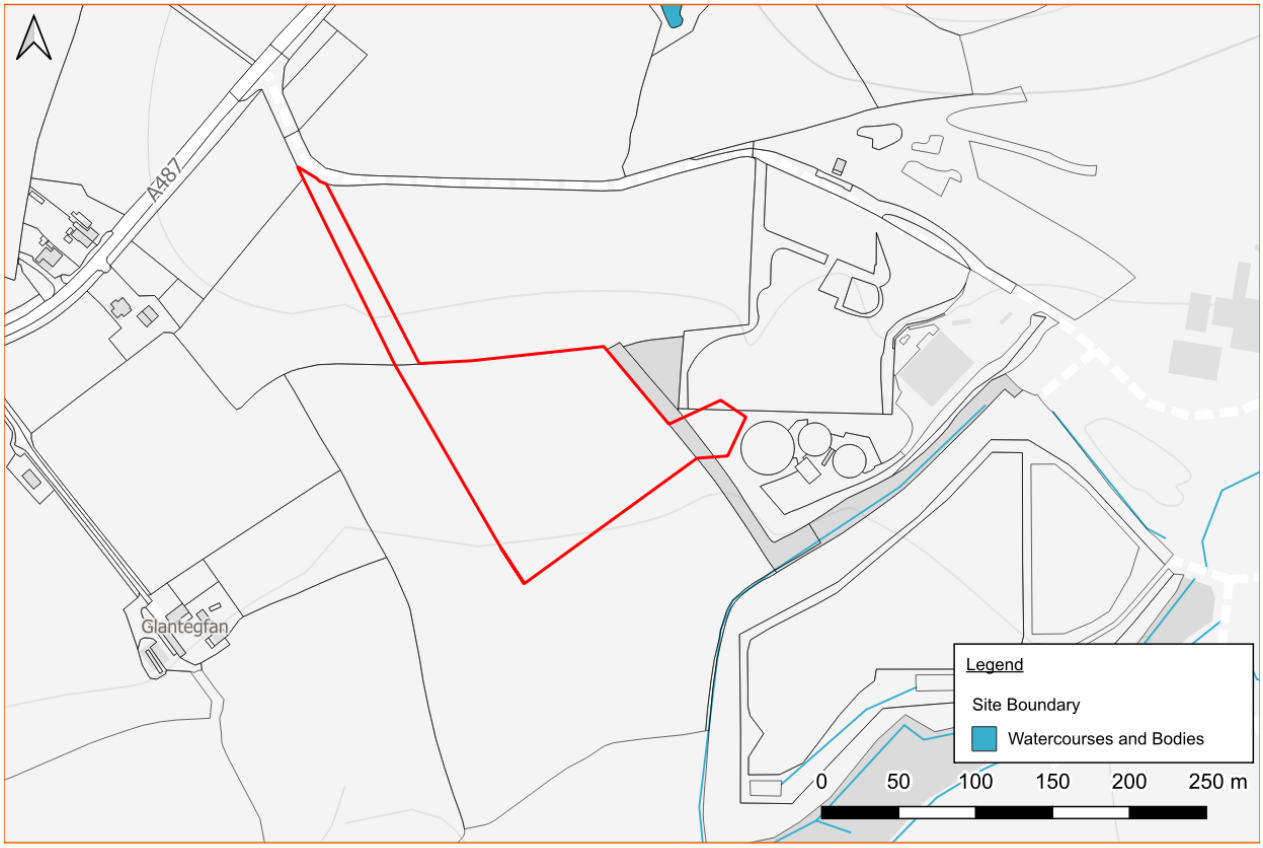


Figure 1: Site Location Plan

Site Location	The site is located approximately 2km northeast from the centre of Cardigan, and approximately 1.4km south-west of Penparc, within the county of Cardigan, Wales. The A487 is located 300m north of the site and Cardigan Dental Practice is located approximately 2.2km south-west of the site. The River Teifi is located approximately 2km southwest of the site and the nearest coastline is 4.5km northwest of the site.
Existing Site Conditions	Online mapping (including Google Maps and Google Streetview imagery, accessed 02/12/2024) shows that the site is wholly greenfield and comprises of arable land. Therefore the existing site is 100% permeable. To the east the site is bordered by Asgard Renewables Ltd – Food Waste Recycling. The north, west and south is bordered by greenfield with a solar farm adjacent the southeast boundary. Access to the site is provided from the A487, north of the site, via a 200m private road.
Topography	A topographical survey has been undertaken by CIAT in April 2024 and is included in Appendix B. The topographical survey shows that the site slopes from 87.8 metres Above Ordnance Datum (m AOD) in the northwest to 77.5 AOD in the southwest. Topographic levels to m AOD have also been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A LiDAR Plan is included as Figure 2.

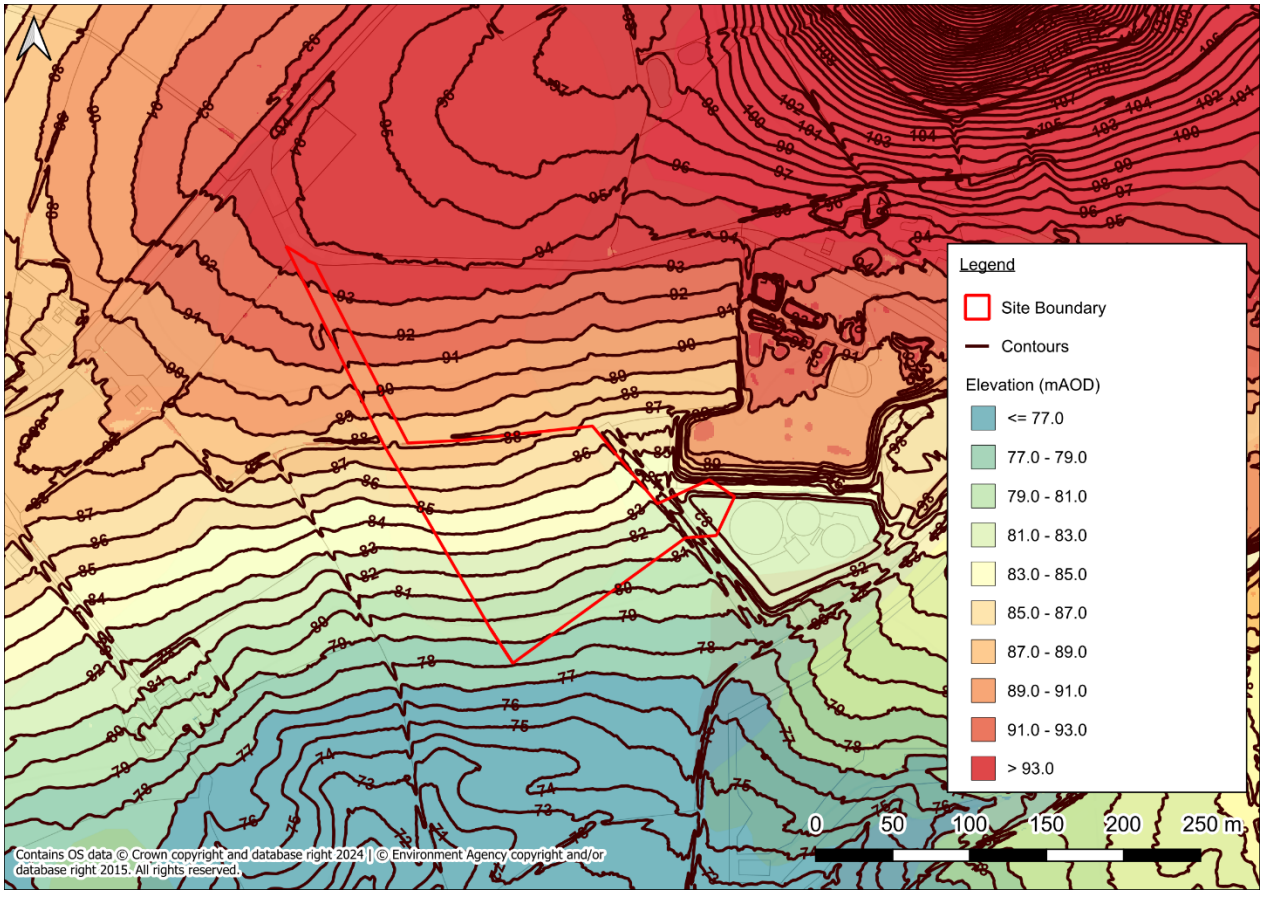


Figure 2: LiDAR Plan

Hydrology	The nearest watercourse is an unnamed Ordinary Watercourse located 200m south of the site, which receives the flows from local land drains serving the area. The Unnamed Ordianry Watercourse is a tributary off the river Nant-Rhyd-y-fuwch. Ordinary Watercourses are within the jurisdiction of the LLFA to maintain.

Geology	Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the majority of the site is not underlain by any superficial deposits. There are however areas of superficial deposits of Till, Devensian (Irish Sea Ice) – Diamicton to the south and east of the site. There is also a small area of Head – clay, silt, sand and gravel at the southeast of the site. The superficial deposits are identified as being underlain by Nantmel Mudstones Formation consisting of Mudstone. The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis. A ground investigation was performed on the land immediately adjacent to the east of the site. The survey was taken by Terra Firma (Wales) Ltd. in February 2014 and comprised of 4 boreholes. The report indicates that the following geology was encountered: • Soft to firm Boulder Clay to 2/3m below ground level (bgl); • Firm to stiff to very stiff light brown Clayl from 2/3m to 3.6/9.6m bgl; and • Shale bedrock from 3.6/9.6m bgl. There were no water strikes registered during the survey.
Hydrogeology	According to the NRW's Interactive Map Aquifer Data, accessed 05/12/24, the Till and Head Deposits are classified as a Secondary Undifferentiated Aquifer. The data also identifies the underlying Bedrock Deposit of Nantmel Mudstones Formation as a Secondary B Aquifer. Secondary Undifferentiated Aquifers are assigned in 'cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type'. Secondary B Aquifers are 'predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'. The NRW's 'Source Protection Zones' data, obtained from NRW's Interactive Map accessed 05/12/24, indicates that the site is not located within a Groundwater Source Protection Zone.

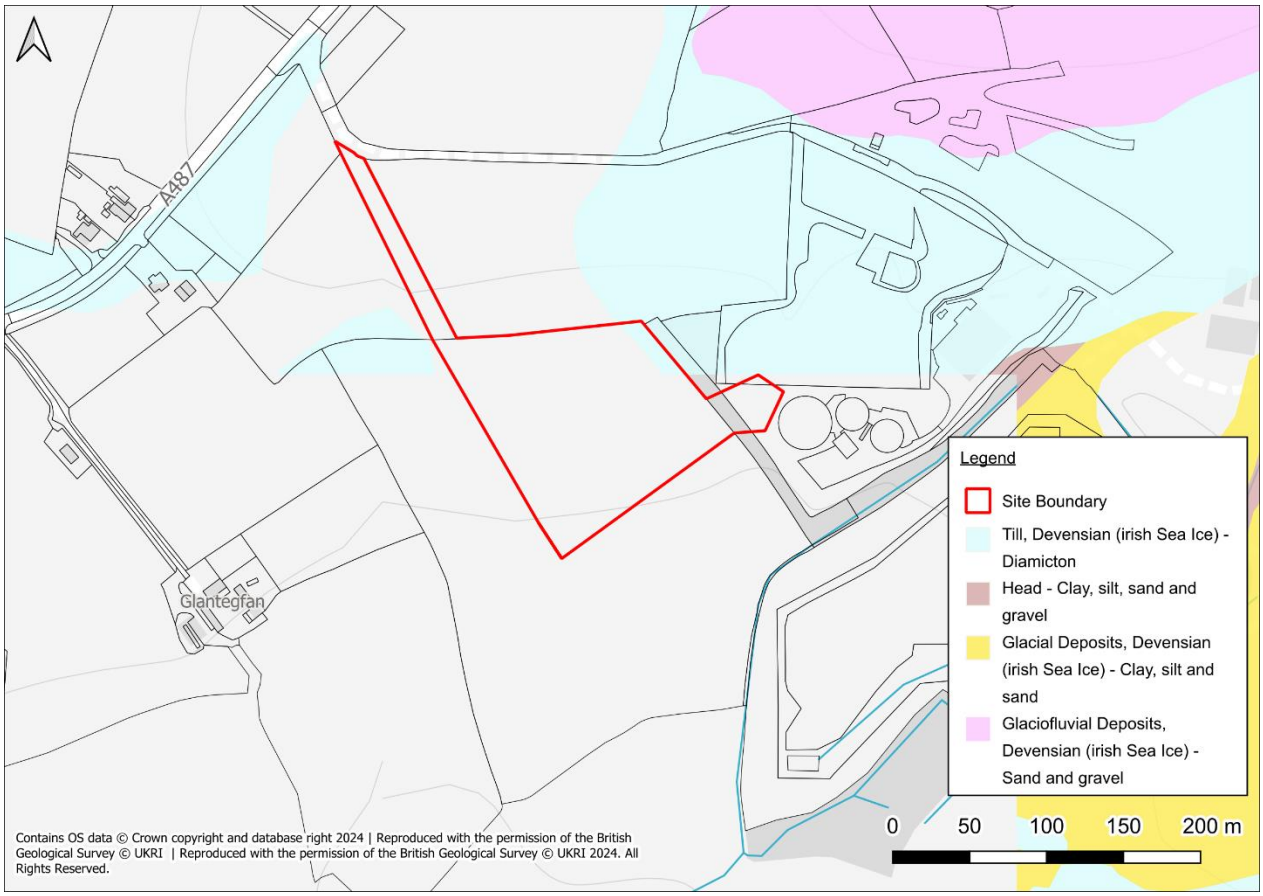


Figure 3: Superficial Deposits

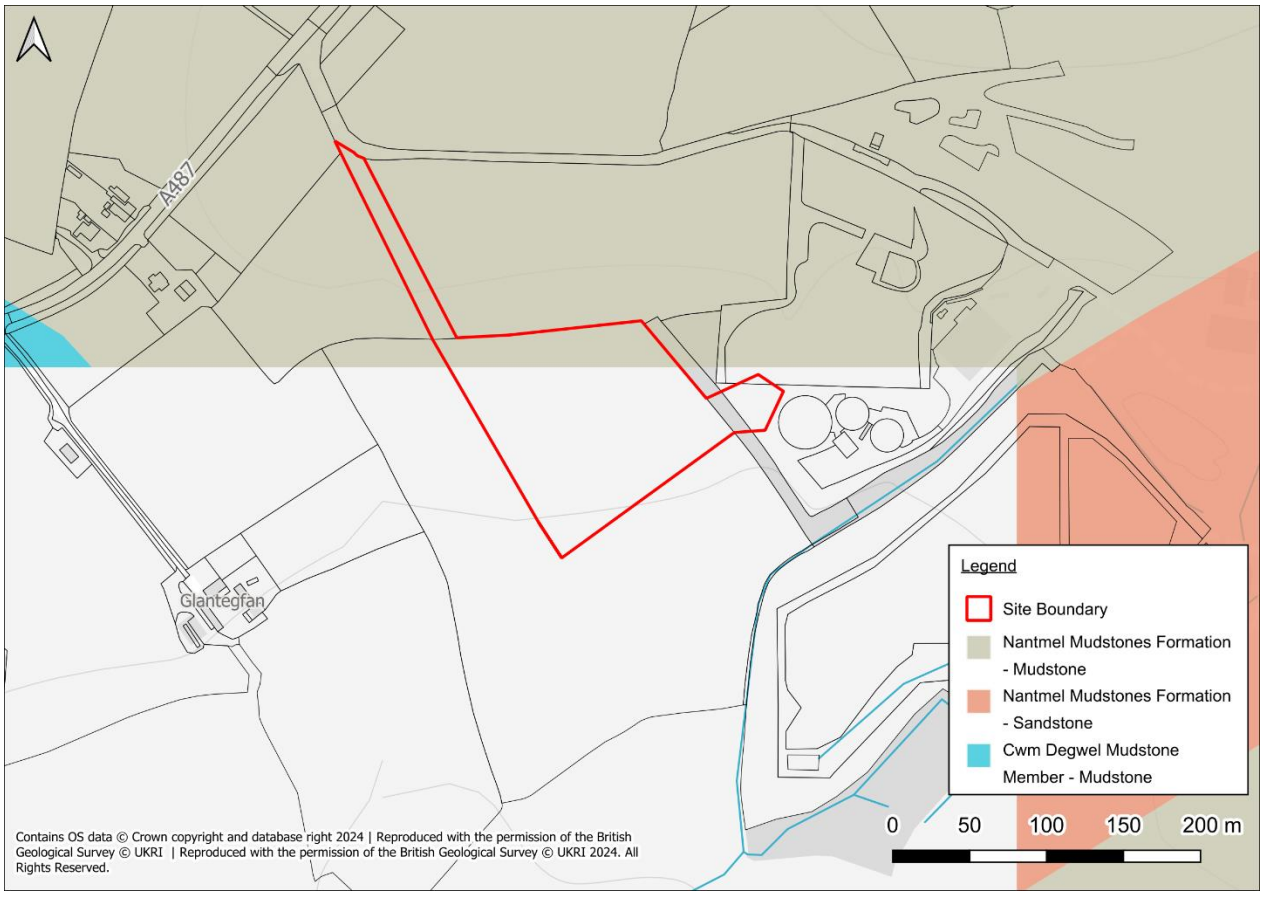


Figure 4: Bedrock Deposits	
Local Drainage	Sewer plans have been requested from Welsh Water and received on Decembre 2024. The records show there is a 200mm combined sewer north of the site, the crosses the proposed access road to the site. The sewer records can be found in Appendix C. The site is also served by a series of land drains. The existing land drains freely discharge into the local watercourse, directly to the south of the site.
Development Proposals	The proposed development is to expand the existing AD facility to provide two covered storage lagoons, maturation tank and associated infrastructure. The proposed development plan is included in Appendix D. The proposed development will have the finished floor levels at 84m AOD. The development will result in an increase in hardstanding areas in the form of lagoons and access. Hardstanding will comprise 1.22ha or 64% of the total site area. The remaining permeable, soft landscaped areas will occupy 0.7ha or 36% of the total site area.

3.0 Relevant Planning Policy and Guidance

3.1 Introduction

3.1.1 The aim of this section of the report is to discuss the main aspects of the local and national planning policies that are relevant to any proposed development on the site and relevant guidance and legislation.

3.2 Planning Policy Wales

3.2.1 Given the nature and scale of the development, the proposed development is considered to be a 'less vulnerable' development in accordance with Figure 3 of the Welsh Government's Technical Advice Note 15 – Development and Flood Risk (TAN15).

3.2.2 The site is entirely in Flood Zone A within Welsh Governments TAN 15 Development and Flood Risk Map and therefore is considered to be at little or no risk of fluvial or costal/tidal flooding.

3.2.3 Schedule 3 is the new legislation which the Welsh Government implemented in January 2019. The main role of the legislation is to guarantee that SuDS are utilised to manage surface water on new developments in urban and rural areas. The following changes now apply in Wales:

- New developments of more than 1 house or where construction area is >100m^2 will require the implementation of SuDS;
- Drainage Systems must be designed and built with regards to the statutory SuDS standards;
- Local authorities will become the SuDS Approving Body (SAB);
- SuDS schemes require approval by the acting SAB before construction starts; and
- The SAB are responsible for adopting compliant SuDS as long as it is built in accordance with the approved proposals.

3.3 Local Policy

3.3.1 The Cardigan County Council Local Development Plan 2007 – 2022 (adopted April 2013) contains the following policies relating to drainage:

"Policy DM13:
Sustainable Drainage Systems

In addition to requirements set out by national guidance, development will be permitted provided that:

1. *Where a site is being developed on a plot-by-plot basis a scheme for an appropriate SUDS for the entire site is put forwards as part of the first application;*
2. *If the site is capable of being extended at a future date it should not be developed in such a way that future SUDS systems cannot be implemented;*
3. *Non-residential development of 500m^2 or more is accompanied by a SUDS that is capable of being adopted by the SUDS Approving Body; and*
4. *A management scheme is submitted detailing the maintenance of the SUDS scheme.*

If SUDS cannot be implemented a full written justification should be submitted explaining why this is the case."

3.4 Climate Change

3.4.1 The NRW 'Flood Risk Assessments: Climate Change Allowances' Guidance states that the central estimate or change factor should be used as a minimum for development proposals. This may not be applicable to every site depending on the scale and nature of the site. Where the assessment indicates significant flood risk then the upper estimate should be used.

3.4.2 The Peak River Flow Allowance[7] for West Wales within the central estimate is 25% for the 2050s epoch and 30% for the 2080s epoch.

3.4.3 The Peak Rainfall Intensity across all of Wales within the central estimate is 10% for the 2050s epoch and 20% for the 2080s epoch.

3.4.4 It is worth noting that for river catchments over 5km^2, the climate change percentages for peak river flow should be used as the peak rainfall intensity.

3.5 Guidance

3.5.1 The 2015 CIRIA SuDS Manual involves guidance that covers “the planning, design, construction, and maintenance of SuDS to assist with effective implementation in both new and existing developments. The aim is to maximise amenity and biodiversity benefits and deliver the key objectives of managing flood risk and water quality.”

[7] https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf

4.0 Drainage Strategy

4.1 Introduction

4.1.1 The site currently comprises of undeveloped land which is not formally drained and is therefore considered to be 100% permeable.

4.1.2 The proposed development will introduce 1.22ha of hardstanding in the form of storage lagoons and access roads.

4.1.3 The increase in hardstanding area will result in an increase in surface water runoff rates and volumes. To ensure the proposed development will not increase flood risk elsewhere, surface water discharge from the site will be controlled.

4.2 Drainage Hierarchy

4.2.1 The recommended surface water drainage hierarchy (Paragraph 080 of the NPPG: Flood Risk and Coastal Change) is to utilise soakaway systems or infiltration as the preferred option, followed by discharging to an appropriate watercourse. If this is not feasible, the final option is to discharge to an existing public sewer.

Surface Water Discharge to Soakaway

4.2.2 The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above most of the site doesn't have superficial deposits. There are underlain superficial deposits of Till, Devensian (Irish Sea Ice) – Diamicton to the south and east of the site. There is also a small area of Head – clay, silt, sand and gravel at the southeast corner of the site.

4.2.3 The storage lagoons will store organic matter to be used as fertiliser and will be covered while in use. However, if the lagoon covers fail, there the risk that runoff may become contaminated with the organic matter. It can be concluded that soakaways may not be suitable for the discharge of surface water runoff.

Surface Water Discharge to Watercourse

4.2.4 Where soakaways are not suitable a connection to watercourse is the next consideration.

4.2.5 The existing site is greenfield and it is assumed to freely discharge to a land drain 200m south of the site. The land drain is situated at approximately 77m AOD and discharges to a nearby Unnamed Ordinary Watercourse (a tributary off the river Nant-Rhyd-y-fuwch).

Surface Water Discharge to Sewer

4.2.6 As described above, a connection to watercourse is feasible and therefore a connection to the public surface water sewer is not required.

4.3 Surface Water Discharge

4.3.1 The Sustainable Drainage Systems Standards for Wales states that "All the runoff from the site for the 1:100 year event should be discharged at either a rate of 2 l/s/ha or the average annual peak flow rate (i.e. the mean annual flood, Qbar), whichever is the greater". The site area of 1.92ha would result in a rate of 3.84l/s and Qbar rate of 5.5l/s. We therefore propose a discharge rate of 5.5l/s, since it is the greater.

4.4 Attenuation Storage

4.4.1 In order to achieve a discharge rate of 5.5l/s, attenuation storage will be required. Storage estimates have been provided using Causeway Flow and are included in Appendix E. An estimated storage volume of 800m³ will be required for the 1 in 100 year plus 30% CC plus 10% creep event. The storage estimates are based on a flow rate of 5.5l/s, a design head of 2.0m and hydro-brake flow control.

4.4.2 The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

4.5 Sustainable Drainage Systems

4.5.1 Attenuation storage should be provided in the form of Sustainable Drainage Systems (SuDS) where practical. The following SuDS options have been considered:

Soakaways

4.5.2 As described above, the use of soakaways is not considered to be feasible.

Swales, Detention Basins and Ponds

4.5.3 The site will be mostly occupied by lagoons and access roads, there is limited space to accommodate above ground storage features such as ponds and basins.

Filter Drains/Strips

4.5.4 Filter drains are trenches filled with stone/gravel that create temporary subsurface storage for the filtration, attenuation, and conveyance of surface water runoff. Ideally, filter drains receive lateral inflow from adjacent impermeable surfaces pretreated over a filter strip. Filter drains can help manage peak flows by naturally limiting rates of conveyance through the filter medium and by providing attenuation storage when the rate of flow at the outlet is controlled. Given the nature of the site, filter drains cannot be effectively incorporated into the landscaped areas and public open spaces.

Bioretention Systems

4.5.5 Bioretention systems (including rain gardens and raised box planters) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution. They also provide attractive landscape features and biodiversity. Bioretention systems can help reduce flow rates from a site by promoting infiltration / evapotranspiration and providing some attenuation storage. Bioretention systems can also provide very effective treatment functionality. Bioretention systems are a very flexible surface water management component that can be integrated into a wide variety of developments / densities using different shapes, materials, planting, and dimensions. Bioretention systems (including rain gardens) should be considered within the detailed drainage design.

Rainwater Harvesting

4.5.6 The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the tanks were not full. However, rainwater harvesting techniques could be incorporated within the final design.

Porous/Permeable Paving

4.5.7 Permeable paving could be incorporated within private roads and driveways. Storage would be provided within the sub-grade material prior to controlled release to the receiving sewer / watercourse. The amount of storage offered by permeable paving is subject to sub-grade depth and site gradient. The use of permeable paving should be considered at the detailed design stage.

4.5.8 **Underground Attenuation Tanks**

4.5.9 Storage could be provided within underground attenuation tanks or within oversized pipes. Sufficient space for an underground tank is provided in the northern extent of the site. The use of underground attenuation is detailed further below, and should be considered at the detailed design stage.

4.6 Preferred Drainage Scheme

4.6.1 Surface water runoff will be discharged at 5.5l/s (Qbar) to the southern land drain which takes the flows to a nearby unnamed watercourse. Surface water runoff up to the 1 in 100 year plus 30% climate change plus 10% creep allowance event will be attenuated on site. A total attenuation volume of 800m³ will be required to achieve the discharge rate and will be provided in the form of an underground attenuation tank within the north of the site. Details of the proposed drainage strategy can be found in Appendix F - Proposed Drainage Layout.

4.6.2 The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development.

4.7 Event Exceedance

4.7.1 Storage will be provided for the 1 in 100 year plus 30% CC event. Storm events in excess of the 1 in 100 year plus 30% CC event should be permitted to produce temporary shallow depth flooding within the car park / access road / landscaped areas. Finished floor levels will be set at a minimum of 150mm above surrounding ground levels ensuring exceedance flooding will not affect the buildings.

4.8 Surface Water Treatment

4.8.1 In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), industrial roofs have a 'low' pollution hazard level. Table 2 below shows the pollution hazard indices for each land use.

Table 2: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Other Roofs (typically commercial/industrial roofs)	Low	0.5	0.2**	0.4

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

** up to 0.8 where there is potential for metals to leach from the roof

4.8.2 Where practical, runoff from the site will be directed in the attenuation tank and discharged at a rate of 5.5l/s to the southern land drain. Table 3 below demonstrates that permeable paving provides sufficient treatment.

Table 3: SuDS Mitigation Indices

	Mitigation Indices		
Type of SuDS	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Permeable Pavement	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.3

4.8.3 It can be concluded that the inclusion of permeable paving will provide sufficient treatment.

4.9 Maintenance

4.9.1 Maintenance of communal drainage features such as permeable paving or an attenuation tank will be the responsibility of the site owner. Maintenance of shared surface water drainage systems can be arranged through appointment of a site management company.

4.9.2 Maintenance schedules for an attenuation tank and permeable paving are included in Appendix G.

4.10 Foul Water Discharge

4.10.1 The site it is not expected to produce foul flows.

4.11 Loss of Contamination Management

4.11.1 The development incorporates integrated mitigation measures to minimise runoff contamination effectively. Potential environmental risks associated with the escape of the contents from the storage lagoons have been considered.

4.11.2 Contaminated water containment will be achieved using a Sandfield ToggleBlok valve integrated into the proposed surface water drainage system, which discharges to the land drain. In the event of a contamination, the valve will automatically close, isolating the drainage system. The activation, triggered by the site's alarm system, ensures containment by allowing flows to back up within the drainage network. The system is designed to handle up to a 1 in 100-year storm event with a 30% climate change and 10% creep allowance, ensuring sufficient capacity to manage a 1 in 10-year event during isolation.

4.11.3 After a contamination of runoff, the retained runoff will be tested for contamination. Based on the test results, an appropriate disposal method will be determined, which may include on-site treatment and controlled release or tankering the water for off-site disposal.

4.12 Other Considerations

4.12.1 Maintenance access to the existing land drain should be retained. Maintenance access can be ensured by providing an 8 m buffer either side of the watercourse.

5.0 Conclusions and Recommendations

5.1 Conclusions

5.1.1 The proposed development will expand the existing AD facility to provide two covered storage lagoons, maturation tank and associated infrastructure. The development will introduce a new impermeable drainage area, this will result in an increase in surface water runoff. Hardstanding will comprise 1.22ha or 64% of the total site area. The remaining permeable, soft landscaped areas will occupy 0.7ha or 36% of the total site area

5.1.2 In order to ensure the increase in surface water runoff will not increase flood risk elsewhere, flow control will be used, and attenuation provided on site, to accommodate storm events up to and including the 1 in 100 year plus 30% climate change and 10% creep event.

5.1.3 All methods of surface water discharge have been assessed. Where soakaways are not possible, discharge of surface water to the existing southern land drain at a rate of 5.5l/s (Qbar) appears to be the most practical option, subject to approval from the LLFA.

5.1.4 Attenuation storage will be required on site in order to restrict surface water discharge to 5.5l/s. To achieve the desired flow rate it is required a volume of 800m^3, it has been proposed to store the runoff in an underground attenuation tank within the site.

5.2 Recommendations

Drainage Strategy

- Verify the attenuation volumes included in this report when undertaking detailed drainage design;
- Make provision for sustainable drainage features in the north extent of the site; and
- Survey the existing southern land drain to determine invert levels and determine capacity.

Appendix A – Limitations

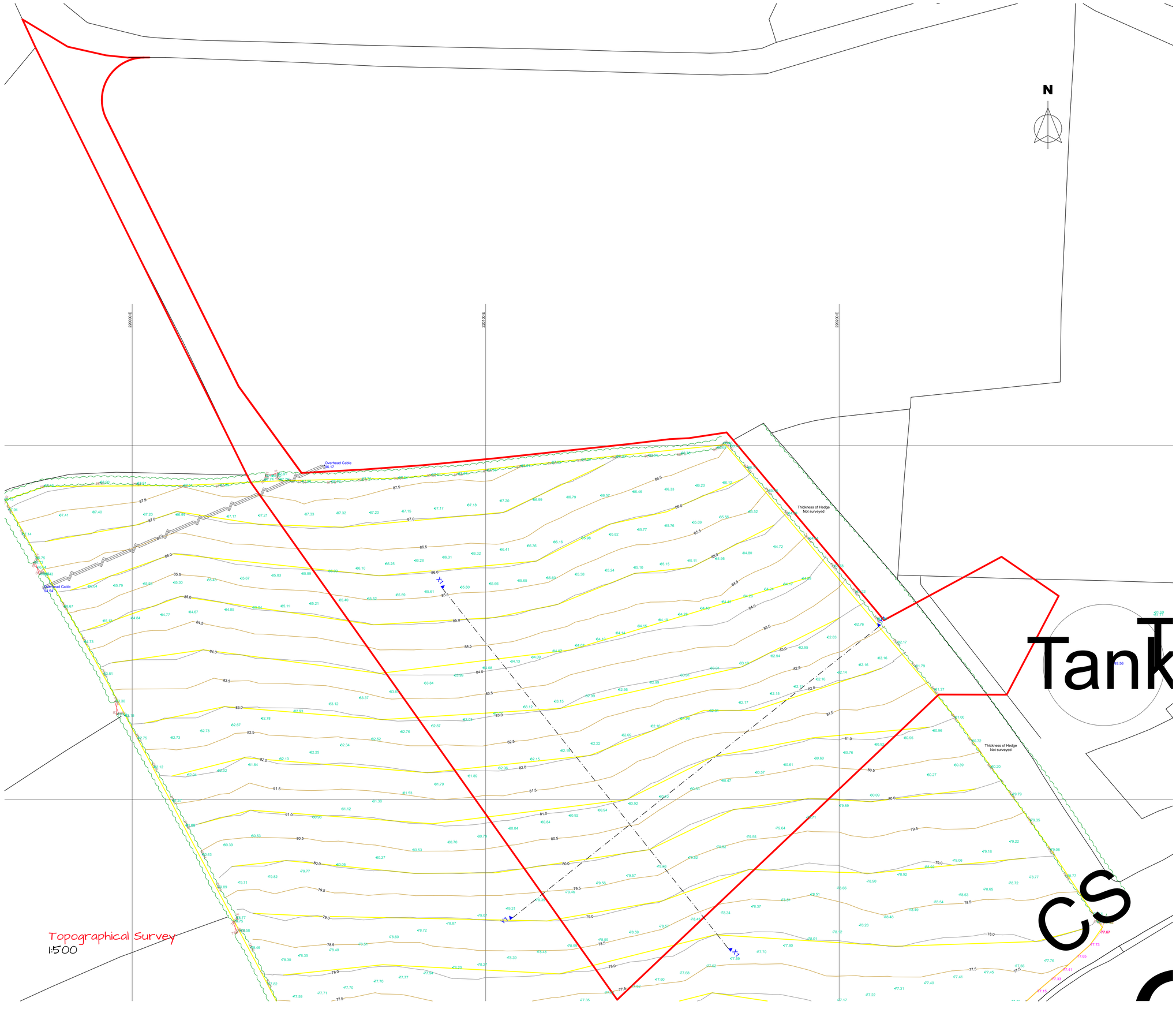
Limitations

The recommendations contained in this Report represent Mabbett professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Mabbett does not warrant or guarantee that the site is free of hazardous or potentially hazardous materials or conditions.

Mabbett obtained, reviewed and evaluated information in preparing this Report from the Client and others. Mabbett conclusions, opinions and recommendations has been determined using this information. Mabbett does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Mabbett has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Mabbett for the sole and exclusive use of the Client and for the specific purpose for which Mabbett was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Mabbett, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Mabbett does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Mabbett from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B – Topographic Survey



Topographical Survey
1:500

General

No allowance has been made for sub surface entry into manholes or other chambers or voids below ground level. Therefore ay details relating to depths, sizes etc. are taken from above ground and as such will be approximate only.

Should there be any conflict between the details indicated on this drawing and those indicated on other drawings, the Engineer should be informed prior to construction on site.

It is important to note that the same accuracies implied by the plotting scale are equally applicable to digital data supplied for CAD.

Every effort is made to identify all visible above ground features. However, it should be borne in mind that there may be items obscured at the time of survey.

Notes

1. Survey Control - This survey is to GPS data.

2. This drawing is to be read in conjunction with all other relevant drawings / documentation.

3. Check 10m grid before taking non-figured dimensions from this drawing.

4. If in doubt ask.

Legend

- Top of Bank
- Fence
- Gate
- Overhead Cable

Rev.	Initial	Description	Date
A	LC	First Release	02/04/24

Status

For discussion
For approval
For construction

CIAT
REGISTERED PRACTICE

Job Title

Crugmor Farm
Cardigan
Ceredigion
SA43 1QY

Drawing Title

Proposed Lagoons
Existing Site Layout Plan

Drawing Type

Survey Drawing

DO NOT SCALE
If in Doubt - Ask!

Use only figured dimensions.
All dimensions to be confirmed on site.
Report any discrepancies to Trevor Hopkins Associates Ltd.

Drawing Number	Revision	Sheet
P-1742	A	01

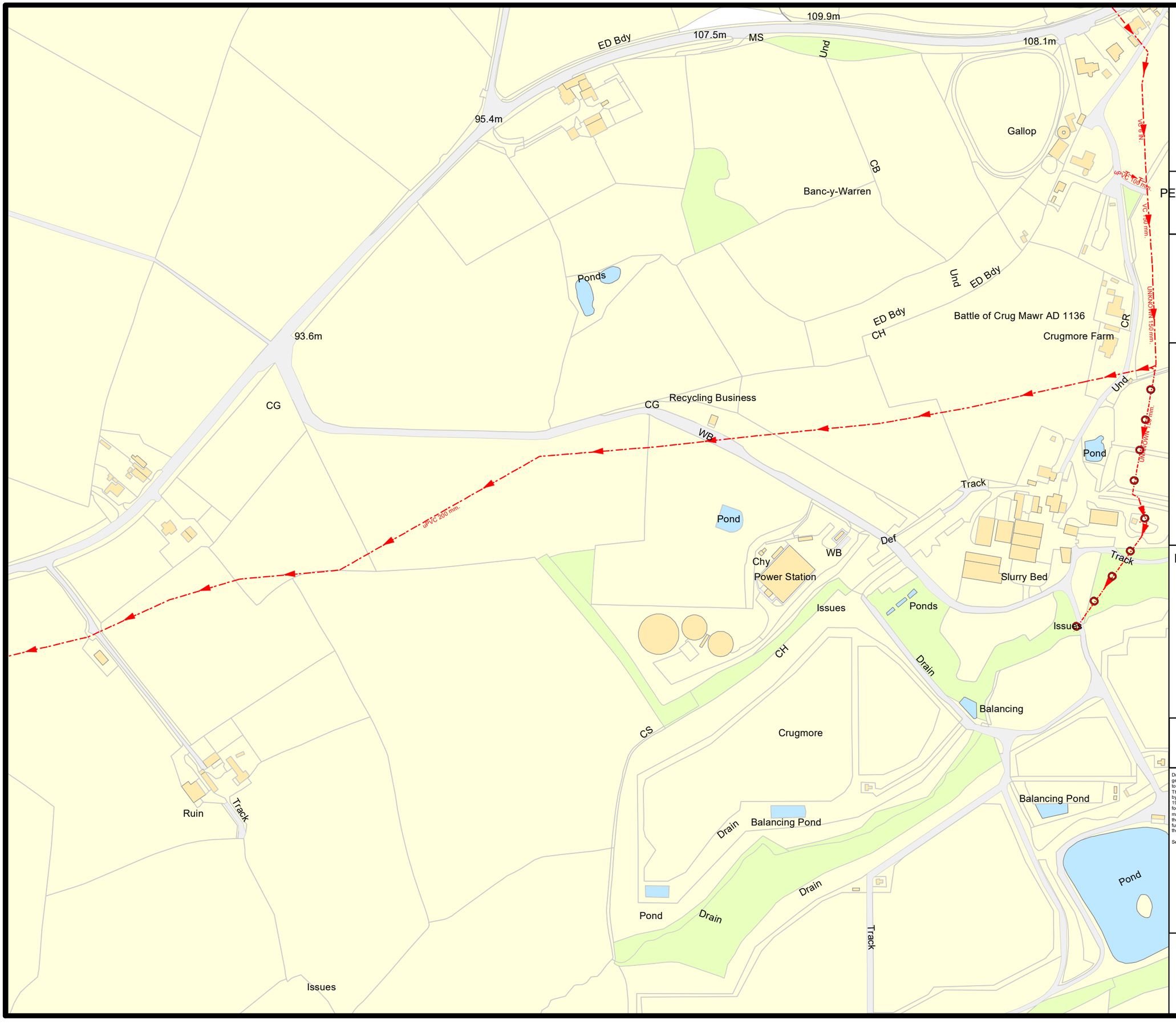
(01239) 621010
design@trevorhopkins.com

Trevor Hopkins Associates Ltd
Parc House, Parc Teifi, Cardigan, Ceredigion, SA43 1EW

/Users/leecowie/THA Dropbox/THA Files/Drawings/00 Numbered Projects/1742-Crugmore Farm/P-1742A.pln

Original: A1

Appendix C – Welsh Water Sewer Plans



Dŵr Cymru
Welsh Water

PENPARC CARDIGAN A487 CARDIGAN SA43 1QY

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

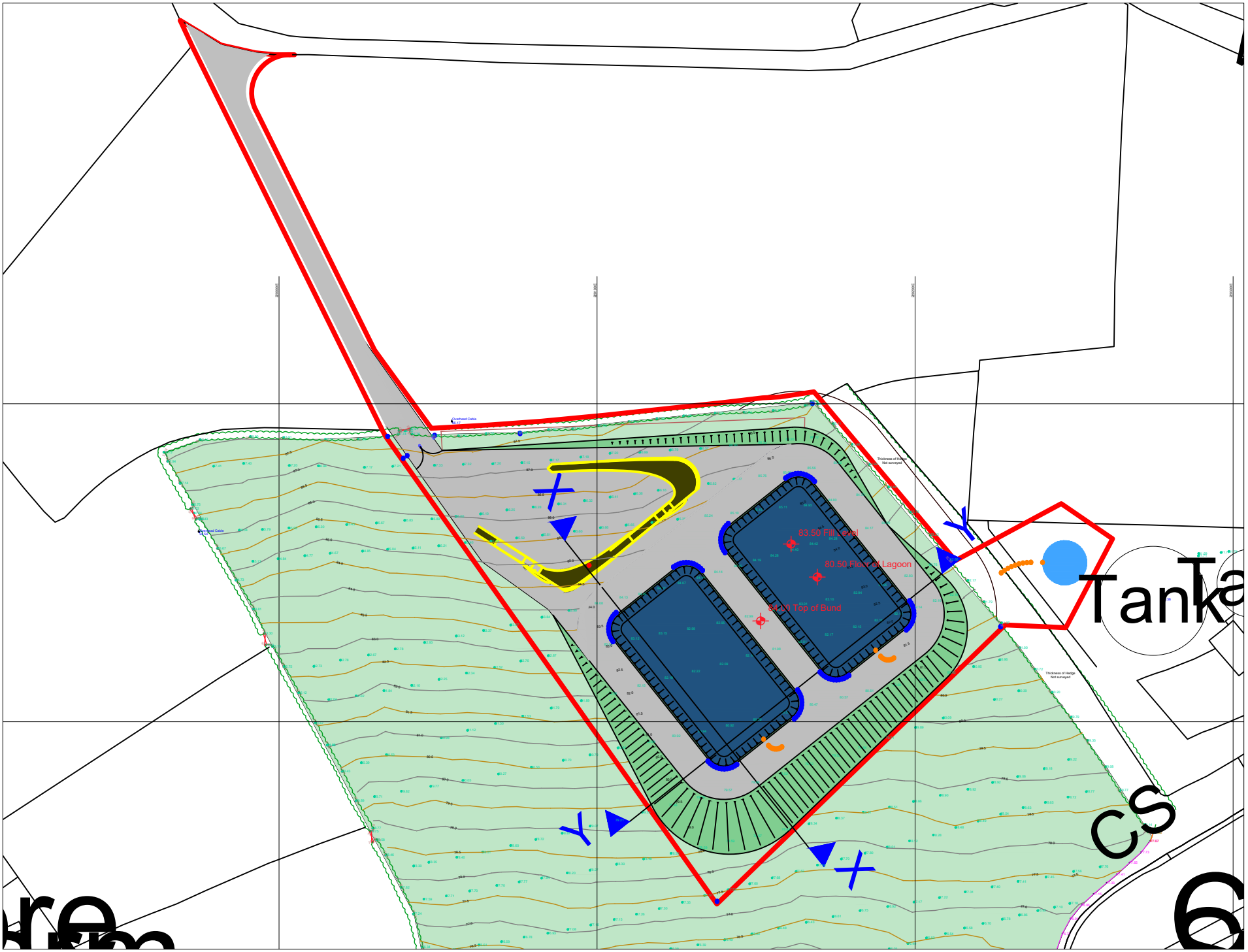
Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

Map Ref:	220214,247244
Map scale:	1:3000
Printed by:	Warren Rees
Printed on:	12 Dec 2024

Appendix D – Proposed Development Plans


83.50 Fill Level
80.50 Floor of Lagoon
84.00 Top of Bund
Tank
CS

Appendix E – Storage Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	14.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Storage	1.220	5.00	100.000	1200	0.000	0.000	2.000

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.300	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	97.500	Product Number	CTL-SHE-0110-5500-1000-5500
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.5	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

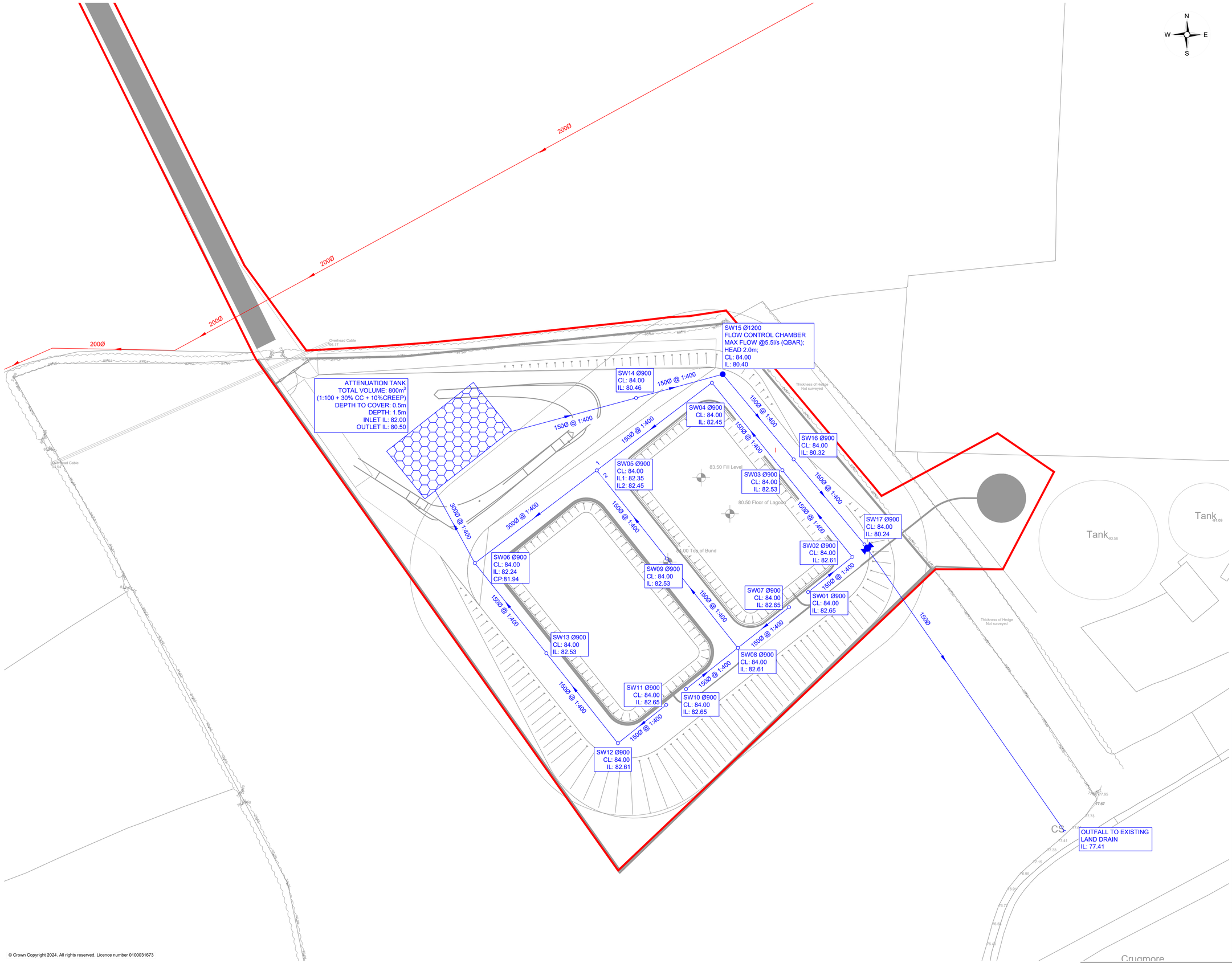
Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	800.0	0.0	1.000	800.0	0.0	1.001	0.0	0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 85.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	915	99.347	1.347	49.7	817.2356	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	7.3	418.7

Appendix F – Proposed Drainage Strategy



GENERAL NOTES:

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS.
2. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS TO BE CHECKED ON SITE.
4. DO NOT SCALE FROM THE DRAWING.
5. THIS DRAWING IS FOR PLANNING ONLY.
6. ALL SERVICES TO BE CHECKED ON SITE AND NOT SCALED FROM THIS DRAWING.
7. COVER LEVELS ESTIMATED USING PROPOSED FINISHED FLOOR LEVELS.

KEY:

- SITE BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER OUTFALL
- PROPOSED HYDROBRAKE OR SIMILAR FLOW CONTROL DEVICE
- SANDFIELD TOGGLEBLOK FIRE WATER VALVE
- ATTENUATION TANK
- PUBLIC COMBINED SEWER

DRAWING BASED ON:

- P-1742C - SITE PLAN
- P-1742A 01 TOPO SURVEY

Rev.	Description:	Date:	By:	Chk:
01	ISSUED FOR PLANNING	02/12/24	TH	GM

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Status: PRELIMINARY

Client: **STEPSIDE AGRICULTURAL**

Site: **PENPARC, CARDIGAN**

Drawing Title: **PROPOSED DRAINAGE LAYOUT**

Date:	Scale:	Paper Size:
24 Jan 2025	1:500	A1 (841 x 594mm)

Drawn By:	Checked By:	Passed:	Revision:
TH	GM	JR	01

CAD Ref:	Drawing No: / Client Ref:
A1 Landscape	**Figure 1**

Appendix G – Maintenance Schedule

Attenuation Storage Tanks Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 21.3

Pervious Pavements Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 20.15