Swansea North BESS: Flood Consequence Assessment and Outline Drainage Strategy

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Swansea North BESS: Flood Consequence Assessment and Outline Drainage Strategy

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1. Introduction

1.1. Instruction

Aqua Terra Consultants Ltd (Aqua Terra) was instructed by Land Use Consultants (LUC) (the Client) on behalf of EDF Renewables Energy Limited to provide a Flood Consequence Assessment and Outline Drainage Strategy for Swansea North BESS at Felindre, Swansea (the Site). Instruction to proceed in accordance with the Technical Workscope – Swansea BESS was confirmed by email dated 19th February 2025.

1.2. Brief

The Client is supporting EDF Renewables through the planning and consenting process for a Battery Energy Storage System (BESS), including associated infrastructure on the Site. Aqua Terra has been instructed to provide a provide a Flood Consequence Assessment (FCA) and Outline Drainage Strategy (SuDS) to support the proposed development through the planning process, inline with Planning Policy Wales (Welsh Government, 2024) (PPW) and Technical Advice Note 15 (TAN15) (Welsh Government, 2025).

1.3. Data sources

The principal sources of data used in this assessment are summarised below:

- Site development plans provided by LUC;
- NRW flood map for planning datasets;
- Statutory standards for sustainable drainage systems (Welsh Government, 2018);
- South West Wales – Stage 1 Strategic Flood Consequence Assessment (JBA Consulting, 2022)
- LiDAR digital terrain model (DTM) data from Welsh Government 2020-22 LiDAR;
- Hydrological descriptor data from the Flood Estimation Handbook (FEH) website (UK Centre for Ecology & Hydrology, 2025);
- Ordnance Survey mapping; and,
- British Geological Survey (BGS) mapping data and borehole logs (British Geological Society, 2025).

1.4. Limitations

This report is written strictly for the benefit of the Client and bound by the conditions presented in Appendix A.

2. Site setting

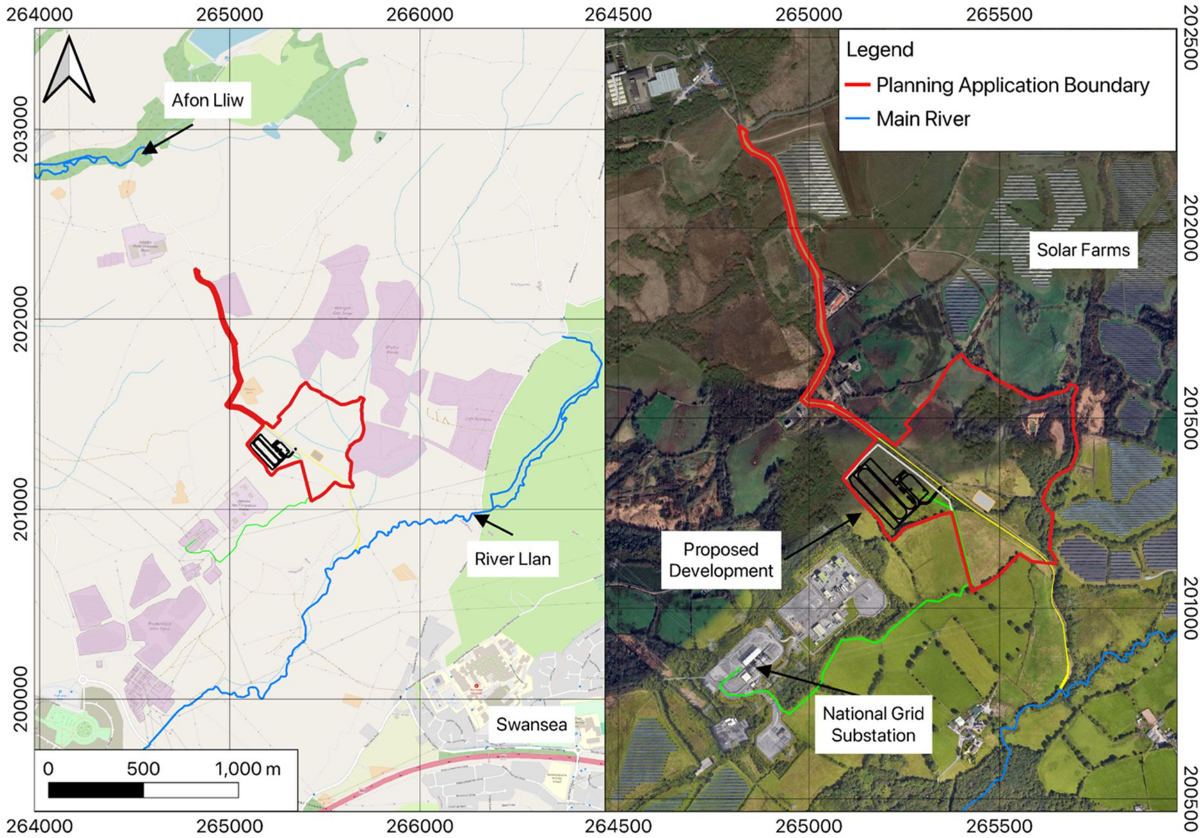
2.1. Site location and description

A Site location plan is presented in Figure 2-1and the Site address is given as follows:

Swansea North BESS,
Felindre,
Swansea,
SA5 7NN

The wider Site that comprises the Planning Application Boundary is approximately 22.1Ha in size. The Development Area is located at the north west corner of the southern land parcel.it lies between Felindre Gas Compressor Station to the west and Cefn Betingau, Rhyd-y-pandy and Abergelli Glas Solar Farms to the east and north. The Development Area is located at the north west corner of the wider Site. The majority of the Site comprises undeveloped agricultural land. The National Grid Reference at the centre of the Site is 265382, 201339..

Figure 2-1: Site location



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2.2. Proposed Development

The proposal is for the construction, operation, maintenance and decommissioning of a 250MW Battery Energy Storage System for distribution of electricity to the National Grid. The Proposed Development would operate for a time limited period of 40 years. The main components of the Proposed Development comprise:

- Battery storage facility comprising batteries housed within shipping containers or similar;
- Inverter/transformer stations and associated electrical infrastructure distributed evenly across the Site housed within metal containers;
- Underground cabling to connect the battery containers and inverters/transformer stations to the proposed on-site substation and control room;
- Security fencing and monitoring CCTV/infra-red cameras mounted along the perimeter of the BESS Site;
- Landscape planting, biodiversity enhancements and surface water attenuation measures (to be designed as part of the evolving design); and
- Temporary construction laydown area and Site access from the public highway.

Due to the potential risk of fire associated with the BESS and substation, along with the subsequent risk of contaminated firewater, the ground must be impermeable and water collected and contained within a storage area, which can be isolated if required.

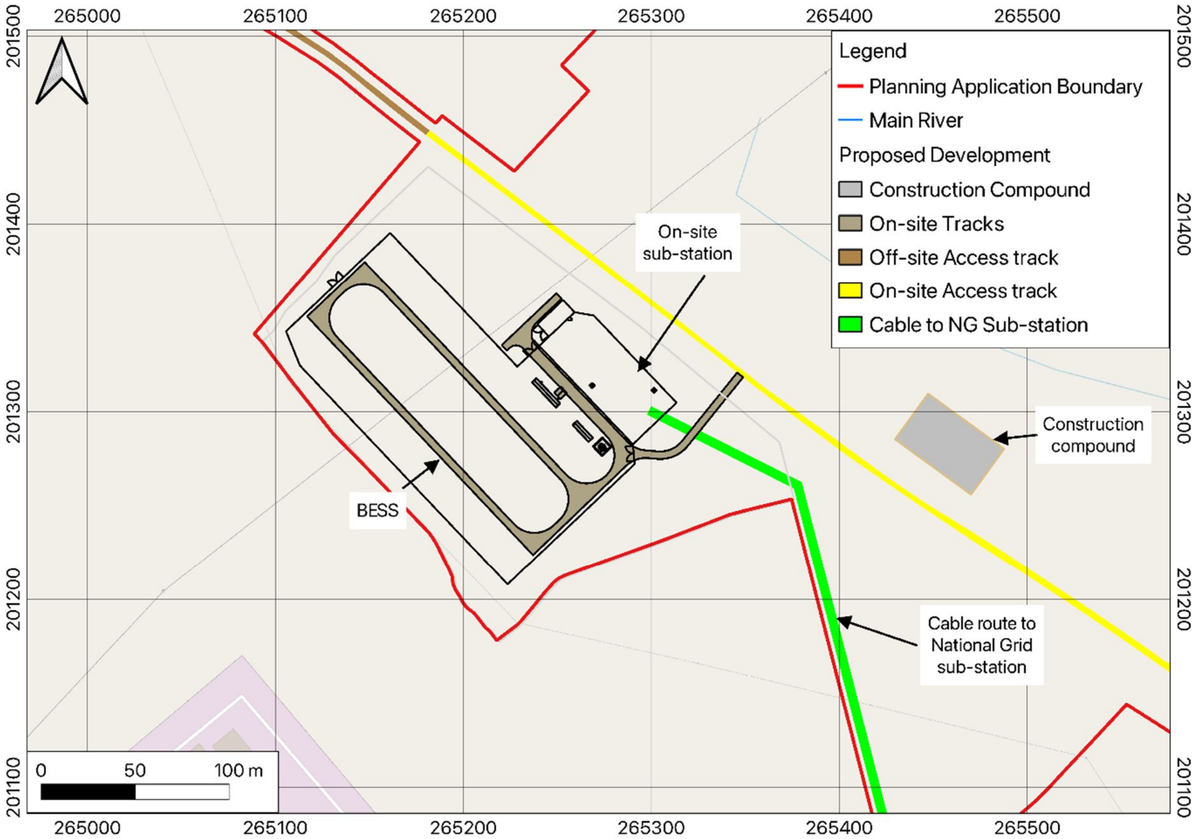
Whilst the Site extends to cover some 22.1 ha the proposed areas of development consist of:

- BESS area (16,144 m^2);
- An on-site substation adjacent to the BESS (2,465 m^2);
- A temporary construction compound (1,500 m^2); and
- Access tracks

Figure 2-2 shows the Proposed Development with an off-site access track heading to the public road network to the north west, and an on-site access track extending to the south eastern corner of the Site near the River Llan (no construction is proposed along this route).

The construction of the Proposed Development is planned to take place over a period of 12 months. Once operational there will be limited vehicle visits each month for scheduled maintenance. After the operational 40-year period the Proposed Development would be decommissioned with all electricity generating equipment and built structures associated with the development removed from Site.

Figure 2-2: Proposed Development



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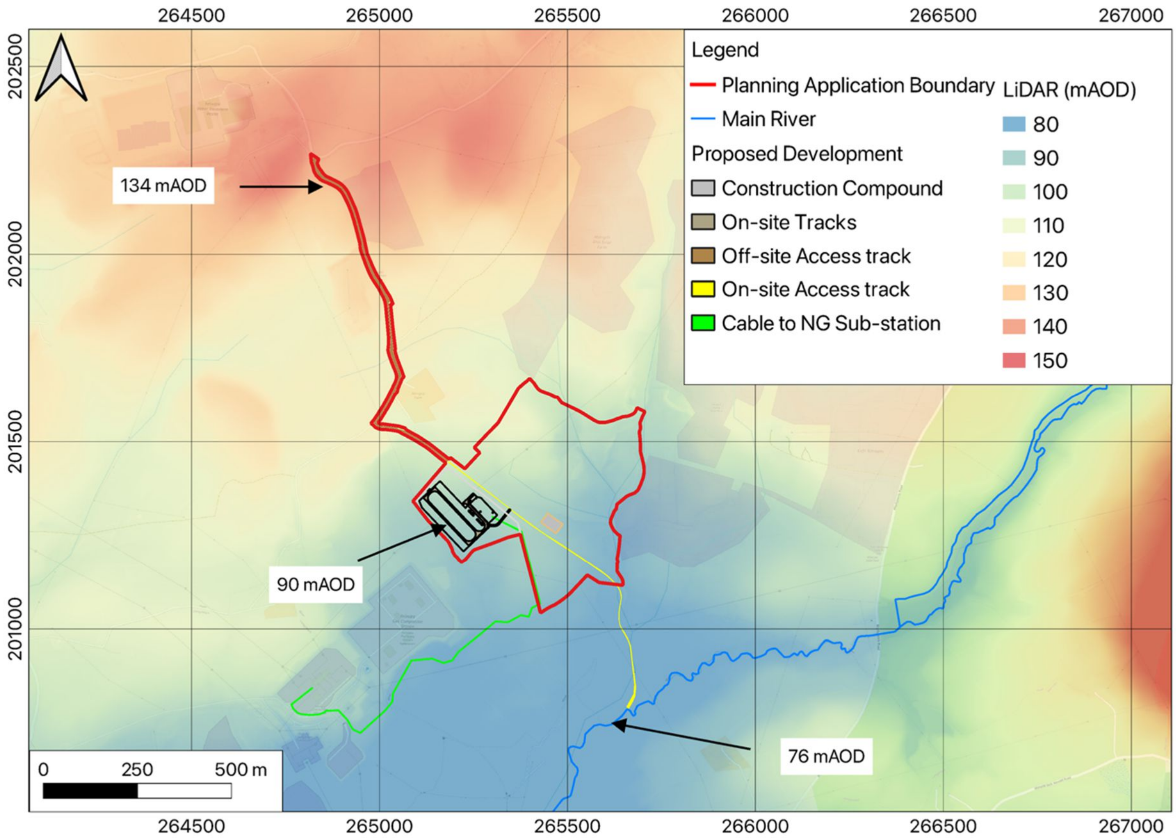
2.3. Topography

The overall Site slopes from the north west towards the River Llan in the south east (Figure 2-3). Elevations in the north west are 134 metres above Ordnance Datum (mAOD) and 76 mAOD at the River Llan. Around the Proposed Development Site levels are approximately 90 mAOD. A detailed topographic survey of the proposed BESS and substation footprint was undertaken by Land Utility Group Ltd in April 2025, and is provided in Appendix B. This survey shows the land to fall from a maximum elevation of 100.74 mAOD in the northern corner of the BESS to 86.68 in the southern corner.

Figure 2-3: Site Topography from LiDAR data



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2.4. Geology and hydrogeology

2.4.1. Published soils and geology

A review of the Soilscapes viewer and British Geological Survey (BGS) 1:50,000 scale mapping and 1:10,000 scale mapping (Sheet No. SN60SW and SN60SE) indicates the geological sequence underlying the wider Site is as follows:

- Soils: Slowly permeable wet very acid upland soils with a peaty surface and impeded drainage across much of the Site (including under the proposed BESS and Sub-station footprints). Some smaller areas of Feely draining slightly acid loamy soils.
- Superficial geology: Till – Devensian (Diamicton) outcrops across the Development Area and across the west of the Site. Hummocky (moundy) Glacial Deposits, Devensian (sand and gravel) outcrops across the north of theSite. Peat outcrops across the east of the Site. Alluvium (clay, silt, sand and gravel) outcrops along the watercourse at the eastern boundary of the Site.
- Solid geology: Grovesend Formation - Mudstone, siltstone and sandstone.

BGS mapping also shows an inferred normal fault in the north of the wider Site trending NNW-SSE. Figure 2-4 and Figure 2-5 below depict mapped superficial and bedrock geology across the Site respectively.

Figure 2-4: BGS 1:50,000 mapped superficial geology

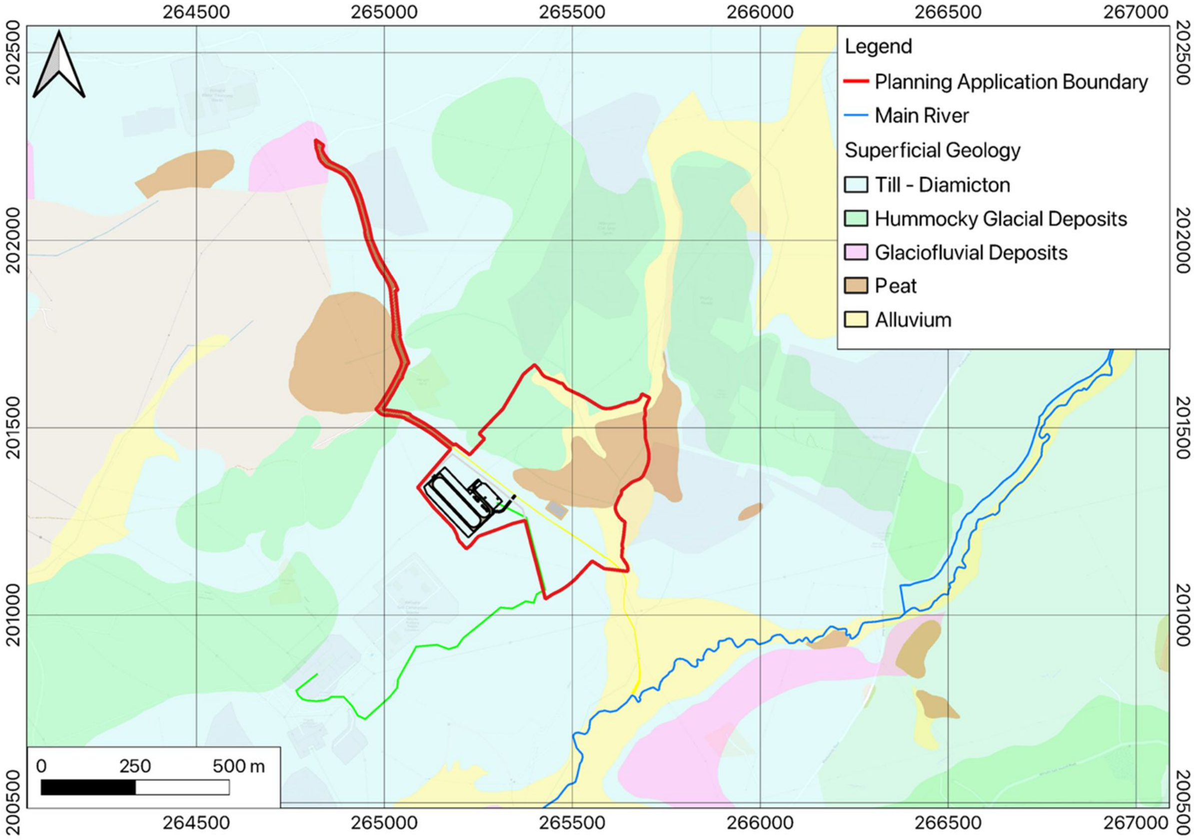

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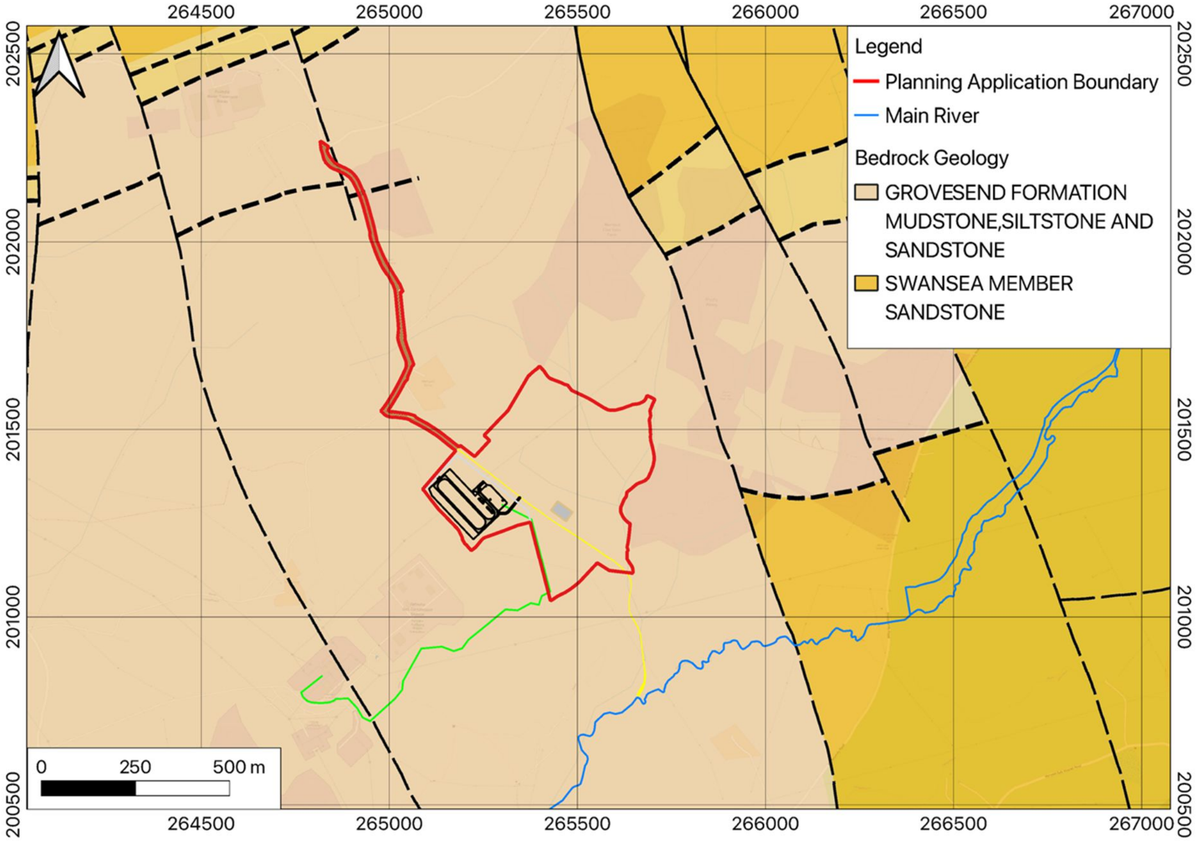
Figure 2-5: BGS 1:50,000 mapped bedrock geology



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2.4.2. Hydrogeology

The Grovesend Formation and the superficial Alluvium and Hummocky (moundy) Glacial Deposits are classified by National Resources Wales (NRW4) as a Secondary A Aquifer. These are defined as comprising permeable layers that can support local water supplies and may form an important source of base flow to rivers. Groundwater vulnerability within the aquifer is classed as high. The Glacial Till (Diamicton) is classified as a Secondary (Undifferentiated) Aquifer. These are defined as aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value. The peat deposits are classified by NRW as unproductive strata. Groundwater vulnerability ranges between low and medium across the Site.

The Water Framework Directive (WFD) classifies the Carmarthen Carboniferous Coal Measures groundwater body which lies within the Grovesend Formation as having an overall and chemical rating of poor, and a quantitative rating of good in 2017.

The Site does not lie within a source protection zone and there are no active licensed groundwater abstractions. There are three historical groundwater abstractions within 500m of the wider Site at Abergelli Farm, at Cwfn Betinge Farm and south of Maes-Eglwys all for general farming and domestic use. The nearest recorded potable groundwater abstraction is 1228m north of the wider Site at Lower Lliw Reservoir and is currently active.

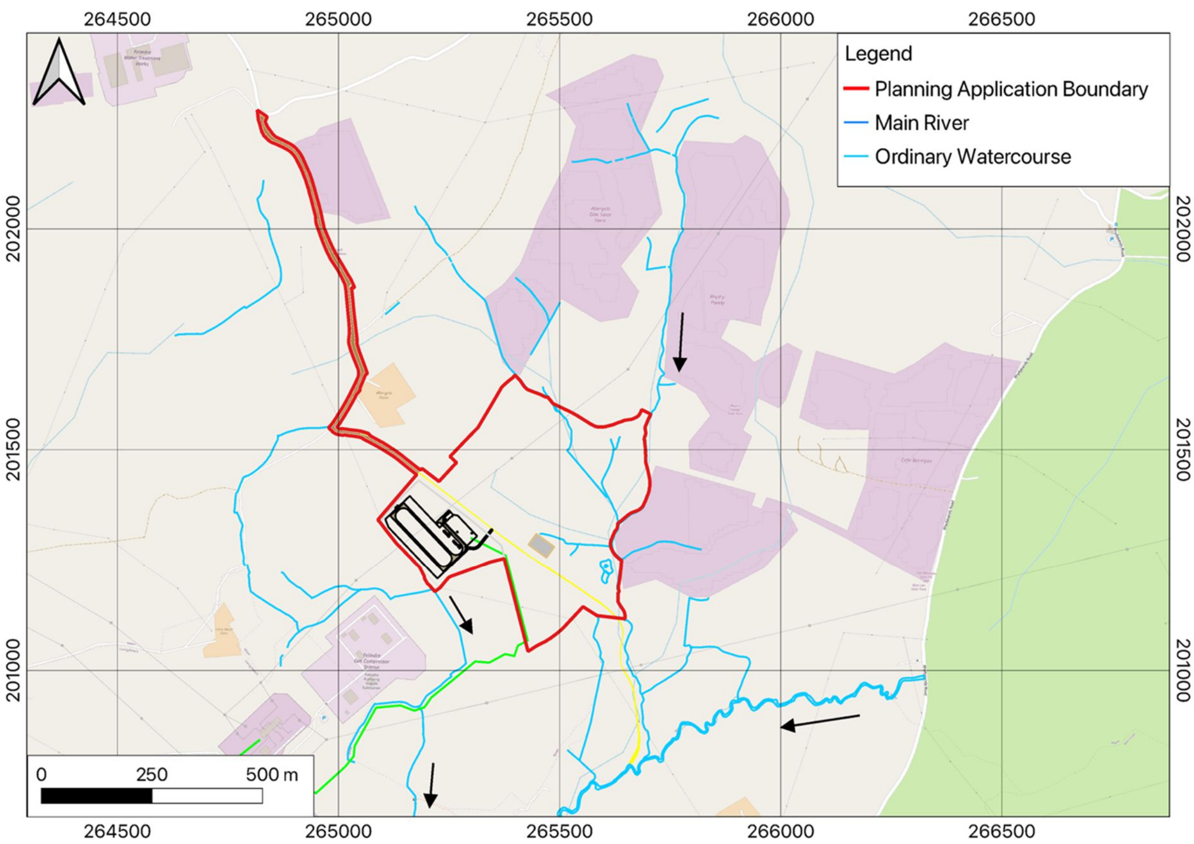
2.5. Hydrology

2.5.1. Current drainage arrangements and existing surface water features

A network of Ordinary Watercourses extend across the Site running in a broadly south easterly direction towards the Afon Llan (designated as Main River). One watercourse to the west of the Site passes the corner of the field where the proposed development Site lies. The topographic survey gives a ditch level of 85.70 mAOD and suggests that ditches also extend along the field boundaries to the north and east (along the Site boundary). The ordinary watercourses are shown in Figure 2-6.

There is currently no formal drainage on Site and surface runoff is thought to follow the topographic lie of the land towards the Afon Llan.

Figure 2-6: Water features on and adjacent to Site



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2.5.2. Catchment descriptors

Representative hydrological descriptors for part of the Site area have been obtained from the online Flood Estimation Handbook (FEH) (UK Centre for Ecology & Hydrology, 2025) and are provided in Table 2-1.

Table 2-1: Hydrological descriptors for representative part of the Site

Descriptor	Abbreviation	Value
Base Flow Index associated with each HOST soil class	BFIHOST19	0.422
Proportion of time when soil moisture deficit was equal to, or below, 6mm during 1961-90	PROPWET	062
Average Annual Rainfall (1961 – 1990)	SAAR	1435

2.5.3. Climate Change

The potential increase in rainfall intensity needs to be considered when designing drainage strategies. The recommended allowances for rainfall intensity 'Flood Consequences Assessments: Climate change allowances' (Welsh Government Planning Policy Branch, 2021) are included in Table 2-2.

Table 2-2: Climate change allowances (rainfall intensities)

Applies across all of Wales	Total potential change anticipated for 2020s (2015 – 2039)	Total potential change anticipated for 2050s (2040 – 2069)	Total potential change anticipated for 2080s (2070 – 2115)
Upper estimate	10%	20%	**40%**
Central estimate	5%	10%	20%

The climate change allowance guidance states that drainage systems will be designed to ensure there is no increase in site run-off when assessed against the upper estimate. The energy park is likely to be operational for 40 years, (approx. 2070). It would therefore be conservative to assume a 40% increase in rainfall intensity.

3. Flood risk to the Proposed Development

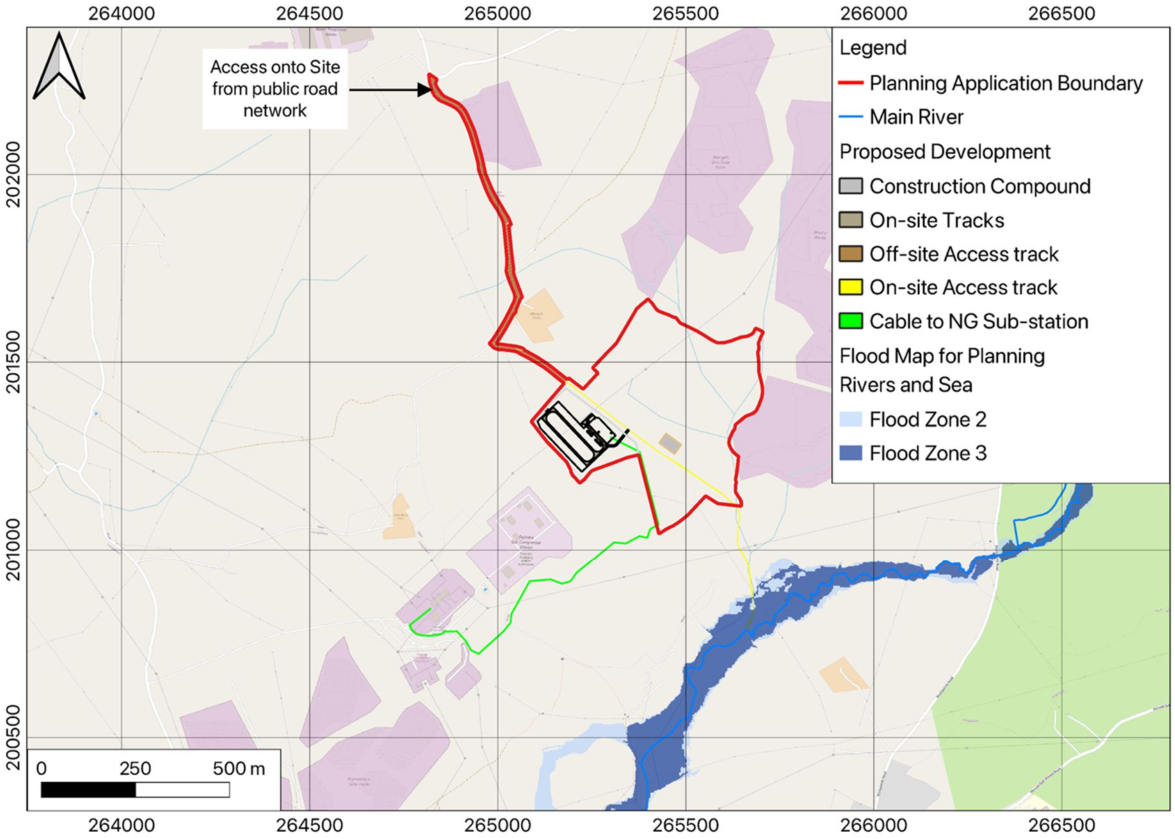
3.1. Fluvial and Tidal

The flood risk arising from rivers and the sea is mapped nationally by NRW. The Site is not subject to tidal flooding – therefore the risk of flooding from the sea has not been further assessed.

The Flood Map for Planning (Natural Resources Wales, 2025) flood risk zones are presented in Figure 3-1. The Flood Map for Planning identifies the areas at risk of fluvial or tidal flooding, accounting for climate change. This indicates that the Site is within Flood Zone 1 (i.e. less than a 0.1% annual probability of flooding from these sources) and as such has a Low Probability of flooding.

Flood model data for the Afon Llan has not been requested as no development that will have an impact on flood risk is proposed in this area.

Figure 3-1: Flood map for planning – Fluvial flood risk



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3.2. Surface Water

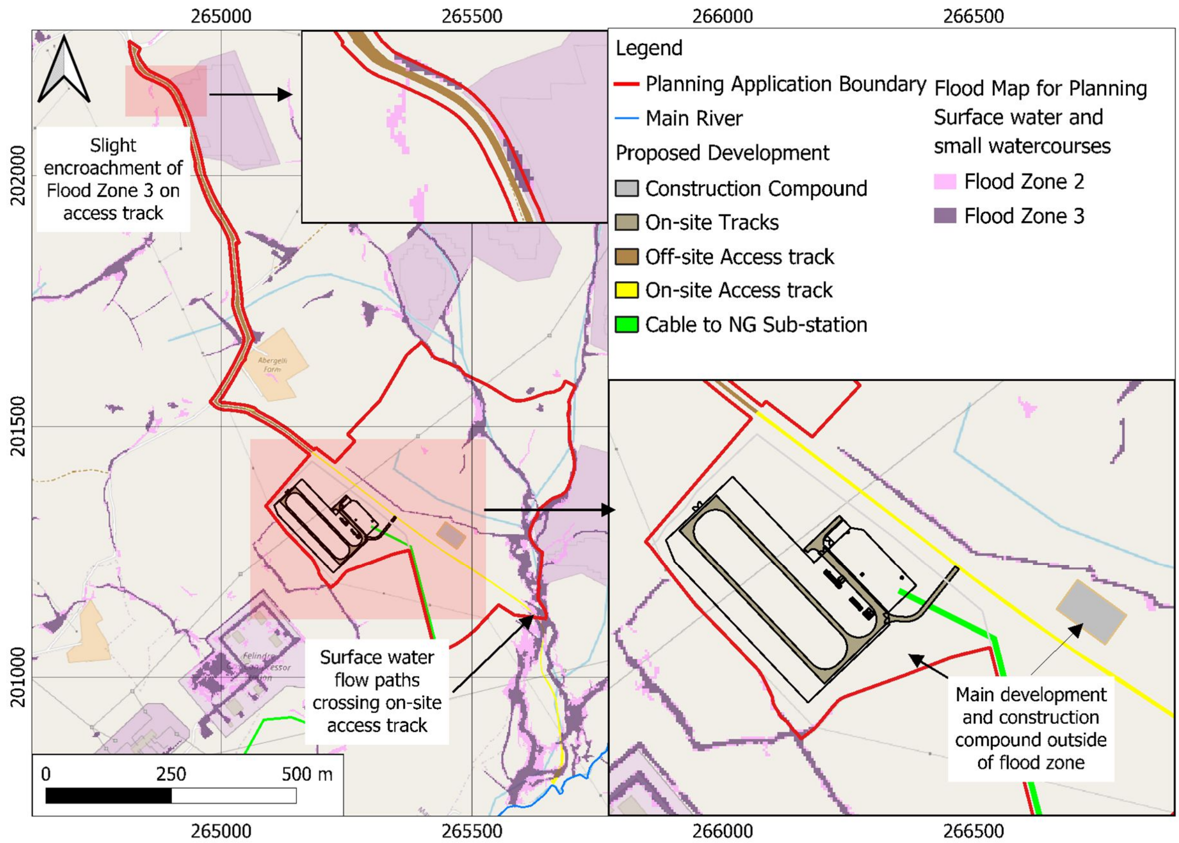
Surface water (pluvial) flooding is usually associated with extreme rainfall events but can also occur when rain falls on land that is already saturated or is of low permeability. Rainfall that is unable to infiltrate, either due to high rainfall intensity or ground conditions, generates overland flow. Runoff can cause flooding or ponding in localised topographic depressions before runoff can enter a drainage system or watercourse.

Figure 3-2 shows that the risk of surface water flooding within the Site is predominantly very low (no colour). This data includes the predicted flood extents associated with minor watercourses.

The southern most portion of the Site is at most risk from surface water flooding, with several areas of elevated risk (1% chance of flooding or greater on a given year), and with a portion crossing the on-site access track in the south east of the Site.

The area of proposed development (see Figure 3-2) is entirely within Flood Zone 1 (very low flood risk). The access track to the north, which provides access and egress to the public road network has a very small area of Flood Zone 2 (greater than 0.1% but less than 1% chance of flooding on a given year) crossing the track, with an area of Flood Zone 3 ponding to the north of the track (see Figure 3-2).

Figure 3-2: Flood map for planning – Surface water flood risk



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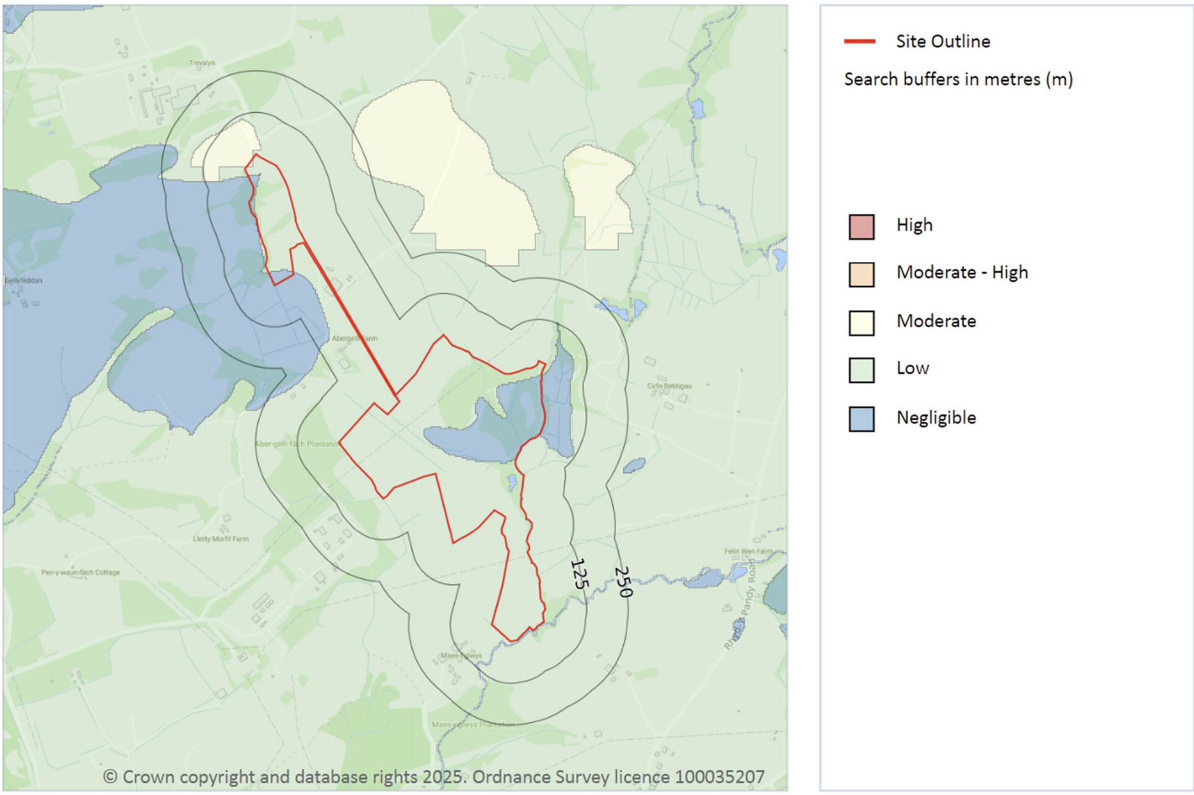
3.3. Groundwater

Groundwater flooding occurs when the water table rises above the ground surface or into man-made ground.

Mapping from Ambiental Risk analytics (Figure 3-3), indicates the risk of groundwater flooding across the Development Area and majority of the wider Site to be low. A small area at the northern most tip of the northern land parcel, is at moderate risk of groundwater flooding.

Figure 3-3: Groundwater flood risk



Source: Groundsure Report

3.4. Catastrophic Failures

This flood risk source includes release of large volumes of stored water, such as in reservoirs and canals, due to catastrophic failure. NRW have mapped areas that are at risk of flooding from failure of large reservoirs and the Site is not shown to be potentially at risk from these sources.

There are no other identified large sources of stored water that may affect the Site and the risk of flooding from this source is considered to be negligible

3.5. Historical Flooding

The NRW Recorded Flood Outline dataset does not show any historical flooding on or in the vicinity of the Site.

4. Suitability of the Proposed Development

4.1. Planning policy

TAN 15 aims to steer new developments towards areas at a low risk of flooding. The principal tool supporting this process is the Flood Map for Planning. The Site is entirely within the fluvial Flood Zone 1 which is defined as being "*at little or no risk of fluvial or tidal/coastal flooding*".

Flood Zones 2 and 3 from the surface water and small watercourses dataset cross the Site in several locations, primarily in the south east of the Site. The primary development Site (where the BESS and sub-station are located) are located within Flood Zone 1. A very small portion of the main access track to the Site is within Flood Zone 3. A slightly larger portion of an internal access track towards the southern boundary of the Site is within Flood Zones 2 and 3.

The BESS and substation would be classified as Highly Vulnerable development, and the access tracks as Less Vulnerable development.

4.2. Flooding and plan-led system

TAN15 states that Development Plans set the context for rational and consistent decision making and provide certainty for developers and the public about the type of development that will be permitted at a particular location.

The Swansea Local Development Plan 2010 to 2025 indicates that the Site is within a Renewable and Low Carbon Energy Local Search Area.

4.2.1. BESS and Sub-Station

The BESS and substation are located within Flood Zone 1 (both for fluvial and surface water flood risk). TAN15 allows for all types of development within Zone 1, therefore the siting of these elements of the Proposed Development is acceptable.

4.2.2. Access tracks for the Site

The main access track for the Site (heading north from the BESS and substation) has a very small portion within Flood Zone 2 of the surface water and small watercourse flood extents.

TAN15 states that '*Planning applications in Zone 2 require careful consideration and must be consistent with the acceptability considerations set out in section 11. They must also be accompanied by an FCA which clearly describes the flood risk and the risks must be acceptable*'. TAN15 however does not put any further restrictions on 'Less vulnerable' development within Zone 2.

An acceptability of flood consequences assessment has been undertaken in Section 4.3.

4.3. Acceptability of flood consequence assessment

An acceptability of flood consequence assessment is required as detailed above for the main access track for the Site and for the internal access track. TAN15 requires that '*In zones 2, 3 and TAN 15 defended zones developers must undertake a flood consequence assessment proportional to the nature and scale of the proposal*'. The level of detail provided in the acceptability of flood consequence assessment below is reflective of the very small portion of main access track to the north that is within flood zone 2.

4.3.1. No increase of flooding elsewhere

The proposed access tracks will not be raised above the ground surface within the areas identified as being at flood risk. They will therefore not increase flood risk elsewhere either by diverting flow paths or through loss of floodplain volume.

All access tracks will be constructed of compacted gravel such that they are permeable to negate impacts to drainage. Each track shall be designed with a fall to a gravel filled longitudinal trench into which excess water will flow. These trenches will act as attenuation and treatment prior to infiltration.

Runoff from the BESS and substation are considered within Section 5.

4.3.2. Occupiers aware of flood risk / Flood emergency plan and procedures in place

The Site will not be normally occupied. Maintenance will be timetabled and restricted to daylight hours. Maintenance visits should be cancelled, and any on-site personnel withdrawn when significant rainfall is forecasted.

Flood warning is unlikely to be of use in the area as the catchment is mostly out of the fluvial flood zones, and the response of the small watercourses to rainfall could be very rapid. Nevertheless, the Site operatives should sign up to the flood alert service provided by NRW in order to avoid working on Site when flooding is possible, and have measures in place to inform any personnel on Site of the need to close and evacuate.

4.3.3. Escape / evacuation routes present

The main access track onto public roads is almost entirely free from flooding, with the exception of a very small area of Flood Zone 2 (<10m^2). Whilst the local road network in the immediate vicinity of the Site is free from flooding, it is likely that further afield the road network will be affected by flooding where it crosses unnamed watercourses and by surface water. The on-site access track to the south is not considered an escape / evacuation route.

4.3.4. Flood resistant and resilient design

The Proposed Development has been designed to be flood resistant through placing vulnerable infrastructure, such as the BESS and substation outside of the flood zones. The access tracks will be designed to be allowed to flood.

4.3.5. Acceptable consequences for type of use

The consequences of flooding occurring on Site are negligible. The access track to the north is likely to still be passable (as <10m^2 within flood zone 3).

TAN15 provides tolerable conditions in an extreme flood event. For less vulnerable development this is 600mm depth of flooding and a maximum flood water velocity of 0.3 m/s. Whilst the flood map for planning does not provide this information, it is considered very unlikely given the small extent of flooding on the main access track that the depths would exceed 600mm, or the velocity exceed 0.3 m/s.

4.3.6. Flood consequences during the construction phase

Flood consequences associated with a Site can increase during the execution of construction works, owing to removal or increased compaction of soils or by changing or blocking flow paths for example.

Good water management practices will be implemented to minimise construction phase impacts on flood risk/ consequences and will be subject to regular monitoring. This is likely to be delivered through a Construction Environmental Management Plan (CEMP), which would be expected to adhere to industry best practice measures, for example CIRIA guidance on the management of water quality and surface water runoff during construction projects.

The CEMP will provide guidance on the use of techniques to minimize soil compactions such as restricting access during wet conditions, using protective boarding and low ground pressure machinery. This will reduce the potential impact of compaction of soils during the construction phase on flood risk during the operational phase.

5. Sustainable Urban Drainage Strategy

5.1. Introduction

The following sections describe the outline SuDS Strategy for the proposed development with due regard to the Statutory national standards for sustainable drainage systems (Welsh Government, 2018) which recommends the following hierarchy for disposal of surface water:

- Surface water runoff is collected for use;
- Surface water runoff is infiltrated to ground;
- Surface water runoff is discharged to a surface water body;
- Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system; and
- Surface water runoff is discharged to a combined sewer.

5.2. Runoff destination and proposed SuDS design

There is limited need on Site for runoff collected for use. This option has therefore not been considered.

5.2.1. Access tracks

All access tracks will be constructed of compacted gravel such that they are permeable to negate impacts to drainage. Each track shall be designed with a fall to a gravel filled longitudinal trench into which excess water will flow. These trenches will act as attenuation and treatment prior to infiltration. The soils and superficial deposits on the Site mean that infiltration rates are likely to be limited, however this approach best reflects the current drainage arrangements across the Site.

5.2.2. BESS and substation

Due to the potential risk of fire associated with the BESS and substation, and the subsequent risk of contaminated firewater, infiltration is not considered a suitable SuDS measure for these areas. Instead, water should be collected and contained within a storage area, which can be isolated if required.

Under normal circumstances the storage area will discharge to the ordinary watercourse in the south-west corner of the field containing the BESS and substation. However, automated pollution control devices (valves) will be fitted to the tank outfall to prevent the release of water when a fire is detected on Site. Sizing of the storage area (see Section 5.4) has been based on the largest capacity required between a 1% AEP event including climate change, assuming discharge at permissible rates, and the joint probability of a 10% AEP event including climate change during a fire scenario assuming no discharge[1].

Ordinary Watercourse consent is likely to be required for the discharge to the watercourse.

5.3. Greenfield runoff and permissible discharge rates

For greenfield sites, the peak runoff rate from the development should not exceed the peak greenfield runoff rate for the same event. Additionally, the runoff volume from the development in the 1% AEP 6-

[1] The joint probability of a 1% AEP event simultaneously with a fire occurring is very remote, and therefore the 10% AEP event has been chosen to determine the storage requirements during a fire scenario.

hour rainfall event should not exceed the greenfield runoff volume for the same event. Where the second condition cannot be met (i.e. due to limited infiltration potential), then peak flow for all events up to and including the 1% AEP event should be limited to the Mean Annual Peak Rate of Runoff (Qbar).

The existing greenfield runoff rates and volumes for combined area of the BESS and substation (1.86 ha) have been estimated and are summarised in Table 5-1. These were derived using the Revitalised Flood Hydrograph (ReFH2) model and a 6-hour storm duration assumed to calculate the volumes. A summer storm has been used as the proposed development will be 100% impermeable. The combined area has been used as they are likely to be served by a single attenuation feature.

As infiltration is not possible for the BESS and substation, the runoff volume will not be able to be controlled to greenfield volumes. Therefore discharge from the Site will be limited to the 1 in 2 year greenfield rate[2] for all events (16.1 l/s).

Table 5-1: Greenfield runoff and volumes for BESS and substation

Flood event AEP	Runoff rate (l/s)	Runoff volume (m^3) 6 hour storm duration
100% (1 in 1)	14.2	
50% (1in 2)	16.1	
10% (1 in 10)	27.1	
3.3% (1 in 30)	34.5	
1% (1 in 100)	43.5	467

5.4. Attenuation storage volumes

In order to achieve the above discharge rates within the BESS and substation areas, attenuation storage will be required. The required storage has been calculated for two scenarios and the largest volume used:

1) A 1% AEP event with climate change, assuming discharge at the 1 in 2 year greenfield rate. This scenario assumes no fire.
2) A 10% AEP event with climate change, assuming no discharge. Firefighting volume of 300m^3 added to represent the additional discharge of contaminated firefighting water to the storage area.

Both scenarios have been simulated for a range of storm durations to determine the most critical duration, however the firefighting scenario (scenario 2) has been limited to storm durations 24 hours and less, based on the assumption that this is the longest period required for a tanker to arrive at the Site and pump out the potentially contaminated water.

The estimated storage volumes are shown in Table 5-2. A storage capacity of 1990 m^3 has been designed for, which is significantly larger than that required for the 1% AEP event with climate change under a normal scenario, therefore the storage area will generally be underutilised during normal conditions.

[2] The 1 in 2 year rate is very similar to the Mean Annual Peak Rate (Qbar), however ReFH2 does not provide a Qbar rate, hence the 1 in 2 year rate has been used as a proxy.

Table 5-2: Attenuation volumes for BESS and substation events

Storm duration	1% AEP event with 40% climate change Discharge at 1 in 2 year greenfield rate[3]	10% AEP event with 40% climate change $300m^3$ of firefighting water No discharge
1 hour	973	788
3 hour	1360	1202
6 hour	1616	1470
12 hour	**1710**	1730
24 hour	1595	**1990**

A preliminary design of the storage area has been undertaken. It is assumed that the storage area will be located underneath the BESS / substation area, which is bunded and lined to prevent infiltration and filled with single sized granular material to provide attenuation. The amount of storage offered would be dependent upon the subgrade depth and Site gradient. The use of permeable surfacing should be considered at the detailed design stage.

By creating storage areas with a depth of 0.4m and a void ratio of 30% within the granular fill material, a storage volume of 1940 m^2 would be created within the footprint of the BESS (area of 16,144 m^2). Alternative design options include spreading the storage out over a greater area including the substation, but at a shallow depth, or using Geocellular units under the BESS footprint with a higher porosity value of 0.9 to contain the storage within a smaller area. The final choice of design will be undertaken at detailed design stage.

5.5. Exceedance routes

Storm events in excess of the design event (1% AEP with climate change and the 10% AEP with climate change and fire) will result in the storage area being exceeded. The exceedance flows will be designed to follow the existing preferential surface water flow route towards the southern corner of the field and the watercourse located there. A more detailed analysis of exceedance flows can be undertaken once the Site elevations and storage area design has been finalised and modelled.

5.6. Water quality

SuDS techniques can be used to effectively manage the quality of surface water flowing across a Site. Different methods can be used to intercept pollutants and allow them to degrade or be stored in-situ without impacting the quality of water further downstream. Frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5mm to 10mm of rainfall (i.e. the ‘first flush’) should be adequately treated using SuDS.

[3] A 25% increase has been applied to the calculated storage values to represent that the discharged rate will not attain the design discharge until maximum head in the storage is reached. This is in line with CIRIA guidance provided in section 24.9.3

The proposed development will include low traffic roads, which the CIRIA SuDS manual categorises as presenting a low hazard rating. Table 5-3 shows the pollution hazard indices for each land use.

Table 5-3: Pollution hazard indices

Land use	Pollution hazard level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Low traffic roads	Low	0.5	0.4	0.4

Where practical, runoff will be directed to permeable surfacing. Within the BESS and substation areas, water will be contained within a storage area prior to discharging to a nearby drainage channel. Table 5-4 below demonstrates that these SuDS methods provide sufficient treatment.

Table 5-4: SuDS mitigation indices

Type of SuDS	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable surfacing	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6

5.7. Biodiversity and amenity

SuDS schemes present opportunities to enhance habitat for wildlife on-site and in an urban setting this often improves the biodiversity of the surrounding areas. Given the rural setting and potential for contaminated runoff from the Site, the proposed scheme does not aim to use the runoff to improve biodiversity and amenity of the Proposed Development.

6. Maintenance schedules

6.1. Overview

This section outlines the maintenance and management schedules for the proposed stormwater drainage system. The schedules have been formulated in line with guidelines contained within the CIRIA SuDS Manual (C753) (Woods Ballard, et al., 2015).

There are three categories of maintenance activities (including inspections and monitoring) referred to in this report:

- Regular maintenance – tasks which are required to be undertaken on a weekly or monthly basis, or as required.
- Occasional maintenance – tasks which are required to be undertaken periodically, typically at intervals of 3 months or more.
- Remedial maintenance – tasks which are not required on a regular basis but are done when necessary.

This section is intended to give an overview of the operation and maintenance for the range of drainage features included within the surface water drainage strategy and in relation to typical/ standard details only.

Maintenance schedules for the proposed SuDS components are provided in the following tables. These schedules are not exhaustive and should be reassessed at regular intervals to determine if any additional maintenance requirements are required to preserve the performance and condition of the drainage system.

6.2. Maintenance schedules

6.2.1. Pipes and manholes

A typical schedule of maintenance activities for pipes and manholes is included in Table 6-1.

Table 6-1: Pipes and manholes

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove any accumulation of silt, sediment, leaves and debris etc	Monthly, or as required
	Inspect for evidence of poor operation	Monthly (during the first year), then half yearly
Occasional maintenance	High pressure water jet removal of silt build-up and avoid blockages, particularly at bends or changes in direction	Six monthly, or as required
	Remove or control tree roots where they are encroaching pipe runs, using recommended methods	As required
Remedial actions	Clear pipework and gully grates of blockages	As required
	Replace any damaged or failed pipes, gullies or manholes	As required

6.2.2. Permeable paving

A typical schedule of maintenance activities for permeable paving is included in Table 6-2.

Table 6-2: Permeable paving

Maintenance schedule	Required action	Frequency
Occasional maintenance	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 hours after large storm in first six months
	Inspect silt accumulation rates and establish appropriate jetting frequencies	Annually
	Monitor inspection chambers	Annually
	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate 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 50mm of the level of the paving	As required
	Remedial work to any depressions or ruts considered detrimental to the structural performance or a hazard to users.	As required
	Rehabilitation of surface.	As required

6.2.3. Granular Sub-base

A typical schedule of maintenance activities is included in Table 6-3.

Table 6-3: Granular sub-base

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect/ check all inlets, outlets, inspection/access chamber, vents to ensure that they are in good condition and operating as designed	Monthly for 3 months, then annually
	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Inspect and identify any areas that are not operating correctly. If required take remedial action	Monthly for 3 months, then annually

Maintenance schedule	Required action	Frequency
Occasional maintenance	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlets, overflows, inspection/access chamber and vents	As required

6.2.4. Flow controls

A typical schedule of maintenance activities for flow control devices is included in Table 6-4.

Table 6-4: Flow control devices

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect/check pipework to ensure that the flow control is in good condition and operating as designed	Monthly
	Inspect for evidence of poor operation	Monthly, or as required
Occasional maintenance	High pressure water jet removal of silt build-up	Six monthly, or as required
Remedial actions	Replace the flow control if it becomes damaged	As required
	Clear pipework of blockages	As required

6.3. Inspections

In conjunction with the above maintenance schedules and in accordance with both the CEMP (Construction Phase) and management plan (Operational Phase), regular inspections of all stormwater drainage equipment will be undertaken to identify potential problems as early as possible. Routine inspections will be undertaken each quarter, with all swales, ditches and drains inspected for blockages and/or debris. All blockages are to be cleared immediately.

Swales, ditches and drains, on-site will also be inspected for blockages and/or debris after a storm event.

7. Foul Drainage

The Proposed Development does not include any permanent buildings, with no requirement for foul sewerage/ drainage during the operational phase.

Welfare facilities will be required on Site during the construction and decommissioning phases. As a result, there will be a requirement to manage the foul effluent for this transient period. The location of the Proposed Development is such that a mains sewerage connection will not be possible.

It is proposed that foul water will be retained in tanks and transferred to a waste water treatment works on a regular basis. It will be necessary to work with the operator of the waste water treatment works to ensure that it has capacity to accept the effluent. The Site is not within a phosphorous sensitive Special Area of Conservation (SAC).

8. Conclusions

Flood risk to the Site in general is low, with a very small area of the access tracks to the north of the Site within Flood Zone 2, and in the south of the Site within Flood Zones 2 and 3 of the surface water flood extents. The risk of flooding from fluvial flooding, groundwater flooding and reservoir failure are low / negligible.

The proposed development would be classified as being a mix in vulnerability ratings between 'Highly Vulnerable' for the BESS and substation, and 'Less Vulnerable' for the access tracks. The BESS and substation are located within Flood Zone 1 – which is acceptable for all types of development. The main access track to the Site to the north extends over a very small portion of Flood Zone 3. The access track to the south extends over a small portion of Flood Zone 2 and 3, however this track is not considered essential for operational purposes of the BESS and sub-station, and does not form an access / egress route.

An acceptability of flood consequence assessment has been undertaken for the access tracks and the flood risk consequences considered to be acceptable due to the type of proposed development within the flood zones, and the lack of a need to use the internal southern access track during flood conditions.

An Outline SuDS strategy for the Site has been presented. Tracks will drain via infiltration through gravel trenches located alongside the tracks. The BESS and substation will drain to storage located within the granular sub-base of the BESS, and be discharged at the 1 in 2 year greenfield runoff rate to the ordinary watercourse located in the southern corner of the field. The storage will include an automated control valve for shutting off the discharge in the event of the firefighting water being used to fight a fire. The storage has been designed to accommodate the 1% AEP with climate change event under normal conditions, and the 10% AEP with climate change event coincident with a fire.

The principal mitigation measures proposed are avoidance by design to minimise onsite flood risk, the implementation of a SuDS Strategy to mitigate potential increases in offsite flood risk and a Construction Environmental Management Plan to mitigate flood risk during the construction phase.

Appendix A Report conditions

Report Conditions

This report has been prepared by Aqua Terra Consulting Ltd. (Aqua Terra) in its professional capacity as soil and groundwater specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by Aqua Terra solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report, taking account of the terms of reference agreed with the client. The findings are based on the information made available to Aqua Terra at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology, and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

Where necessary and appropriate, the report represents and relies on published information from third party, publicly and commercially available sources which is used in good faith of its accuracy and efficacy. Aqua Terra cannot accept responsibility for the work of others.

Site investigation results necessarily rely on tests and observations within exploratory holes only. The inherent variation in ground conditions mean that the results may not be representative of ground conditions between exploratory holes. Aqua Terra take no responsibility for variation in ground conditions between exploratory positions.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, Aqua Terra may, by prior written agreement, agree to such release, if it is acknowledged that Aqua Terra accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. Aqua Terra accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual, or otherwise, against Aqua Terra except as expressly agreed with Aqua Terra in writing. Aqua Terra reserves the right to withhold and/ or negotiate the transference of reliance on this report, subject to legal and commercial review.

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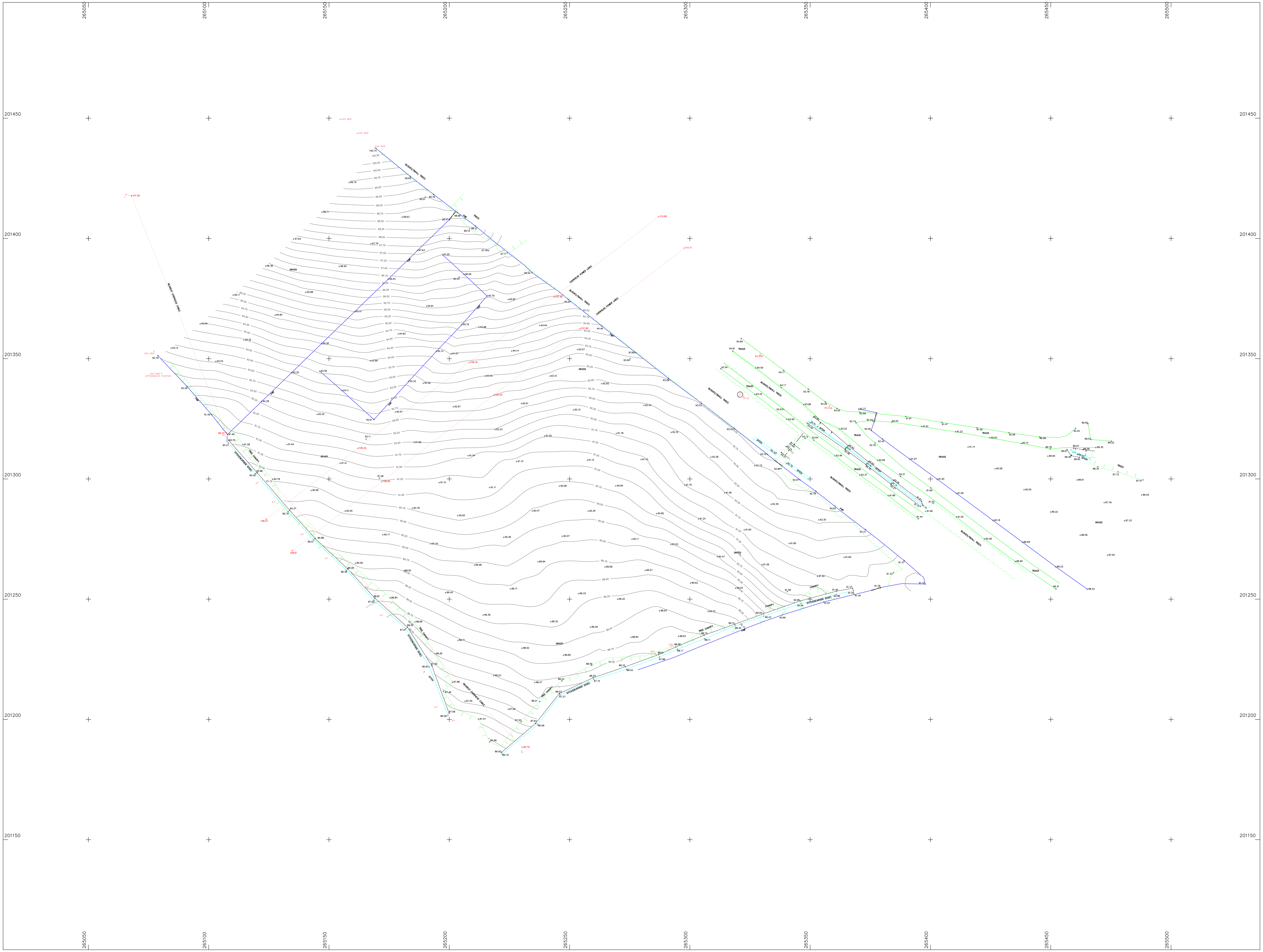
Appendix B Site Topographic Survey

AQUA TERRA
CONSULTING



ABBREVIATIONS

ABH	Arched Beam Height	KO	Kerb Outlet
B	Brick	L	Light
BAL	Balcony	LP	Lamp Post
BB	Belisha Beacon	MH	Manhole
BD	Bollard	MKR	Marker
BH	Beam Height	MSF	Metal Security Fence
BL	Bed Level	N/A	No Access
BP	Brick Pier	OHC	Overhead Cables
BRW	Brick Retaining Wall	P	Post
BS	Bus Stop	PALF	Palisade Fence
BT	British Telecom	PF	Picket Fence
BW	Brick Wall	PIT	Trial Pit
BWF	Barbed Wire Fence	PL	Pavement Light
C	Concrete	PM	Parking Meter
CAB	Cabinet	PRF	Post & Rail Fence
CBF	Close Boarded Fence	PWH	Parapet Wall Height
CBW	Concrete Block Wall	R	Render
CIF	Corrugated Iron Fence	RAD	Radiator
CL	Cover Level	RE	Rodding Eye
CLF	Chain Link Fence	RH	RH
COL	Column	RS	Road Sign
CPF	Concrete Panel Fence	RWP	Rain Water Pipe
CPS	Concrete Paving Slabs	S	Stone
CRW	Concrete Retaining Wall	SV	Stop Valve
CSU	Ceiling Slopes Up	SHP	Sheet Piling
CTV	Cable Television	SP	Soil Pipe
CW	Concrete Wall	SPS	Stone Paving Slabs
CZY	Crazy Paving	SRW	Stone Retaining Wall
D	Door	SW	Stone Wall
DH	Door Height	SWS	Surface Water Sewer
EC	Electricity Cover	TJ	Top of Joist
ESG	Electrical Switch Gear	T	TILE
EH	EH	TI	Timber
EP	Electricity Pole	TRW	Timber Retaining Wall
FB	Flower Bed	UJ	Underside of Joist
FC	False Ceiling	UR	Underside of Ridge Board
F/E	Fire Escape	UWP	Underside of Wall Plate
FH	Fire Hydrant	V	Vent
GML	Gas Marker	VP	Vent Pipe
GY	Gully	W	Window
GV	Gas Valve	WL	Water Level
HA	Hatch	WM	Water Meter
IC	Inspection Cover	WMF	Wire Mesh Fence
IL	Invert Level	WPF	Wooden Panel Fence
IRF	Iron Railing Fence	WCL	Window Cill Height
IWF	Interwoven Fence	WHL	Window Head Height
		WRW	Wooden Retaining Wall

Top
Banks
Bottom
Fences
Change in Surface
Edge of Vegetation
OS Data
3.28 Floor to Ceiling Height
Gate
Survey Station
+10.60 Floor Level
Tree

STATION CO-ORDINATE TABLE

Ref.	East	North	Elevation
1	265358.866	201329.390	93.220
2	265329.969	201351.067	94.500

NOTES

1. ALL LEVELS SHOWN ARE RELATED TO ORDNANCE SURVEY GPS DATUM.
2. TREE TYPES SHOWN ON THIS DRAWING CANNOT BE GUARANTEED AND IF CRITICAL SHOULD BE VERIFIED BY A TREE SPECIALIST. TREE SPREADS ARE AVERAGES UNLESS OTHERWISE INDICATED. TREE HEIGHTS ARE APPROXIMATE.
3. ALTHOUGH CARE HAS BEEN TAKEN, DUE TO ACCESS LIMITATIONS ALL HIGH LEVEL DETAIL HAS BEEN SURVEYED REMOTELY AND NOT CHECKED BY PHYSICAL MEASUREMENTS.
4. ALL CRITICAL MEASUREMENTS MUST BE CHECKED / VERIFIED.
5. ALL CO-ORDINATES AND LEVELS SHOWN RELATE TO AN ORDNANCE SURVEY DERIVED GRID.

REVISIONS DATE

SCALE: 1:500@A0
DATE: APRIL 2025
DRAWN: JL

TITLE: SITE SURVEY

JOB: SWANSEA BESS

CLIENT: AQUA TERRA CONSULTING

DWG. No: LUG / 9.0

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