Flood Consequence Assessment and Drainage Strategy

Development of National Significance Pre-Application Consultation

Alaw Môn Solar Farm

Land west of the B5112, 415m south of Llyn Alaw, 500m east of Llantrisant and 1.5km west of Llannerch-y-Medd, Anglesey

October 2023

FLOOD CONSEQUENCE ASSESSMENT AND DRAINAGE STRATEGY

Proposed Solar Farm and Battery Energy Storage System Facility

Alaw Môn Solar Farm
Land west of the B5112, 415 m south of Llyn Alaw, 500 m east of Llantrisant and 1.5 km west of Llanerch-y-Medd
Anglesey

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1 INTRODUCTION

Background

1.1 RMA Environmental Limited was commissioned by Wylfa Green Limited to prepare a Flood Consequence Assessment (FCA) to support a Development of National Significance (DNS) application for a proposed solar farm and battery energy storage system ('BESS') Facility ("the Development") at Alaw Môn Solar Farm on land west of the B5112, 415 m south of Llyn Alaw, 500 m east of Llantrisant and 1.5 km west of Llanerch-y-medd, Anglesey ("the Site").

1.2 This FCA has been prepared in accordance with Planning Policy Wales (PPW; Edition 11, February 2021) and Technical Advice Note 15: Development and Flood Risk (TAN 15).

Site Location and Land Use

1.3 The Site comprises greenfield land which is predominately in agricultural use; it extends to an area of approximately 268.77 hectares (ha) including the grid connection (within the adopted highway of local roads) and is located at National Grid Reference SH 38435 83870 (refer to Appendix A). The fields within the Site are referred to as Fields 1 to 63 for the purpose of this assessment (refer to Appendix B). Fields 1, 5, 13, 14, 41, 42 and 43 were included within a previous iteration of the Development but have now been removed from the Site.

1.4 The Site is bordered by the following land-uses:

- agricultural land surrounds the majority of the Site;
- two unnamed roads are located to the north, east, south-west and through the centre of the Site;
- areas of woodland are located to the west of the Site; and
- a number of dwellings are located around the Site.

1.5 Access to the Site is currently via the unnamed roads surrounding the Site. Further details on Site topography, geology and hydrology are set out in Section 2.

The Development

1.6 The Development comprises the construction, operation, management and decommissioning of a grid connected solar farm with BESS Facility and associated infrastructure (refer to Appendix C). The solar farm will have a generating capacity of approximately 160 Mega-Watts (MW). The Development has a modelled operational lifetime of 40 years.

1.7 The Development exceeds the 10MW threshold for energy generating projects in Wales. Therefore, it constitutes a DNS under the Planning (Wales) Act 2015.

1.8 The metal framework that supports the solar panels would be fixed into the ground by posts, which would be pile-driven to a depth of around 1.5 m to 2.0 m (i.e. no concrete foundations).

1.9 The solar panels would utilise a fixed tilt system, facing south with a tilt of 15-30 degrees. At their lower edge panels would be approximately 0.8 m from the ground and up to approximately 3 m at their higher edge.

1.10 The Site would be accessed via the existing and proposed access points shown in Appendix D. These access routes would be used during both the construction, operational and decommissioning phases.

Requirements for a Flood Consequence Assessment

1.11 The precautionary framework for FCA is provided in PPW and TAN 15 which combine to advise caution in respect of new development. Developers are required to provide information to demonstrate that their proposal satisfies the tests contained in TAN 15.

1.12 Paragraph 32 of TAN 15 states that: "*The operation of the precautionary framework is governed by:*

- *A Development Advice Map containing three zones (A, B and C, with subdivision into C1 and C2) which should be used to trigger the appropriate planning tests in relation to Sections 6 and 7 and Appendix 1; and*

- *Definitions of vulnerable development and advice on permissible uses in relation to the location of development and the consequences of flooding".*

1.13 According to TAN 15, the Flood Zones are defined as follows:

- Zone A is considered to be at little or no risk of fluvial;

- Zone B is defined as areas known to have been flooded in the past evidenced by sedimentary deposits;

- Zone C is based on the extreme flood outline, equal to or greater than 0.1% Annual Exceedance Probability (AEP) (river, tidal or coastal);

- Zone C1 is defined as areas of the floodplain which are developed and served by significant infrastructure, including flood defences; and

- Zone C2 is defined as areas of the floodplain without significant flood defence infrastructure.

1.14 FCAs should describe and assess all flood risks (from rivers, the sea, surface water, sewers, reservoirs and groundwater) to and from the Development and demonstrate how they will be managed, including an evaluation of climate change effects.

1.15 Guidance on the content of FCAs is contained within Appendix 1 of TAN 15 which requires the level of detail of the FCA to be proportionate to the scale and nature of any development. This document has been consulted with regard to the acceptability of the Development described in this FCA.

Consultation

1.16 Consultation has been undertaken with the National Resource Wales (NRW; refer to Appendix E) to confirm the approach of the FRA.

1.17 The approach of the drainage strategy has been agreed in principle with the Isle of Anglesey County Council Lead Local Flood Authority (LLFA) team through consultation (refer to Appendix F).

2 BASELINE ENVIRONMENTAL CONDITIONS

Topography

2.1 A topographical survey for the Development (excluding the Development's grid connection within the adopted highway of local roads) has been undertaken which is being submitted as a separate document in the DNS application. The levels from the topographical survey indicate that the eastern part of the Site generally slopes in an easterly direction towards the Cors y Bol and its tributaries. The western part of the Site generally slopes towards the watercourses within this part of the Site. The highest surveyed ground level is 96.08 metres Above Ordnance Datum (mAOD) in the south-eastern corner of the Site, falling to the lowest level of 37.36 mAOD along the western boundary of the Site.

Hydrology

2.2 A number of 'main rivers'[1] and 'ordinary watercourses'[2] are located within and surrounding the Site (refer to Figure 2.1).

2.3 A 'main river', hereafter referred to as Tafarn Brook, flows along the eastern boundary of Field 62 and the southern boundaries of Fields 61 and 62. This watercourse has a small total catchment area of approximately 1.0 km^2 at the Site location and flows in a northerly direction into the Llyn Alaw reservoir.

2.4 A 'main river' known as the 'Cors y Bol' is located approximately 20 m to the west of the Development and underneath part of the grid connection. This watercourse has a total catchment area of approximately 5.6 km^2 at the nearest location to the Site and flows in a north-easterly direction into the Llyn Alaw reservoir.

2.5 Llyn Alaw reservoir is located approximately 415 m north-east of the Site and is 4.3 km long with a surface area of approximately 360 ha. This reservoir supplies drinking water for the northern half of Anglesey.

2.6 An unnamed 'ordinary watercourse' (hereafter referred to as Carmel Brook) flows through Fields 6, 7, 8, 9 and 12 and along the western boundaries of Fields 36, 37, 38, and 39. Carmel Brook has a small total catchment area of approximately 1.79 km^2 and flows in a north-westerly direction into Cors y Bol, a 'main river', approximately 210 m to the west of the site.

2.7 An unnamed 'ordinary watercourse' (hereafter referred to as Pennant Brook) flows along the boundaries of Fields 30, 31, 33, 50, 53, 54, 55, 56, 57, 58, 59 and 60. Pennant Brook has a small total catchment area of approximately 1.15 km^2 and flows in a north-easterly direction into Tafarn Brook approximately 30 m to the north of Field 62.

[1] Main river is defined as a watercourse shown as such on the Main River Map and for which the Natural Resource Wales has responsibilities and powers.

[2] Ordinary watercourse is defined as all watercourses that are not designated Main River and which are the responsibility of riparian owners.

2.8 As indicated on Ordnance Survey (OS) mapping, a number of ordinary watercourses flow into the Tafarn Brook, Carmel Brook and Pennant Brook. An ordinary watercourse located along the boundary of Field 29 flows in a north-westerly direction into Llyn Alaw reservoir approximately 500 m to the north-west of the Site. The Flood Estimation Handbook (FEH) Web Service map does not define the catchment areas of these watercourses as they are smaller than 0.5 km^2 at the Site location.

2.9 A large pond is located in Fields 32 and 33. A pond is located along the northern boundary of the Site within Field 29. A large unnamed surface water pond is also located adjacent to Hen Nantanog, located immediately beyond the Site boundaries near the centre of the site. Two ponds are located in Field 21.

2.10 There are no other significant watercourses or water bodies within the surrounding area.

2.11 The existing surface water overland flow routes within the Site are shown on Figure 2.2 based on the site topography.

Geology and Hydrogeology

2.12 When reviewing the British Geological Survey (BGS) online map viewer, the Site is underlain by the following superficial deposits:

- the majority of the Site is underlain by superficial deposits of the Till Devensian, comprising Diamicton[3];
- land along the eastern boundary of Field 62 and along the western boundaries of Fields 2, 9, 21 and 22 are underlain by Alluvium, comprising clay, silt, sand and gravels;
- an area along the eastern boundary of Field 62 and an area along the access road leading to Field 63 is underlain by Glaciofluvial Deposits comprising sand and gravel; and
- areas in Fields 4, 6, 8, 9, 11, 17, 23, 26, 30, 32, 54, 57, 58, 59 and 63 are not underlain by any superficial geology.

2.13 The majority of the Site is further underlain by the bedrock geology of the Ordovician Rocks, comprising mudstone and sandstone. Areas in Fields 7, 11, 59, 61 and 63 are underlain by the bedrock geology of Ordovican Rocks, comprising interbedded sandstone and conglomerate. An isolated area in Field 23 is underlain by an unnamed igneous intrusion comprising gabbro, microgabbro and diorite.

2.14 The NRW classify the Till Devensian as 'Secondary Undifferentiated Aquifer'; these are defined 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*.'

[3] Diamicton is defined as heterogenous mixture of clay, sand, gravel and boulders varying widely in size and shape.

2.15 The NRW classify the Alluvium deposit and Glaciofluvial Deposits as 'Secondary A Aquifers'; these are defined as *"permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers."*

2.16 The bedrock geology of the Ordovician Rocks is classified as 'Secondary B Aquifer'; these are defined as '*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*.'

2.17 The Site is located within the Dŵy Cymru Welsh Water (DCWW) Drinking Water Catchment known as Llyn Alaw.

3 EXTERNAL FLOOD RISK

Flooding Mechanisms

3.1 Parts of the cable route are located within Flood Zones B and C2 and areas at risk of surface water flooding, however, the cables will be installed underground and will have no impact on flood risk. Given that the cable route is underground, there is no potential for an adverse impact within the Site or an increase in flood risk elsewhere.

3.2 When reviewing the NRW's Development advice maps, the majority of the Site is located in fluvial Flood Zone A, whilst limited areas along the western boundary and in the north-eastern corner are located in Fluvial Flood Zone B (refer to Figure 3.1). A very limited area along the western boundary is located in Fluvial Flood Zone C2, associated with Cors y Bol.

3.3 According to NRW's long term flood risk mapping, the Site is not considered to be at risk from tidal flooding.

3.4 NRW's Flood Map for Surface Water indicates that the majority of the Site has a very low surface water flood risk, with limited areas of up to a high surface water flood risk associated with the ordinary watercourses within the Site and isolated ponding (refer to Figure 3.2).

3.5 The Anglesey Local Flood Risk Management Strategy (LFRMS; Isle of Anglesey County Council, 2013) indicates that '*groundwater flooding occurs in low lying areas …*' As the Site is not considered to be located within a low lying area, the risk from groundwater flooding is low; however, this is discussed further below.

3.6 According to NRW's long term flood risk mapping, the Site is not considered to be at risk from reservoir flooding.

3.7 The Anglesey and Gwynedd Strategic Flood Consequence Assessment (SFCA; Isle of Anglesey County Council and Gwynedd Council, 2016) has not identified any records of sewer flooding within the vicinity of the Site.

3.8 A review of the SFCA and NRW flood maps, has identified that the principal risks to the Site are from fluvial and surface water flooding which forms the focus of the assessment below.

Historic Flooding

3.9 The Anglesey LFRMS (Isle of Anglesey County Council, 2013), Anglesey and Gwynedd SFCA (Isle of Anglesey County Council and Gwynedd Council, 2016) and Anglesey County Council Flood Investigation Report have been reviewed to identify any records of flooding at or in close proximity to the DNS application Site. This identified that these documents did not contain any historic flood records for the Site or surrounding area.

3.10 The NRW's recorded flood extents indicate that there are no historic flood records for the Site or surrounding area.

Fluvial Flood Risk

3.11 The majority of the Site is located in fluvial Flood Zone A, whilst limited areas along the western boundary and in the north-eastern corner are located in Fluvial Flood Zone B (refer to Figure 3.1). Fluvial Flood Zone C2 is located approximately 30 m to the west of the Site.

3.12 The NRW's river depths during the low risk event (between 1% and 0.1% AEP events) indicate that the maximum flood depth within the Site is between 0.4 m and 0.6 m (refer to Figure 3.3); however, this only affects areas along the western boundary and the Development (i.e. all built development) is located outside of these extents.

3.13 Detailed fluvial flood data was requested from the NRW which confirmed that they do not hold any modelled flood levels for Tafarn Brook, Carmel Brook, Pennant Brook or the other ordinary watercourses within the Site (refer to Appendix H). However, these watercourses all have small catchment areas at the Site location of 1.00 km^2, 1.79 km^2, 1.15 km^2 and less than 1 km^2, respectively and given their areas are less than 3 km^2 these watercourses are excluded from the NRW's JFLOW model. As such, these watercourses are unlikely to pose a significant source of flood risk.

3.14 However, in this instance the NRW's surface water flood map appears to show that surface water flooding is interlinked with fluvial flooding from these watercourses (refer to Figure 3.2). Therefore, it is considered appropriate to use the EA's surface water flood map as an indicator for fluvial flood depths and extents for Tafarn Brook, Carmel Brook, Pennant Brook and the other ordinary watercourses.

3.15 Figure 3.4 provides flood depths for the low surface water risk event (i.e. between 1.0% and 0.1% AEP). All proposed solar arrays and associated infrastructure is either located outside of the low risk extent or affected by shallow depths, i.e. less than 800 mm. However, isolated areas are affected by greater depths, principally in the vicinity of watercourses themselves.

Climate Change

3.16 The modelled operational lifetime of the Development is 40 years and, therefore, the climate allowances by the 2080's are appropriate. Based on this operational timescale, the latest guidance on climate change states that a climate change allowance of 30% would be appropriate for the West Wales river basin district.

3.17 It is considered appropriate to use the low risk surface water flood depths as a proxy indicator for the 1% AEP event plus 30% climate change (refer to Figure 3.4). Given the short operational lifetime of the Development and that the low risk scenario represents an extreme 0.1% AEP event, this is a conservative approach.

Surface Water Flood Risk

3.18 The NRW's Risk of Flooding from Surface Water mapping (refer to Figure 3.2) shows that the majority of the Site has a very low surface water flood risk, however; some areas throughout the Site have a low, medium or high risk of surface water flooding.

3.19 Very low surface water flood risk is defined where *"each year, this area has a chance of flooding of less than 1 in 1000 (0.1%)."* Low surface water flood risk is defined where "*each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%)".* Medium surface water flood risk is defined where "*each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%)."* High surface water flood risk is defined where *"each year, this area has a chance of flooding of greater than 1 in 30 (3.3%)".*

3.20 Areas of low, medium and high risk areas are located within the majority of the Site (Fields 7, 8, 9, 10, 11, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 47, 48, 50, 53, 54, 55, 56, 57, 58, 59, 60 and 62) in the vicinity of the watercourses within and along the boundaries of the Site. These areas of surface water flooding are considered to be interlinked with the fluvial flooding of the watercourses, as discussed above.

3.21 Areas of isolated ponding of surface water with up to a low surface water flood risk are located within Fields 3, 6, 7, 11, 15, 20, 21, 23, 24, 25, 32, 35, 36, 37, 38, 40, 48, 51, 52 and 55. There are areas of isolated ponding of surface water with up to a high surface water flood risk within Fields 30, 51, 52 and 63.

3.22 The low risk depths are almost entirely limited to less than 600 mm with a few areas with depths greater than 600 mm (refer to Figure 3.4). The areas with depths greater than 600 mm are located in the vicinity of the watercourses, which does not affect the solar arrays or associated infrastructure.

3.23 In the areas of localised ponding where solar arrays or inverter stations are proposed, the maximum low surface water flood risk depths are estimated between 200 mm and 400 mm. However, the low risk depths are shallower than those from fluvial flooding discussed above and can be mitigated alongside the fluvial flood risk (refer to Figure 3.4).

Groundwater Flood Risk

3.24 The Western Wales River Basin District Preliminary Flood Risk Assessment Report (PFRA; NRW, 2018) states that '*groundwater flood events in Wales are rare'* and that '*since 2011, there have been no recorded events of groundwater flooding within the Western Wales River Basin District'*.

3.25 The Anglesey LFRMS (Isle of Anglesey County Council, 2013) indicates that '*groundwater flooding usually occurs in combination with pluvial and fluvial flooding. As such groundwater flooding occurs in low lying areas …*' As the Site is not considered to be located within a low lying area, the risk from groundwater flooding is considered to be low.

3.26 According to BGS mapping, there are no publicly accessible borehole records identified within the Site boundary. However, it is considered reasonable to assume that there is potential for groundwater to be perched within Alluvium deposits that underly the Site.

3.27 From a review of the above information, it is considered unlikely that groundwater would emerge at the surface. However, any groundwater flooding that could occur is likely to be shallow and any risk of groundwater flooding can be mitigated alongside measures proposed for surface water and fluvial flooding.

Mitigation Measures

Design Levels

3.28 A justification approach has been taken in the layout whereby the most vulnerable parts of the Development will be located in the areas at lowest risk of flooding. The Development will be located outside of the Flood Zones B and C2 and the low fluvial flood extents. Additionally, the BESS Facility, substation and inverter stations will be located outside of the low surface water flood extents.

3.29 The panels and sensitive electrical equipment will be raised above the low surface water flood risk depths, where required. To achieve this, panels and sensitive electrical equipment will be elevated on framework above the surface water flood depths and, therefore, flow would not be impeded and the displacement of floodplain storage would be negligible.

3.30 The NRW's low surface water flood depth map indicates a maximum flood depth of approximately between 400 mm and 600 mm in the area of the panels. Therefore, the maximum height the panels need to be raised above ground level is approximately 0.6 m; however, the flood depths for the vast majority of the Site are significantly less. It is proposed for the panels to be raised 800 mm above ground level which will elevate the panels significantly above the low surface water flood depths.

3.31 With the above mitigation measures, the Development would remain operational in all modelled flood events.

Floodplain Compensation

3.32 Solar arrays have only been located within areas at risk of flooding where the depth is below the level of the solar panels, i.e. where only the framework would be inundated and, therefore, flow would not be impeded and the displacement of floodplain storage would be negligible. As such, it is not considered necessary to provide floodplain compensation.

3.33 The BESS Facility and substation are located outside of the low surface water flood event and, therefore, these structures would not displace any floodplain storage.

3.34 All of the inverter stations are located outside of the low surface water flood extent; therefore, these structures would not displace any floodplain storage.

3.35 Therefore, it is concluded that there would be a negligible loss in floodplain storage and it is not considered necessary to provide floodplain compensation. As such, it is concluded that the Development will not result in a significant increase in flood risk elsewhere.

Safe Access/Egress

3.36 Access/egress to the Site would be via access points in Fields 17, 28, 30, 32, 34 and 63. The access routes via Fields 28 and 30 are located entirely outside of the low surface water flood extent, whilst the other access routes are located partially in the low surface water flood extent.

3.37 During the low surface water flood event, the access/egress route via Field 17 could flood to an estimated depth of between 0 m and 0.2 m. In accordance with FD2320/TR2[4], the hazard rating for this route would be classified as a 'very low hazard' and a 'danger for some' depending on the velocity. A 'very low hazard' is defined as a caution for access/egress. A 'danger for some' is defined as a danger for children, the elderly and disabled people.

3.38 The access/egress route via Field 32 could flood during the low surface water flood event to an estimated depth of between 0.4 m and 0.6 m and the hazard rating for this route would be classified as a 'danger for some' and a 'danger for most' depending on the velocity. A 'danger for most' is defined as a danger for the general public.

3.39 During the low surface water flood event, the access/egress route via Field 34 could flood to an estimated depth of between 0.6 m and 0.8 m. The hazard rating for this route would be classified as a 'danger for most' and a 'danger for all' depending on the velocity. A 'danger for all' is defined as a danger for the general public including the emergency services.

3.40 The access/egress route via Field 34 could flood during the low surface water flood event to an estimated depth of between 0.2 m and 0.4 m. The hazard rating for this route would be classified as a 'very low hazard', 'danger for some' and a 'danger for most' depending on the velocity.

3.41 It is anticipated that personnel will only be on-Site during the construction and decommissioning phases of the Development and for occasional maintenance visits once construction has been completed. There will be no other personnel present at the Site for the majority of the operational lifetime of the Development.

3.42 The Site operator would sign up to the NRW's flood warning service for the local area, to ensure as far as possible that sufficient warning is provided in the event of an extreme flood. This will ensure that, should NRW issue a flood warning for the area, all personnel would have sufficient time to leave the Site or reschedule their planned visits.

3.43 On this basis, it is concluded that future maintenance personnel at the Site would be safe during the design flood event for the operational lifetime of the Development.

Land Use Vulnerability

3.44 Figure 2 of the TAN15 sets out a schedule of land uses based on their vulnerability or sensitivity to flooding. As set out in Table 2 and paragraph 5.2, the Development is classified as 'less vulnerable development' due to the minimal maintenance visits required and the limited risk to the water environment should the Site be inundated.

[4] Framework and Guidance for Assessing and Managing Flood Risk for New Development

3.45 A justification approach has been taken in the layout whereby all of the Development (excluding the grid connection) is located in Flood Zone A. In accordance with the guidance, this FCA has assessed the safety element of the Development in terms of safe access and egress, as recommended by current guidance. Therefore, on the basis of land use vulnerability, the Development should be deemed appropriate in planning policy terms in its proposed location.

Other Considerations

Maintenance Buffers

3.46 A minimum of 8 m buffer for 'main rivers' (Cors y Bol and Tafarn Brook) and 3 m buffer for 'ordinary watercourses', will be provided from the top of bank to the proposed fences in order to ensure access for maintenance. These buffers have been confirmed through consultation with NRW and the LLFA (refer to Appendix E and Appendix F).

3.47 Where planting is proposed in the maintenance buffers, this will be in the form of neutral grassland with wildflowers or tussocky grassland that would not prohibit access to the watercourses.

Ordinary Watercourse Consent

3.48 It is proposed for three access points at Fields 28, 31 to 55 and 58 to 59 to be widened and the loading of the existing culverts to be checked and strengthened if required (refer to Appendix D). A new culvert is proposed along the southern boundary of Field 32 (refer to Appendix D). These works would require Ordinary Watercourse Consents from Isle of Anglesey County Council once consent has been granted for the DNS application.

4 DRAINAGE ASSESSMENT

Introduction

4.1 This drainage strategy has been prepared in accordance with TAN15 and The Welsh Government Statutory Standards for sustainable drainage systems (2018) to ensure that the Development does not increase flood risk to the Site or elsewhere and where practicable reduces flood risk over the lifetime of the Development.

4.2 Surface water arising from a developed Site should, as far as is practicable, be managed to mimic the surface water flows arising from the Site prior to the Development while reducing the flood risk to the Site itself and elsewhere.

Drainage Strategy

Solar Arrays

4.3 The surface water drainage strategy has been based on the research report "*Hydrologic Response of Solar Farms*" (Cook and McCuen, 2013) published in the Journal of Hydrologic Engineering. It should be noted that the report states "*this study, along with design recommendations, can be used as a guide for the future design of solar farms*".

4.4 Cook and McCuen (2013) demonstrates that the solar panels and their metal framework do not have a significant effect on runoff volumes, peaks or time to peak if grass cover is located underneath panels and between rows. The study concludes that this is true for the 2 year, 25 year and 100 year events for a range of storm durations.

4.5 The report also notes that although the panels could concentrate runoff onto the ground, this only has the potential to cause erosion if it falls directly onto bare ground or a gravel surface.

4.6 On this basis, it is concluded that solar farms only significantly change the hydrologic response if gravel is placed under panels or if patchy or bare ground is created between rows. Therefore, the proposed planting framework discussed below will provide a method of source control, maintain the current hydrological response of the Site and will not increase flood risk elsewhere.

4.7 Consultation with the LLFA has confirmed that the proposed planting framework would be '*recognised as a SuDS feature'* and '*grassland mitigation is acceptable'* for sustainably manage runoff from the Development (refer to Appendix F).

4.8 The Development will result in a reduction in runoff rates and improved water quality of runoff due to the absence of typical farming activities such as ploughing and soil compaction by heavy machinery.

4.9 The research report also investigated the effects of ground slope on the solar farm. It considers the differences in the hydrological response between a slope of 1% (i.e. 1 in 100) and 5% (i.e. 1 in 20). The report concluded that the '*greater ground slope did not significantly influence the response of the solar farm*'.

4.10 Operational vehicle trips will include approximately two maintenance visits per month, typically with a transit style van and, therefore, the risk from erosion by vehicle traffic is low.

Mitigation

4.11 The Landscape and Ecological Management Plan (LEMP) to be secured through a planning condition will outline the proposed planting framework and enhancement to the quality of grass cover. The Site will be permanently vegetated with grassland located beneath the solar arrays and between rows. It is recommended by the LLFA that a buffer of at least 6 m of longer grass should be grown along field boundaries and watercourses where practicable, which will provide a further betterment to surface water runoff and erosion (refer to Appendix F).

4.12 The proposed planting will reduce runoff, encourage interception, infiltration and evapotranspiration and provide water quality treatment before surface water enters the watercourses within and surrounding the Site. The proposed planting will also provide sufficient mitigation against soil erosion.

4.13 Grass cover would be inspected and maintained at least twice a year or after periods of significant drought, which is considered an appropriate level of mitigation. It is recommended that during maintenance, any patchy grass or bare ground is re-seeded. The maintenance requirements for the planting mitigation is provided in detail in the LEMP.

4.14 The increased interception, evapotranspiration and infiltration due to the proposed planting will provide a betterment on the existing runoff rates at the Site and, therefore, will also provide a betterment in any future climate change scenarios.

<u>BESS Facility and Substation</u>

4.15 The BESS Facility and the majority of the substation buildings will be located above an extensive 500 mm deep sub-base formed of permeable material with a 30% void ratio, i.e. MOT Type 3 or similar (refer to Figure 4.1). The ground within the BESS Facility and the substation area will made level through cut and fill. The permeable sub-base will extend wider than the BESS Facility and substation buildings footprints. The auxiliary transformer within the substation compound needs to be mounted on a small 4.1 m x 4.1 m concrete base; however, this will drain to the surrounding sub-base.

4.16 The permeable sub-base would receive surface water from the containers and would promote infiltration to the ground without concentrating runoff. This will mimic the existing greenfield surface water runoff arising from the Site and ensure that runoff rates are not increased post-development. It is noted that this approach has been accepted on other recent solar farm developments (e.g. application reference P20/13909/F South Gloucestershire Council and 2/2019/0850/PAEIA Dorset Council).

4.17 MicroDrainage estimations provided in Appendix I indicate that the 30% void space within the 500 mm deep sub-base will provide the required storage volume for the 1 in 100 year event including 20% climate change. The MicroDrainage estimates have been used to size the sub-base within a conservative approach of not allowing any infiltration which will occur.

4.18 The maintenance requirements of the proposed granular sub-base are detailed in the SuDS Manual and would be carried out accordingly (refer to Appendix J).

Inverter Station Containers

4.19 The inverter station containers will be located above a 400 mm deep sub-base formed of permeable material with a 30% void ratio, i.e. MOT Type 3 or similar. The plan area of the sub-base will extend at least 500 mm beyond the footprint of the containers to allow the collection of roof runoff (refer to Figure 4.1).

4.20 The permeable sub-base would receive surface water from the containers and would promote infiltration to the ground without concentrating runoff. This will mimic the existing greenfield surface water runoff arising from the Site and ensure that runoff rates are not increased post-development.

4.21 MicroDrainage estimations provided in Appendix I indicate that the 30% void space within the 400 mm deep sub-base will provide the required storage volume for the 1 in 100 year event including 20% climate change. The MicroDrainage estimates have been used to size the sub-base with a conservative approach of not allowing for any infiltration which will occur.

4.22 The maintenance requirements of the proposed granular sub-base are detailed in the SuDS Manual and would be carried out accordingly (refer to Appendix J).

Tracks and Roads

4.23 Internal tracks would be required to facilitate vehicle movement around the Site for construction, decommissioning and maintenance purposes. The Development will utilise the existing access tracks where possible to minimise the extent of new tracks required.

4.24 All proposed roads and tracks will be constructed of a permeable material (e.g. MOT Type 3 or similar); therefore, there would be no increase in runoff from these areas.

4.25 Consultation with the LLFA (Appendix F) indicated that the tracks should have *"an alternating camber (changing sides every 25 meters) creating off the edge drainage in different directions in the event of silting up would avoid water running along the track and concentrating to one point."* This requirement should be considered in the detailed design and included wherever practicable.

4.26 The maintenance requirements of the permeable tracks are detailed in the SuDS Manual and would be carried out accordingly (refer to Appendix J).

Water Quality Treatment

4.27 Water quality treatment will be provided for surface water runoff from the solar arrays, inverter stations roofs, the substation, access roads and the BESS Facility.

4.28 In this instance, mitigation with an index or combined indices of more than 0.2 for Total Suspended Solids (TSS), 0.2 for metals and 0.05 for hydrocarbons is acceptable for the solar arrays as the pollution hazard level would be very low. The proposed planting beneath the panels will meet the water quality requirements required for the Development. It is considered that the proposed planting will provide a similar level of treatment to a filter strip.

4.29 Mitigation with an index or combined indices of more than 0.3 for TSS, 0.2 for metals and 0.05 for hydrocarbons is acceptable for the other aspects of the Development as the pollution hazard level would be low. The granular sub-base beneath the inverter stations, BESS Facility, associated buildings within the proposed substation compound and the permeable access tracks will meet the water quality requirements. It is considered that the granular material in the sub-base will provide a similar level of treatment to permeable paving.

4.30 As discussed above, the proposed planting framework and the absence of harvesting and ploughing will increase the quality of surface water runoff.

Construction

4.31 An Outline Construction Environmental Management Plan (CEMP) has been prepared for the DNS application which details the construction phases of the Development. Good construction practices will be undertaken to ensure that no adverse impacts on surface water or groundwater quality occur during the construction phase.

4.32 The internal access roads will be completed during initial construction stage so temporary haul routes are unnecessary.

4.33 The cable trenches will be backfilled with the excavated material to maintain the characteristics of the ground.

4.34 It is possible that construction could give rise to some ground compaction; however, it is considered that this would be no worse than other traditional farming practices which use heavier machinery.

4.35 During construction, it is recommended that vegetation disturbance should be minimised as much as possible and any bare ground resulting from construction should be re-seeded.

Decommission

4.36 The modelled operational lifespan of the Development is 40 years, and its decommissioning phase will result in similar impacts associated with its construction phase.

4.37 There may be a minor increase in impermeable areas as a result of infrastructure and temporary compound; however, decommissioning will result in the return to greenfield land and, therefore, there would be no long term effects on runoff rates or ground cover.

4.38 Decommissioning activities at the Site would comply to the appropriate British Standards for decommissioning and ensure that drainage features are only removed once the infrastructure they supply has been removed.

4.39 All decommissioning vehicles and activities will comply with the mitigation measures set out in the CEMP.

5 CONCLUSIONS

5.1 This FCA has been prepared in accordance with Planning Policy Wales (PPW; Edition 11, February 2021) and Technical Advice Note 15: Development and Flood Risk (TAN 15).

5.2 The NRW's flood maps identifies that the majority of the Site is located in fluvial Flood Zone A, whilst areas along the western boundary and in the north-eastern corner are located in Fluvial Flood Zone B and a very limited area along the western boundary is located in Fluvial Flood Zone C2.

5.3 The Site is at a low risk of groundwater flooding; however, any groundwater flooding is likely to be shallow and can be mitigated alongside measures proposed for fluvial and surface water flooding.

5.4 The NRW's river depths during the low risk event indicate that the maximum flood depth within the Site is between 0.4 m and 0.6 m; however, this only affects areas along the western boundary and the Development (i.e. all built development) is located outside of these extents.

5.5 Detailed flood data was requested from the NRW which confirmed that it does not have any modelled flood levels for Tafarn Brook, Carmel Brook, Pennant Brook or the other ordinary watercourses within the Site and these watercourses are excluded from the NRW's JFLOW model. As such, it is considered that these watercourses are unlikely to pose a significant source of flood risk.

5.6 In this instance, the NRW's Risk of Flooding from Surface Water mapping appears to show that the majority of the surface water flood risk is interlinked with the fluvial flood risk from the watercourses within the Site.

5.7 The 1% AEP plus 30% CC fluvial flood levels are not available for the Site and, therefore, it is proposed to use the low surface water flood extent as a proxy for the climate change event.

5.8 The low risk depths are almost entirely limited to less than 600 mm with a few areas with depths greater than 600 mm. The areas with depths greater than 600 mm are located in the vicinity of the watercourses, which does not affect the proposed solar arrays or associated infrastructure.

5.9 A justification approach has been taken in the layout whereby the most vulnerable parts of the Development will be located in the areas at lowest risk of flooding. The Development will be located outside of the Flood Zones B and C2 and the fluvial flood extents. The BESS Facility, substation and inverter stations will be located outside of the low surface water flood extents.

5.10 The panels and sensitive electrical equipment will be raised above the low surface water flood risk depths where required and, therefore, flow would not be impeded and the displacement of floodplain storage would be negligible.

5.11 Appropriate buffers will be provided from the top of the bank of the watercourses in order to ensure access for maintenance.

5.12 The access route via the existing access points. The maximum hazard rating for the access/egress route is a 'danger for all'. However, it is anticipated that personnel will only be on-Site during the construction and decommissioning phases and for occasional maintenance visits.

5.13 Cook and McCuen (2013) demonstrated that solar panels do not have a significant effect on runoff volumes, peaks or time to peak if grass cover is located underneath panels and between rows.

5.14 The Landscape and Ecological Management Plan (LEMP) to be secured through a planning application will outline the proposed planting framework and enhancement to the quality of grass cover. It is recommended by the LLFA that a buffer of at least 6 m of longer grass should be grown along field boundaries and watercourses where practicable, which will provide a further betterment to surface water runoff and erosion.

5.15 The proposed planting will reduce runoff, encourage interception, infiltration and evapotranspiration and provide water quality treatment before surface water enters the watercourses within and surrounding the Site. The proposed planting will also provide sufficient mitigation against soil erosion.

5.16 All proposed roads and tracks will be constructed of a permeable material (i.e. MOT Type 3 or similar); therefore, there would be no increased runoff from these areas. The BESS Facility, the sub-station and inverter station will be located in storage containers or cabins on legs above a sub-base formed of permeable material (i.e. MOT Type 3 or similar).

5.17 This FRA has therefore demonstrated that the Development will be safe and that it would not increase flood risk elsewhere. The Development is classified as 'less vulnerable' and is considered appropriate in relation to planning policy terms.

Figures

N

Cors y Bol

Pennant Brook

Tafarn Brook

Carmel Brook

Carmel

Key

- Red Line Boundary
- Main River
- Ordinary Watercourse

Figure 2.1: **Watercourse Plan**

Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:11,000@A3

N

Key

- Red Line Boundary
- Surface Water Flows

Figure 2.2: **Existing Surface Water Flows**

Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:11,000@A3

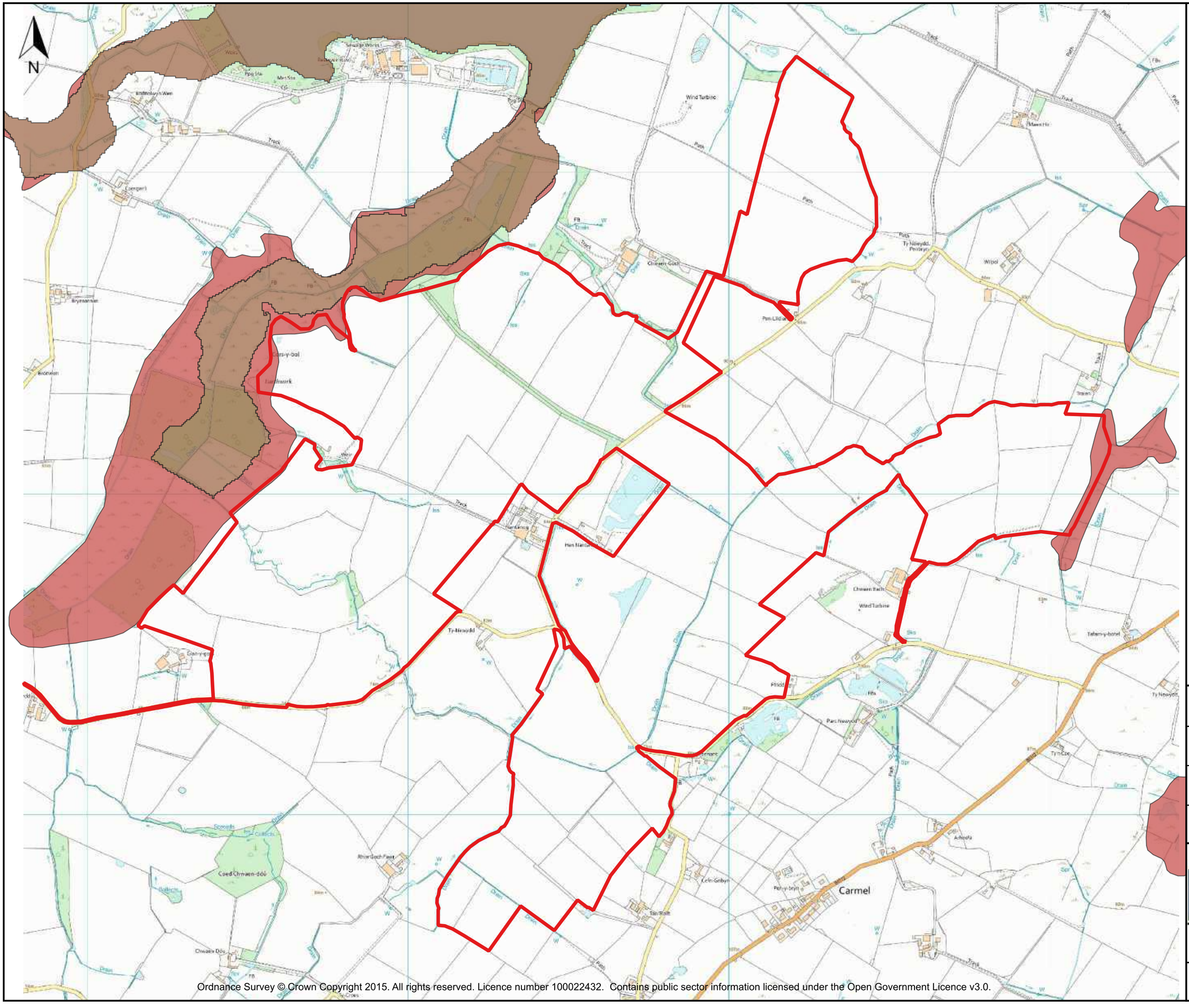


Figure 3.1:	**NRW's Development Advice Map**
Client:	**Wylfa Green Limited**
Project:	**Alaw Môn Solar Farm**
Project No.:	**C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:11,000@A3

N

Key

- Red Line Boundary
- Low Risk
- Medium Risk
- High Risk

Figure 3.2: **NRW's Surface Water Flood Map**

Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:11,000@A3

N

Key

- Red Line Boundary

Flood Depths

- Less than 0.2 m
- 0.2 m - 0.4 m
- 0.4 m - 0.6 m
- 0.6 m - 0.8 m
- 0.8 m - 1.0 m
- 1.0 m - 1.2 m
- 1.2 m - 1.4 m
- 1.4 m - 1.6 m
- Greater than 1.6 m

Figure 3.3: **NRW's Low Risk Fluvial Flood Depth Plan**

Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:5,000@A3

N

Key

Red Line Boundary

Flood Depths

- Less than 0.2 m
- 0.2 m - 0.4 m
- 0.4 m - 0.6 m
- 0.6 m - 0.8 m
- 0.8 m - 1.0 m
- 1.0 m - 1.2 m
- 1.2 m - 1.4 m
- 1.4 m - 1.6 m
- Greater than 1.6 m

Figure 3.4: **NRW's Low Risk Surface Water Flood Depth Plan**

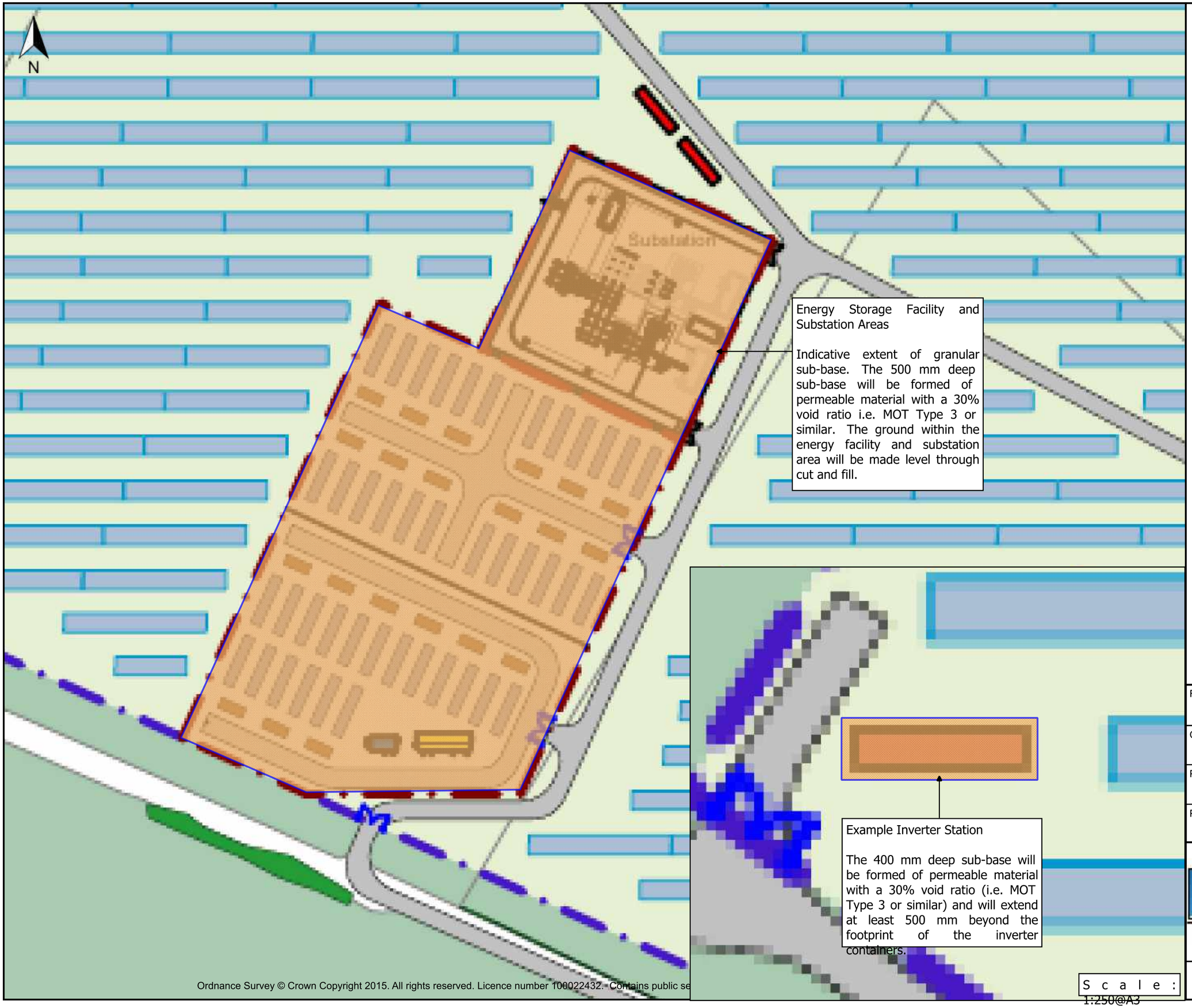
Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2023	1:11,000@A3



Key

Extent of Granular Sub-base

Figure 4.1: **Drainage Plan**

Client: **Wylfa Green Limited**

Project: **Alaw Môn Solar Farm**

Project No.: **C2208**

RMA ENVIRONMENTAL

Drawn:	Checked:	Date:	Scale:
RT	NY	04/10/2022	1:800@A3

Scale: 1:250@A3

Appendix A:
Site Location Plan

KEY

Site Boundary

Revisions:
First Issue- 16/03/2022 JS

N

0 1km

ALL DIMENSIONS TO BE CHECKED ON SITE
WORK TO FIGURED DIMENSIONS ONLY
REPORT DISCREPANCIES TO THE GFP
AT ONCE BEFORE PROCEEDING
COPYRIGHT ACT APPLIES

enso energy
Top Floor, The Priory, Dursley, Gloucestershire, GL11 4HR
Tel: 01452 764685

Project Title:

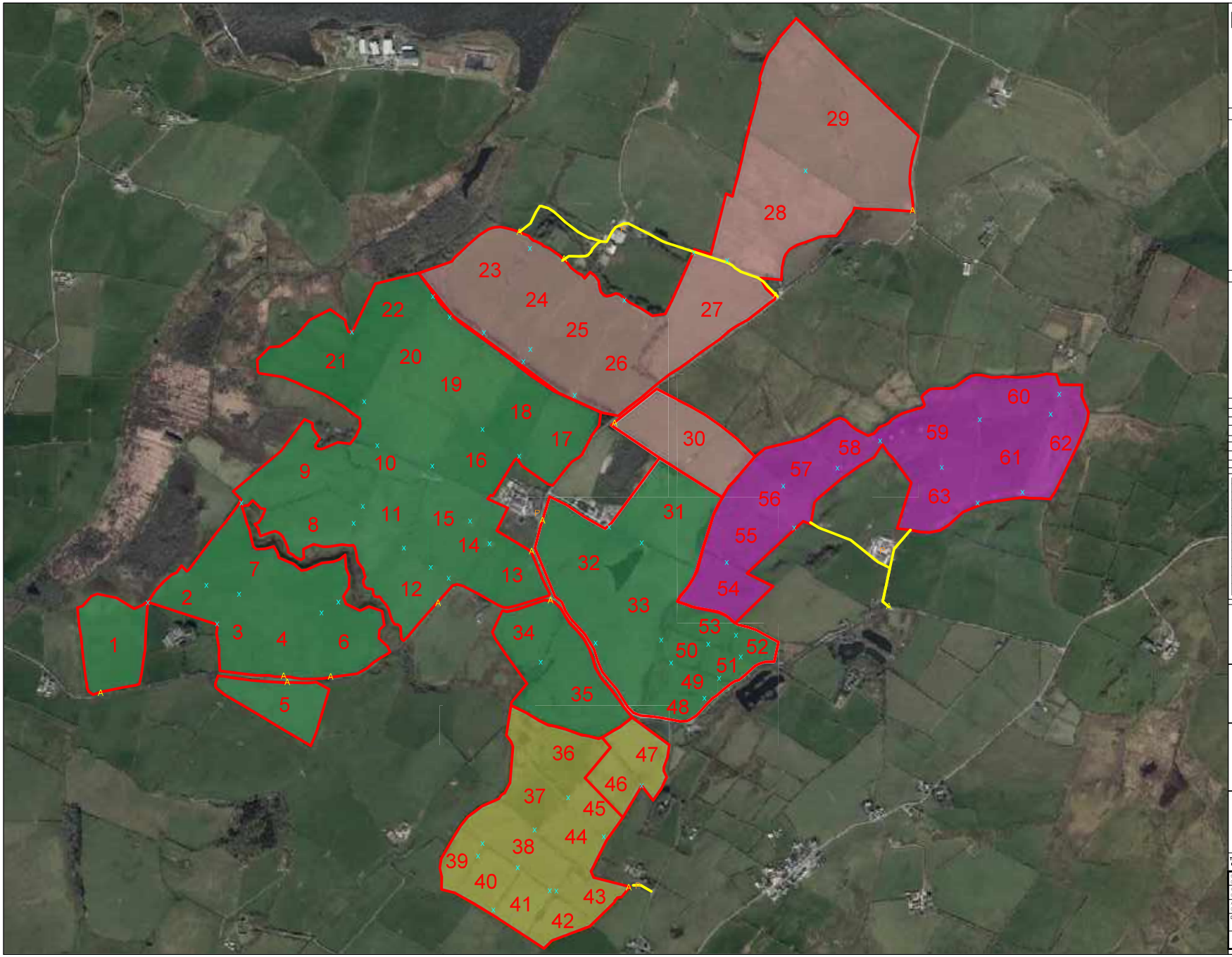
Alaw Môn (Wylfa) Solar Farm

Drawing Title:

Site Location Plan - Overall

DRWG No:	Rev:	Sht No:
ENSO-11-01	-	1/4
Drawn by : JS	Checked by: RS	
Scale: 1:12,500 @ A0	Date: 16/03/2022	

Appendix B: Field Number Plan



CONCEPTUAL DESIGN

N
W E
S

GENERAL NOTES

LEGEND

- Chwaen Goch
- Chwaen Bach
- Tan Rallt
- Nantannog
- Access Road
- A External Access
- P Parking
- X Internal Gates

REFERENCE DRAWINGS

No.	DRAWING TITLE	DRAWING No.

R	DATE	DESCRIPTION OF REVISION	REMARKS
03	10/03/21	Added ownership, access, gates, parking	
02	28/02/21	Added field No. 63	

PROJECT NAME :

WYLFA

OWNER'S ENGINEER :

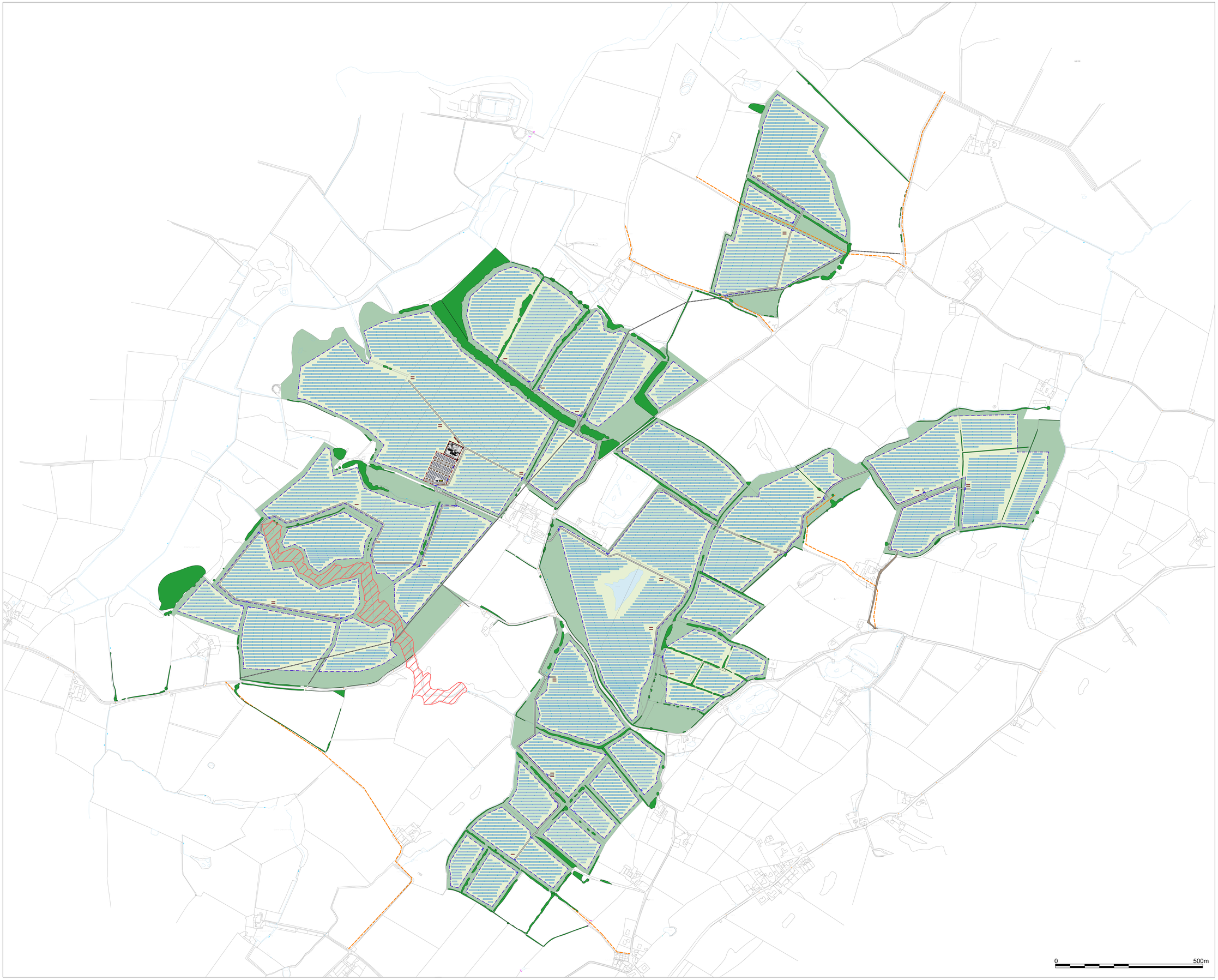
GENERAL CONTRACTOR :

enso energy

DRAWN BY : GD DATE : 10-03-2021		TITLE : RED LINE WITH FIELD NUMBERING AND OWNERSHIP
CHECKED BY : DATE :		
APPROVED BY : DATE :		
DRAWING No. : 001		

SHEET SIZE	SHEET	SCALE	REV
A0	1 OF 1	1:4000	03

Appendix C: Development Plan



KEY

- Solar Panels
- Inverter
- Deer Proof Fencing
- Battery Fence
- Storage Container
- Battery Container
- Substation
- Battery Storage Facility Inverter/Transformer
- Control Room
- New Access Track
- Existing Track
- Overhead Lines
- Species Rich Grassland *(Refer to Landscape Strategy Plan)*
- Field Margin Planting *(Refer to Landscape Strategy Plan)*
- Gravel
- SSSI
- Public Right of Way

NOTE:
CCTV cameras to be added around the perimeter of each fence line. The placement and spacing will be in accordance with the manufacturer's specification. Cameras face internally within site.

N

Revisions:
First Issue- 19/09/2023 JS

enso energy

Enso Energy Limited, Unit 1 & 2 Cirencester Office Park, Tetbury Road, Cirencester, GL7 6JJ
Tel: 01452 764585 Email: enquiries@ensoenergy.co.uk

Project Title:

Alaw Môn (Wylfa) Solar Farm

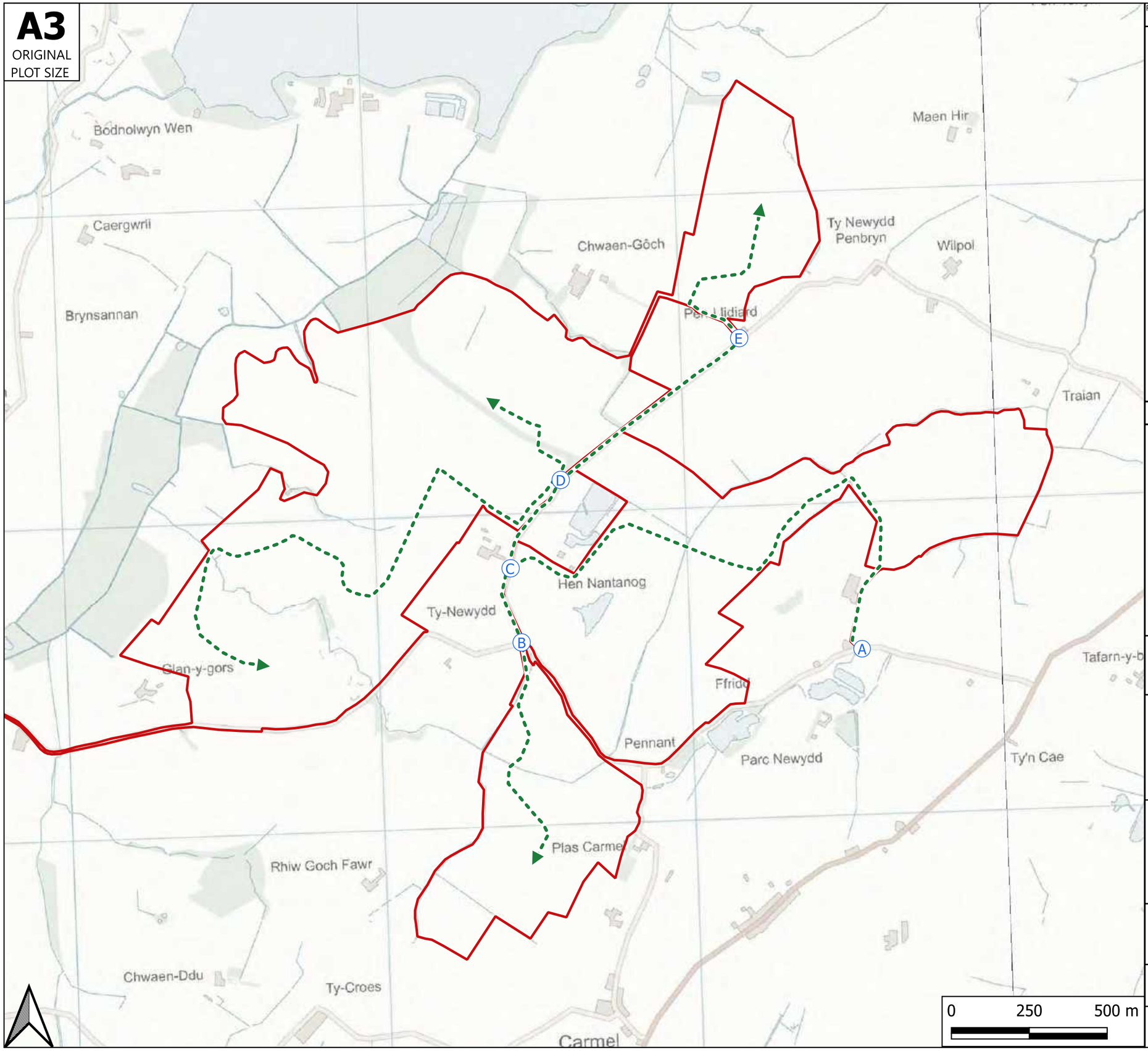
Drawing Title:

Proposed Site Layout

DRWG No:	Rev:	Sht no:
WAM-01-P02	-	-
Drawn by : JS	Checked by: OH	
Scale: 1:4000 @ A0	Date: 19/09/2023	

Appendix D:
Access Points Plan

A3
ORIGINAL
PLOT SIZE



Reproduced from .....

Key

- Site Boundary
- (X) Site Access
- Construction Vehicle Field Connections

Rev	Date	Details	Drawn by	Checked by	Approved by

Bristol
Cambridge
London
Oxford
Welwyn Garden City

tpa
Transport Planning Associates

25 King Street
Bristol
BS1 4PB

0117 925 9400
www.tpa.uk.com

CLIENT:
Wylfa Green Limited

PROJECT:
Alaw Môn Solar Farm

TITLE:
Access Strategy and Field Connections

STATUS:
FOR INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	13/10/23	AC	RR	JD

JOB NO:	DRAWING NO:	REVISION:
2010-26	Figure 3.1	-

Appendix E: NRW Consultation

Cyfoeth Naturiol Cymru
Natural Resources Wales

Ein cyf/Our ref: CAS-145405-T1Q4
Eich cyf/Your ref:

Maes Y Ffynnon,
Penrhosgarnedd,
Bangor,
Gwynedd
LL572DW

ebost/email:
northplanning@cyfoethnaturiolcymru.gov.uk

RMA Environmental
1 Emperor Way
Exeter Business Park
Exeter
EX1 3QS

04/05/2021

Annwyl Syr/Madam / Dear Sir/Madam

PRELIMINARY PRE-APPLICATION ADVICE

BWRIAD / PROPOSAL: PROPOSED SOLAR FARM

LLEOLIAD / LOCATION: west of Llanerch-y-medd and north of Carmel, Anglesey, LL71 7BS

Thank you for consulting Cyfoeth Naturiol Cymru / Natural Resources Wales about the above pre-application enquiry, which we received on 09/04/2021

We have considered your enquiry in relation to our Development Planning Consultations Topics document (September 2018). We advise that the following matters are relevant to your site / proposed development and suggest you consider these further prior to the submission of any planning application:

Flood Risk Management

The Lead Local Flood Authority (LLFA), in this instance Isle of Anglesey County Council, are the lead authority on flood risk from surface water and flooding from ordinary watercourses. You should therefore consult with the Authority's drainage engineers in respect to any issues relating to flooding issues from these sources.

We note there is a small section in the south west of the proposed site which runs adjacent to a main river (Cors y Bol). We have permissive powers in relation to any main rivers which we may use in relation to our Flood Risk management duties therefore any proposals within 8m of the main river may require a Flood Risk Activity Permit (FRAP). Further information can be found on our website here.

In response to your specific queries (copied in italics below) we respond as follows;

1) *Confirmation whether NRW have any requirements for maintenance buffers to the ordinary watercourses and the 'main river' within the site?*

As indicated above any proposal to erect any structure within 8m of a main river may require a FRAP. You will need to discuss matters which may impact on ordinary watercourses or surface water with the LLFA.

2) *Confirmation whether the panels will be acceptable in Zone B? It is noted that the low risk fluvial extent does not affect the site and panels will be elevated 0.8m above ground level which would offer a significant freeboard.*

We may be consulted by the determining authority in relation to any planning application which may be submitted in due course in relation to the proposal. As such we may comment on any Flood Consequences Assessment (FCA) associated with the application which will need to demonstrate that the flood risk in any flood zone (Zone B or C) can be acceptably managed in accordance with TAN 15.

3) *Confirmation that solar panels and other parts of the development would be acceptable within the areas of surface water flood risk subject to the panels and sensitive equipment being raised above the estimated flood depths?*

See comments relating to the LLFA above.

Protected Species

Our records show there may be protected species on and in the vicinity of the site [bats and water vole]. We advise liaison with the LPA ecologist to discuss and agree the scope of any surveys required.

We advise that any planning application should assess direct and indirect impacts on protected species during both the construction, operation (including maintenance works) and decommissioning phases. The application should also identify any necessary mitigation measures.

We refer you to our website for further advice.

Protected Sites

Site of Special Scientific Interest (SSSI)

The site lies partly within Nantanog SSSI, and within 415m of Llyn Alaw SSSI.

The Wildlife and Countryside Act 1981 (as amended) places a duty on public authorities in exercising their functions, so far as this is likely to affect the flora, fauna, geological or physiographical features of a SSSI, to take reasonable steps consistent with the proper exercise of their functions to further the conservation and enhancement of those features.
Any planning application will need to identify any impact pathways for protected sites (including Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, and

Ramsar sites). Where there are impact pathways, the application should clearly assess the possible levels of impact and, where impacts are likely, should provide full details of appropriate mitigation measures to address those impacts. We also advise that the application assesses whether there is functional linkage between the site and the features of protected sites within proximity (e.g. mobile features such as birds that may be a feature of Llyn Alaw SSSI)

Protected Landscapes

The proposal is located within 5km of the Anglesey Area of Outstanding Natural Beauty. We advise that you liaise with the LPA with regard to the scope of the landscape assessments. We advise that any application must demonstrate how significant effects on the AONB will be avoided, and identify appropriate mitigation measures where required.

Pollution Prevention

We advise that detailed pollution prevention measures, detailing how relevant Guidelines for Pollution Prevention and best practice will be implemented, should be set out in a Construction Environmental Management Plan.

Provision of Data

In addition to the above, please note, we can also provide certain data free of charge, as set out in our Open Data Policy. Customers can access our data via our website.

Other Matters

Please note the view expressed in this letter is a response to a pre-planning enquiry only. We trust these comments will prove helpful but they should not set a precedent for any future Natural Resources Wales' response to any formal application for planning permission or other legal consent. Such applications shall be assessed on the information submitted and regulations of relevance at that time. The details contained in this letter are based on the information available to date.

As part of our discretionary advice service we can provide further advice relating to land contamination, groundwater and flood risk prior to your planning application being submitted. There is a charge for this service. Further details are available on our website.

If you have any queries on the above, please do not hesitate to contact us.

Yn gywir / Yours faithfully

Rhys Jones
Cynghorydd - Cynllunio Datblygu / Advisor - Development Planning
Cyfoeth Naturiol Cymru / Natural Resources Wales

Appendix F: LLFA Consultation

Rosie Tutton

From: Rosie Tutton
Sent: 02 July 2021 11:06
To: Rosie Tutton
Subject: RE: Pre-application enquiry - proposed development on land west of Llanerch-y-medd and north of Carmel, LL71 7BS

-Jones Gareth (YGC) <GarethDaviesJones@gwynedd.llyw.cymru>
Sent: 01 July 2021 11:40
To: Daniel Hughes <DanielHughes@ynysmon.gov.uk>
Cc: Roberts Rhydian (YGC) <rhydianroberts@gwynedd.llyw.cymru>; Angharad Crump <AngharadCrump@ynysmon.gov.uk>
Subject: RE: Pre-application enquiry - proposed development on land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Good morning Dan.

We have reviewed the above submission and would comment as follows:

Unfortunately, since the legal implementation of Schedule 3 of The Flood and Water Management Act (2010) in Wales on the 7th January 2019, Cook and McCuen (2013) 's comment:- *"It is not considered necessary to provide SuDS for the proposed solar panel arrays"* is no longer relevant and developments such as this now requires application and approval by the SuDS Approval Body for the sustainable management of the surface water.

It is recognised that introducing the proposed grass cover beneath the panels is required to avoid erosion of the ground and creating ruts and streams which would increase runoff rates… this mitigation measure would be actually recognised as a SuDS feature as it is required to sustainably manage the water and avoid negative impact to the surrounding area.

The track constructed of MOT type 3 would be satisfactory, maintenance to ensure it does not silt up / grow over will be required, having an alternating camber (changing sides every 25 meters) creating off the edge drainage to in different directions the event of silting up would avoid water running along the track and concentrating to one point thus increasing runoff rate and volume at that point.

Confirmation of the control of the runoff from the roofs of the raised cabins to the 300mm deep type 3 sub base area below will be required in the full application… i.e. guttering and downpipes to the sub base or sub base extending wider than the cabin to ensure off the edge roof runoff lands on the subbase.

I also comment on your specific queries below:

1. Grassland mitigation is acceptable….. details to confirm continued maintenance of this feature will be required within the full application.
2. Infiltration testing not considered a requirement on this development as the water runs off the units at regular intervals on the ground giving it an opportunity to mimic its natural management at source and not concentrating runoff to one point. As water is managed on the surface, there is no real outfall to control, 6 meter buffer zones from site perimeter and watercourses have been specified in previous solar farm pre-apps giving any surface water runoff more opportunity to be slowed down and controlled naturally.
3. I have discussed the required maintenance buffer to the ordinary watercourse with the LLFA, they confirm that at least 3meters from top of bank on both sides would be required.

Kind regards.

Gareth.

Gareth Davies-Jones B.Sc. (Hons) MCIOB
Uwch Beiriannydd Draenio / Senior Drainage Engineer
Ymgynghoriaeth GWYNEDD Consultancy YGC
Swyddfa'r Cyngor, Stryd y Jêl, Caernarfon, Gwynedd, LL55 1SH
t: 32501 | (01286) 679 501
w: www.ygc.cymru | www.ygc.wales
Ystyriwch yr amgylchedd cyn argraffu / Please consider the environment before printing

---

From: Daniel Hughes <DanielHughes@ynysmon.gov.uk>
Sent: 13 April 2021 16:31
To: Davies-Jones Gareth (YGC) <GarethDaviesJones@gwynedd.llyw.cymru>
Subject: FW: Pre-application enquiry - proposed development on land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Hi Gareth,

Wedi derbyn yr ebost yma.

Ydi hi yn posib I chi rhoi sylwadau ar gyfer hwn plis?

Diolch

Dan

From: PEMHT <pemht@ynysmon.gov.uk>
Sent: 12 April 2021 09:26
To: Daniel Hughes <DanielHughes@ynysmon.gov.uk>; Steven A. Jones <StevenJones@ynysmon.gov.uk>
Subject: FW: Pre-application enquiry - proposed development on land west of Llanerch-y-medd and north of Carmel, LL71 7BS

From: Rosie Tutton <rosie.tutton@rma-environmental.co.uk>
Sent: 09 April 2021 20:02
To: PEMHT <pemht@ynysmon.gov.uk>
Cc: Nick Yeo <nick.yeo@rma-environmental.co.uk>; Ben.Lewis@bartonwillmore.co.uk; Ben.Kwok@bartonwillmore.co.uk
Subject: Pre-application enquiry - proposed development on land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Dear Enquiries,

We have recently been instructed to prepare an FCA and surface water drainage strategy to support a DNS planning application for a proposed solar farm on land west of Llanerch-y-medd and north of Carmel, Angelsey, LL71 7BS. The approximate grid reference is SH 38435 83870 and I have attached a site location plan. The proposed solar farm will cover an area of approximately 275 hectares (ha). The development is at a very early stage in the pre-application phase and we would appreciate any comments you have at this stage. The FCA and other documents are still being drafted at this stage.

In particular, we would appreciate your comments on the following:

1. Confirmation that the proposed grassland mitigation is acceptable, without the use of swales for mitigating runoff from the panels?

2. Confirmation that infiltration testing or controlled outfalls to watercourses are not required, given the approach detailed in the pre-app form?

3. Confirmation whether the LLFA have any requirements for maintenance buffers to the ordinary watercourses within the site?

We would welcome any comments you have on the proposed development at this stage and look forward to hearing from you.

Kind regards
Rosie

Rosie Tutton
Environmental Consultant

Mobile: 07808 645309

Website: www.rma-environmental.co.uk

Exeter Office: 1 Emperor Way, Exeter Business Park, Exeter, EX1 3QS
Phone: 01392 576227

London Office: 78 York Street, Marylebone, London, W1H 1DP
Phone: 020 3292 0534

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You are welcome to deal with the Council in Welsh or English. You will receive the same standard of service in both languages.

Appendix G: NRW Flood Data

Rosie Tutton

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 25 March 2021 11:50
To: Rosie Tutton
Subject: ATI-21142a : Flood Data Request - Land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Follow Up Flag: Follow up
Flag Status: Completed

Good Afternoon,

Unfortunately, we have no detailed modelling for the area of interest and so are unable to provide any products.

If needing a planning application and the site in question is within an area at risk, then you will need to contact the Discretionary Planning Advice Service (DPAS) following the links given within the paragraph below (**pre-application advice**)

Self Service Open Data:

You can now make the most of open data provided **free online:**

- **NRW Flood Risk Map Viewer**: create and export an A4 or A3 PDF map at a scale of 1:5000. You will find many spatial risk layers, including the Development Advice Map, flood zones, surface water, reservoir hazard data and historic flooding.

- **"Lle" the Welsh Government Portal for Open Spatial data**: Spatial data is free to download, view and use within your own GIS system. The flood datasets includes Flood Zones, Flood Defences, Historic Flood Outlines, Areas Benefiting Defences, Surface Water, Development Advice Map, and LiDAR Composite Dataset. You can also download the 'Coastal Design – Extreme Sea Levels' report and data covering still water levels for the Welsh Coastline (wave overtopping is **not** calculated).

FRM Products:

- **Unfortunately, we have no detailed modelling for this area and so are unable to provide any products**

Please Note the Following:

- All information supplied will need to be verified by the recipient **PRIOR** to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA.

- As of 1st of December, 2016 you will need to apply climate change allowances carefully to ensure compliance with Welsh Government climate change allowances and flood consequence assessments.

- **Pre-application Advice:** NRW are changing the way in which we provide advice to developers. We will continue to meet our duties as an adviser. In addition, we will offer a free initial opinion on your proposal. However, in cases where you would like to access any extra advice that falls outside of our statutory duties, we can only offer this as part of our Discretionary Planning Advice Service (DPA Service). For more information regarding free service and our discretionary planning can be found in the following links: Welsh Version / English version.

Your request for our free or charged discretionary advice service needs to be accompanied by the relevant 'Request Form' which is available to download from our website. You will then need to send the form to northplanning@cyfoethnaturiolcymru.gov.uk who will coordinate our response.

Kind Regards

Owen Jones
Cymorth Technegol Cyswllt Cyfoeth / Customer Hub Technical Support
Cwsmer, Cyfarthrebu a Masnach / Customer Communications and Commercial
Cyfoeth Naturiol Cymru/Natural Resources Wales
Ffôn/Tel: 0300 065 3000

E-bost/E-mail: owen.jones@cyfoethnaturiolcymru.gov.uk / owen.jones@naturalresourceswales.gov.uk
Gwefan/Website: http://www.cyfoethnaturiolcymru.gov.uk/ / www.naturalresourceswales.gov.uk

Twitter: twitter.com/NatResWales
Facebook: facebook.com/nNatResWales
Flickr: Flickr.com/NatResWales
Youtube: youtube.com/NatResWales

From: Data Distribution
Sent: 10 March 2021 07:39
To: Rosie Tutton <rosie.tutton@rma-environmental.co.uk>
Cc: Nick Yeo <nick.yeo@rma-environmental.co.uk>
Subject: RE: Flood Data Request - Land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Dear Ms Tutton,

Thank you for your email concerning the above.

Further to this and in answer to some of your queries, please see below:

- Flood maps differentiating tidal (if applicable) and fluvial flooding sources - http://lle.gov.wales/catalogue/item/NationalFloodHazardMaps/?lang=en & https://naturalresources.wales/evidence-and-data/maps/long-term-flood- risk/?lang=en
- Details of any historic flood records for the site or immediate surrounding area - http://lle.gov.wales/catalogue/item/HistoricFl/?lang=en
- Fluvial/tidal flood levels where available – We will advise in due course.
- Details of site-specific modelled flood levels or flood depth grid maps for the area if available – We will advise in due course.
- Details of any main rivers in the area - http://lle.gov.wales/catalogue/item/MainRivers/?lang=en
- Details of any flood defences for the area - http://lle.gov.wales/Catalogue?lang=en&text=defences

Please also accept this as an acknowledgement that your e-mail has been received and has been added to our queue. We have 20 working days to respond to requests, as allowed under the Legislation. Working days do not include weekends or bank holidays.

Due to the high volume of requests that we deal with, we are unable to respond to chaser e-mails. If you believe the 20-working day period has expired and you have not heard from us further, please get in touch. However, we cannot respond to chasers before this date.

Unfortunately, we are unable to move any requests further up our queue because the data / information is needed urgently. All requests are dealt with in order of the date they are received to be fair and consistent to all customers.

We will only use your personal data in accordance with the General Data Protection Regulation to deal with your request and any matters that arise from it. If you have any queries or concerns please contact dataprotection@naturalresourceswales.gov.uk. For further information on the processing of your personal details please see our Privacy Notice Page.

We will advise in due course about the remaining aspects of your request.

Yn gywir / Yours sincerely,

Michelle Lewis

Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/ Phone: 03000 653577
Symudol / Mobile: **07917243096**
Office Location Llys Afon, Hwlffordd / Office Location River Court, Haverfordwest
Cwsmer, Cyfarthrebu a Masnach - Customer, Communications and Commercial
Oriau gwaith arferol/Normal working hours – Mon-Fri, 9 to 5

From: Rosie Tutton <rosie.tutton@rma-environmental.co.uk>
Sent: 09 March 2021 18:38
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Cc: Nick Yeo <nick.yeo@rma-environmental.co.uk>
Subject: Flood Data Request - Land west of Llanerch-y-medd and north of Carmel, LL71 7BS

Dear Sir/Madam,

Please could you provide relevant flood information for land west of Llanerch-y-medd and north of Carmel, LL71 7BS (SH 38435 83870)? I attach a red line boundary for your information.

Please include the following information where available:

- Flood maps differentiating tidal (if applicable) and fluvial flooding sources;

- Details of any historic flood records for the site or immediate surrounding area;
- Fluvial/tidal flood levels where available;
- Details of site-specific modelled flood levels or flood depth grid maps for the area if available;
- Details of any main rivers in the area; and
- Details of any flood defences for the area.

I look forward to hearing from you in due course.

Kind regards,
Rosie

Rosie Tutton
Environmental Consultant

Mobile: 07808 645309

Website: www.rma-environmental.co.uk

Exeter Office: 1 Emperor Way, Exeter Business Park, Exeter, EX1 3QS
Phone: 01392 576227

London Office: 78 York Street, Marylebone, London, W1H 1DP
Phone**:** 020 3292 0534

Registered Office: RMA Environmental Limited, 2 Chartfield House,
Castle Street, Taunton, TA1 4AS - Registered in England No: 6915388

Appendix H: MicroDrainage Estimates

Appendix H1:

MicroDrainage Estimates for the BESS Facility and Substation

Summary of Results for 100 year Return Period (+20%)

Half Drain Time exceeds 7 days.

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.547	0.067	0.0	203.9	O K
30 min Summer	69.565	0.085	0.0	257.9	O K
60 min Summer	69.587	0.107	0.0	323.1	O K
120 min Summer	69.612	0.132	0.0	401.6	O K
180 min Summer	69.630	0.150	0.0	454.7	O K
240 min Summer	69.643	0.163	0.0	495.8	O K
360 min Summer	69.664	0.184	0.0	559.2	O K
480 min Summer	69.681	0.201	0.0	608.2	Flood Risk
600 min Summer	69.694	0.214	0.0	648.5	Flood Risk
720 min Summer	69.705	0.225	0.0	683.0	Flood Risk
960 min Summer	69.721	0.241	0.0	732.0	Flood Risk
1440 min Summer	69.745	0.265	0.0	804.8	Flood Risk
2160 min Summer	69.771	0.291	0.0	881.2	Flood Risk
2880 min Summer	69.789	0.309	0.0	936.7	Flood Risk
4320 min Summer	69.810	0.330	0.0	1001.0	Flood Risk
5760 min Summer	69.824	0.344	0.0	1043.1	Flood Risk
7200 min Summer	69.833	0.353	0.0	1072.0	Flood Risk
8640 min Summer	69.840	0.360	0.0	1092.2	Flood Risk
10080 min Summer	69.845	0.365	0.0	1106.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.441	0.0	19
30 min Summer	81.528	0.0	34
60 min Summer	49.440	0.0	64
120 min Summer	29.982	0.0	124
180 min Summer	22.376	0.0	184
240 min Summer	18.182	0.0	244
360 min Summer	13.570	0.0	364
480 min Summer	11.026	0.0	484
600 min Summer	9.386	0.0	604
720 min Summer	8.229	0.0	724
960 min Summer	6.617	0.0	964
1440 min Summer	4.867	0.0	1444
2160 min Summer	3.580	0.0	2164
2880 min Summer	2.879	0.0	2884
4320 min Summer	2.093	0.0	4324
5760 min Summer	1.669	0.0	5768
7200 min Summer	1.400	0.0	7208
8640 min Summer	1.213	0.0	8648
10080 min Summer	1.075	0.0	10088

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Winter	69.557	0.077	0.0	234.5	O K
30 min Winter	69.577	0.097	0.0	295.0	O K
60 min Winter	69.601	0.121	0.0	368.1	O K
120 min Winter	69.630	0.150	0.0	456.2	O K
180 min Winter	69.650	0.170	0.0	515.7	O K
240 min Winter	69.665	0.185	0.0	562.0	O K
360 min Winter	69.689	0.209	0.0	633.3	Flood Risk
480 min Winter	69.707	0.227	0.0	688.4	Flood Risk
600 min Winter	69.722	0.242	0.0	733.9	Flood Risk
720 min Winter	69.735	0.255	0.0	772.9	Flood Risk
960 min Winter	69.753	0.273	0.0	828.4	Flood Risk
1440 min Winter	69.780	0.300	0.0	911.2	Flood Risk
2160 min Winter	69.809	0.329	0.0	998.7	Flood Risk
2880 min Winter	69.830	0.350	0.0	1062.8	Flood Risk
4320 min Winter	69.856	0.376	0.0	1139.1	Flood Risk
5760 min Winter	69.872	0.392	0.0	1190.4	Flood Risk
7200 min Winter	69.885	0.405	0.0	1227.0	Flood Risk
8640 min Winter	69.893	0.413	0.0	1253.9	Flood Risk
10080 min Winter	69.900	0.420	0.0	1274.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Winter	134.441	0.0	19
30 min Winter	81.528	0.0	34
60 min Winter	49.440	0.0	64
120 min Winter	29.982	0.0	124
180 min Winter	22.376	0.0	184
240 min Winter	18.182	0.0	244
360 min Winter	13.570	0.0	364
480 min Winter	11.026	0.0	484
600 min Winter	9.386	0.0	604
720 min Winter	8.229	0.0	722
960 min Winter	6.617	0.0	962
1440 min Winter	4.867	0.0	1442
2160 min Winter	3.580	0.0	2144
2880 min Winter	2.879	0.0	2856
4320 min Winter	2.093	0.0	4280
5760 min Winter	1.669	0.0	5712
7200 min Winter	1.400	0.0	7136
8640 min Winter	1.213	0.0	8560
10080 min Winter	1.075	0.0	9888

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 237050 385300 SH 37050 85300
C (1km)	-0.031
D1 (1km)	0.421
D2 (1km)	0.385
D3 (1km)	0.356
E (1km)	0.304
F (1km)	2.320
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 1.011

Time (mins) From:	To:	Area (ha)
0	4	1.011

Model Details

Storage is Online Cover Level (m) 69.980

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	100.0
Membrane Percolation (mm/hr)	1000	Length (m)	101.1
Max Percolation (l/s)	2808.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.480	Membrane Depth (m)	0

Appendix H2:

MicroDrainage Estimates for the Inverter Station Containers

Summary of Results for 100 year Return Period (+20%)

Half Drain Time exceeds 7 days.

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	72.208	0.058	0.0	0.8	O K
30 min Summer	72.224	0.074	0.0	1.0	O K
60 min Summer	72.243	0.093	0.0	1.3	O K
120 min Summer	72.266	0.116	0.0	1.6	Flood Risk
180 min Summer	72.282	0.132	0.0	1.8	Flood Risk
240 min Summer	72.294	0.144	0.0	1.9	Flood Risk
360 min Summer	72.312	0.162	0.0	2.2	Flood Risk
480 min Summer	72.327	0.177	0.0	2.4	Flood Risk
600 min Summer	72.338	0.188	0.0	2.5	Flood Risk
720 min Summer	72.348	0.198	0.0	2.7	Flood Risk
960 min Summer	72.363	0.213	0.0	2.9	Flood Risk
1440 min Summer	72.384	0.234	0.0	3.1	Flood Risk
2160 min Summer	72.406	0.256	0.0	3.4	Flood Risk
2880 min Summer	72.421	0.271	0.0	3.7	Flood Risk
4320 min Summer	72.439	0.289	0.0	3.9	Flood Risk
5760 min Summer	72.450	0.300	0.0	4.0	Flood Risk
7200 min Summer	72.458	0.308	0.0	4.1	Flood Risk
8640 min Summer	72.463	0.313	0.0	4.2	Flood Risk
10080 min Summer	72.466	0.316	0.0	4.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.441	0.0	19
30 min Summer	81.528	0.0	34
60 min Summer	49.440	0.0	64
120 min Summer	29.982	0.0	124
180 min Summer	22.376	0.0	184
240 min Summer	18.182	0.0	244
360 min Summer	13.570	0.0	364
480 min Summer	11.026	0.0	484
600 min Summer	9.386	0.0	604
720 min Summer	8.229	0.0	724
960 min Summer	6.617	0.0	964
1440 min Summer	4.867	0.0	1444
2160 min Summer	3.580	0.0	2164
2880 min Summer	2.879	0.0	2884
4320 min Summer	2.093	0.0	4324
5760 min Summer	1.669	0.0	5768
7200 min Summer	1.400	0.0	7208
8640 min Summer	1.213	0.0	8648
10080 min Summer	1.075	0.0	10088

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Winter	72.217	0.067	0.0	0.9	O K
30 min Winter	72.235	0.085	0.0	1.1	O K
60 min Winter	72.256	0.106	0.0	1.4	Flood Risk
120 min Winter	72.282	0.132	0.0	1.8	Flood Risk
180 min Winter	72.300	0.150	0.0	2.0	Flood Risk
240 min Winter	72.313	0.163	0.0	2.2	Flood Risk
360 min Winter	72.334	0.184	0.0	2.5	Flood Risk
480 min Winter	72.350	0.200	0.0	2.7	Flood Risk
600 min Winter	72.363	0.213	0.0	2.9	Flood Risk
720 min Winter	72.375	0.225	0.0	3.0	Flood Risk
960 min Winter	72.391	0.241	0.0	3.2	Flood Risk
1440 min Winter	72.415	0.265	0.0	3.6	Flood Risk
2160 min Winter	72.440	0.290	0.0	3.9	Flood Risk
2880 min Winter	72.458	0.308	0.0	4.2	Flood Risk
4320 min Winter	72.480	0.330	0.0	4.4	Flood Risk
5760 min Winter	72.494	0.344	0.0	4.6	Flood Risk
7200 min Winter	72.503	0.353	0.0	4.8	Flood Risk
8640 min Winter	72.510	0.360	0.0	4.9	Flood Risk
10080 min Winter	72.515	0.365	0.0	4.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Winter	134.441	0.0	19
30 min Winter	81.528	0.0	34
60 min Winter	49.440	0.0	64
120 min Winter	29.982	0.0	124
180 min Winter	22.376	0.0	184
240 min Winter	18.182	0.0	244
360 min Winter	13.570	0.0	364
480 min Winter	11.026	0.0	484
600 min Winter	9.386	0.0	602
720 min Winter	8.229	0.0	722
960 min Winter	6.617	0.0	962
1440 min Winter	4.867	0.0	1430
2160 min Winter	3.580	0.0	2144
2880 min Winter	2.879	0.0	2856
4320 min Winter	2.093	0.0	4280
5760 min Winter	1.669	0.0	5712
7200 min Winter	1.400	0.0	7136
8640 min Winter	1.213	0.0	8480
10080 min Winter	1.075	0.0	9888

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 237050 385300 SH 37050 85300
C (1km)	-0.031
D1 (1km)	0.421
D2 (1km)	0.385
D3 (1km)	0.356
E (1km)	0.304
F (1km)	2.320
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.004

Time (mins) From:	To:	Area (ha)
0	4	0.004

Model Details

Storage is Online Cover Level (m) 72.550

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.4
Membrane Percolation (mm/hr)	1000	Length (m)	13.2
Max Percolation (l/s)	12.5	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	72.150	Membrane Depth (m)	0

Appendix I:
SuDS Maintenance Schedule

Table I1: Permeable Paving Operation and Maintenance Requirements

Schedule	Required Action	Frequency
Regular maintenance	Brushing and vacuuming.	Three times per year or as required based on observations or manufacturers' recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weed.	As required.
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.	As required.
	Rehabilitation of surface and upper sub-structure	As required (if infiltration performance is reduced as a result of 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.	3-Monthly, 48 hours after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers	Annually.