



## **Cefn Solar Farm**

# **Flood Consequences Assessment**

**Novus Renewable Services Ltd**

**REPORT REF: 321/SP10 (v1)**

**October 2021**

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## 1 Introduction

### 1.1 Purpose of this Report

This Report describes a Flood Consequences Assessment (FCA) that has been undertaken for a proposed Solar Farm at Cefn Road, east of Wrexham (Cefn Road, Abenbury, Pentre Maelor, Wrexham, Wales, LL13 OPX).

Corylus Planning and Environmental Ltd (Corylus) has been instructed by Novus Renewable Services Ltd to undertake this assessment.

### 1.2 Background

This report constitutes a response to the Welsh Government's Technical Advice Note, TAN15 and to identify where additional work may be required, in order to satisfy the Advice Note. This Report was originally drafted to address the original version of TAN15; however, it has been updated to address the requirements of the revised TAN15 of December 2021.

A site-specific flood risk assessment must demonstrate the following<sup>1</sup>:

- the flood risks to the development
- an assessment of the flood consequences of the development
- the development does not increase flood risk elsewhere
- how the flood risk to, or caused by, the development will be managed or mitigated against
- consideration of climate change in line with current government guidance

A specific request was made to NRW by way of a pre-application request for an adjacent Site; the response has been helpful and has informed the text, mostly in Section 2.

As part of this application, a Surface Water Management Plan (SWMP) Ref 321/SWMP/v1 dated September 2021 has also been prepared.

### 1.3 Sources of Information and Consultation

This Report has been informed by:

- Hydraulic modelling for the River Clywedog undertaken by Corylus in 2020 and 2021;
- Topographic surveys by Geodime;
- Site visit by Dr Webster on 8<sup>th</sup> and 9<sup>th</sup> June 2021; and
- Information available on internet sites.

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<sup>1</sup> <https://naturalresourceswales.gov.uk/guidance-and-advice/business-sectors/planning-and-development/advice-for-developers/developing-in-a-flood-risk-area/?lang=en>, accessed on 10<sup>th</sup> December 2020

## 1.4 Structure of this Report

The Report has been structured in order to deal with key flood related issues of TAN15, for which a checklist has been reproduced as Appendix A of this Report. The principal sections of this Report are as follows.

- Section 2 refers to spatial planning considerations by reference to the proposed land use and flood zoning.
- Section 3 presents an assessment of the existing flood risk at the application site.
- Section 4 presents an assessment of flood risks associated with the proposed development along with any mitigation that may be required.
- Section 5 provides a Summary and Conclusions.

A Pre-application response from NRW is provided in Appendix B. This has been helpful in refining the site layout and in establishing the strategy for this FCA. It should be noted that the Site boundary has been reduced compared to that submitted for the pre-application review.

## 1.5 Qualifications of those undertaking this Assessment

### **Dr Paul Webster: Project Manager and Hydrological Specialist**

Dr Webster has 40 years' experience of research and practice in hydrology. He has undertaken flood risk/consequences assessments for planning applications such as those based upon NPPF, PPG/S25 and TAN15 and has been involved as Expert Witness for Planning Enquiries. He was the Head of Flood Risk Management at Hydro-Logic Services from 2000 to 2019 where he oversaw all flood related work including hydraulic modelling, surface water management and FRA/FCAs and which numbered over 1,000 individual projects. He is currently the lead hydrologist at Corylus where he fulfils a similar role. From 1991 to 2000, he was a Lecturer at the University of Birmingham where he led a floods research group with a particular focus on design flood methodologies. He was a reviewer for the Flood Estimation Handbook and was a Project Manager for the Environment Agency on the hydrological research in the joint EA/DEFRA programmes from 2001 to 2008.

## 2 Spatial Planning Considerations

### 2.1 Location and Outline Development proposals

The location of the Site is shown in Figure 2-1 along with the topography. The Site is on land that slopes gently down to the south-east towards the river Clywedog. The land is currently in agricultural use. An aerial view of the Site given in Figure 2-2 showing how the Site covers just two fields that are bounded, in part, by Cefn Road and warehousing on Clywedog Road South. The Site boundary extends to the south to include a substation. Images of the Site are shown in Figure 2-3 and Figure 2-4.

Figure 2-1: Location and topography of Site – outlined in red

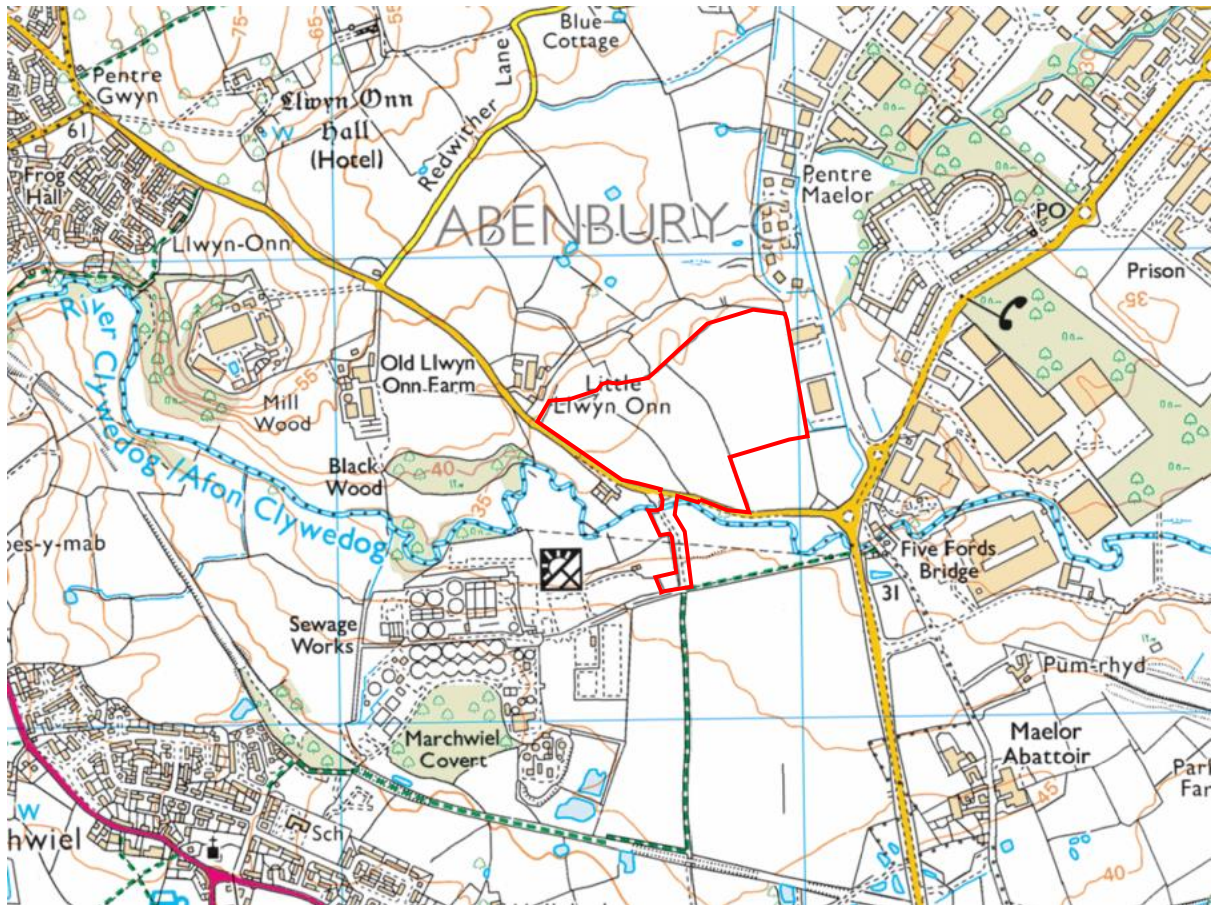


Table 2-1: Map Co-ordinates

Reference	Value
Grid reference	SJ368486
OS X (Eastings)	336822
OS Y (Northings)	348648
Nearest Post Code	LL13 0PX
Lat (WGS84)	53.03
Long (WGS84)	-2.94
What3words	porch.gracing.treaties

Figure 2-2: Existing Site with proposed development outlined in red



Figure 2-3: Field 1 from south-west corner of the field

(a) North along line of ditch

(b) East along Cefn Road





Figure 2-4: Field 2

(a) South along line of ditch



(b) East towards Field 1 along Cefn Road



## 2.2 NRW Flood Zones

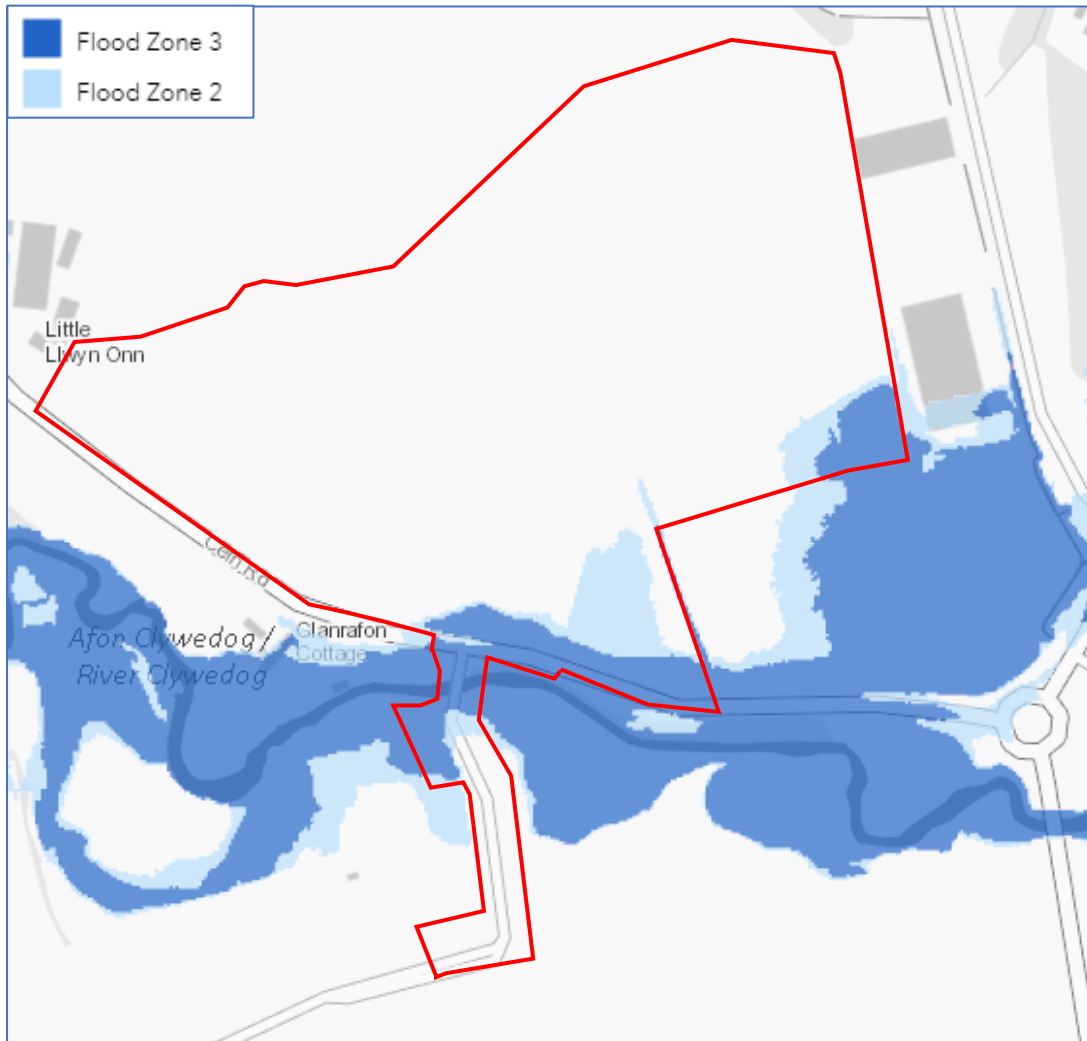
The Flood Map for Planning is shown in Figure 2-5 with the site boundary superimposed in red. This shows that the majority of the two fields are located in Flood Zone 1 and considered to be at little or no risk of fluvial flooding. However, the south-eastern portion of Field 1 and part of the southern boundary of Field 2 lie within Zones 2 and 3 with annual probability of flooding of greater than 0.1% and 1% respectively.. The implications for this are discussed in Section 2.3.

## 2.3 Flood Risk Vulnerability and the Justification Tests

The proposed development category for solar farms (as a power station) was originally assumed to be “Highly Vulnerable”. However, in the Revised TAN15 (December 2021), it is now regarded as “Less Vulnerable”.

TAN15 confirms that it is necessary to apply the Justification Test for Less Vulnerable Development in Flood Zones 2 and 3. This is provided in Table 2-2 and Table 2-3 for Flood Zones 2 and 3 respectively. A “Sequential approach” has been adopted for the proposed development such that there is no electrical infrastructure located in Flood Zones 2 and 3. As noted in Section 4, parts of the Site that lie in Flood Zone 2 are for access or for the temporary construction compound. All electrical infrastructure is thus to be located in Flood Zone 1 – at little or no risk of flooding.

Figure 2-5: Flood Map for Planning with approximate site boundary in red



<https://flood-map-for-planning.naturalresources.wales/> (accessed on 5<sup>th</sup> October 2021)

Table 2-2: Justification Test – Flood Zone 2

1	It is located in an area benefitting from flood defence infrastructure; OR	No
2	It will assist, or be part of, a local authority initiative or strategy to sustain an existing settlement and is identified in an adopted Development Plan as a result of consideration through the SFCA;	<i>This question is more relevant to housing or employment/commercial developments. The adopted local plan has not identified sites for renewable energy and the emerging local plan directs solar farms of 5-50MW to local search areas. The development of a solar farm, with battery storage, will contribute towards the target of generating 70% of the Country's electricity consumption from renewable energy by 2030.</i>
3	<b>AND</b> It conforms with the placemaking policies of PPW and meets the definition of previously developed land;	<i>The site is not previously developed land is currently under crop. Some agricultural use (e.g. grazing) will be possible during its lifetime.. Furthermore, the site will be fully decommissioned when no longer in use and the land restored.</i>  <i>PPW defines placemaking as ““Placemaking” is a holistic approach to the planning and design of development and spaces, focused on positive outcomes. It draws upon an area’s potential to create high quality development and public spaces that promote people’s prosperity, health, happiness, and well being in the widest sense” Although the proposed development does not include public spaces, it has been designed to retain and enhance existing landscape features and to provide ecological enhancements. Furthermore, there are wider public benefits, as previously discussed through the provision of renewable energy and contribution to a reduction in reliance upon fossil fuels.</i>
4	<b>AND</b> The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in accordance with the criteria contained in section 11.	<i>Through this Report</i>

Table 2-3: Justification Test – Flood Zone 3

a	The scheme is allocated (or part of an allocation) or identified in an adopted Development Plan, as a result of consideration through the SFCA, with evidence to justify why it is necessary to locate the development in zone 3;	<i>The site lies within the Solar Local Search Area (LSA) Boundary proposed with the draft Wrexham Local Development Plan 2013-2028. The LSA and accompanying draft local plan policy have been considered as part of the public examination of the Local Plan and the boundary of the LSA at the application site will not be amended within the forthcoming Matters Arising Changes. One of the key reasons for choosing the location of a solar farm is the proximity and availability of a viable connection point to the electricity network. In this instance, a viable connection point is available to the applicant.</i>
b	AND The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in terms of the criteria contained in section 11.	<i>Through this Report.</i>

## 3 Flood Hazard for the Existing Site

### 3.1 Catchment Characteristics

The catchment boundary for the River Clywedog to its confluence with the Redwither Brook, just downstream of the Site is shown in Figure 3-1 with the catchment descriptors in Table 3-2. It is this catchment that has been used in hydrological and hydraulic modelling for sites to the east of the current Site. The 86.3 km<sup>2</sup> catchment area has an SPRHOST runoff coefficient of 36%, which is intermediate in a UK context where values range from around 10% for permeable catchments to over 50% for impermeable clay catchments. The Urban extent is around 10%, of which Wrexham makes up a major portion.

The catchment area to the development Site is slightly smaller than that shown in Figure 3-1, with an area of 84.65 km<sup>2</sup> to the Bedwell Road Bridge, just downstream of the Site and shown on the inset. This is just 1.74 km<sup>2</sup> (2%) less than that for the modelled catchment.

The Site is at the upstream end of a detailed hydraulic model that was built to support investigations for Sites to the east of the Mainetti Factory. The reports for the modelling work have been variously reviewed by the NRW with feedback from officers being incorporated into revisions of the model.

The design flood levels from the model are not appropriate for the current Site as it is too close to the upstream model boundary. However, since there are no permanent interventions in flood zone 2, other than fences, there is no requirement for design flood levels. Accordingly, it has not been necessary to extend the model.

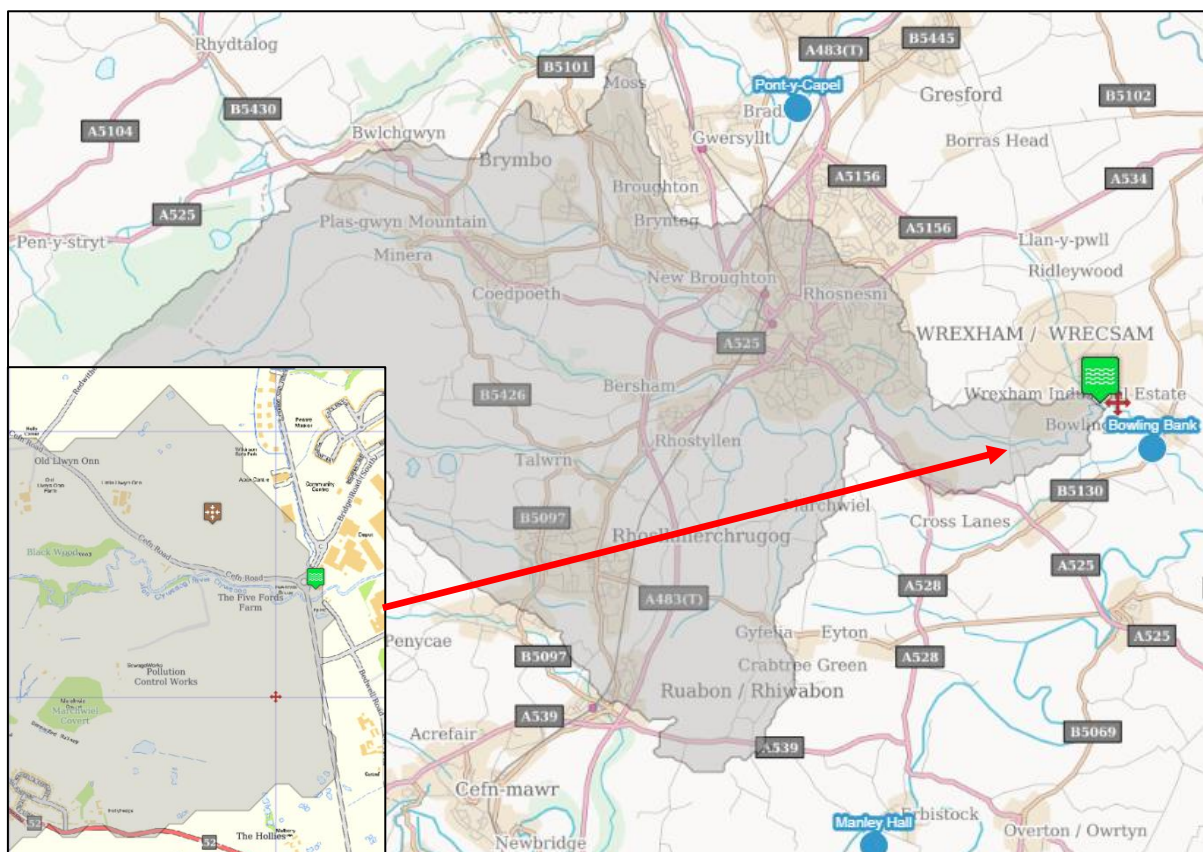
### 3.2 Source of Flood Risk

The flood risks are reviewed in summary form in Table 3-1. The principal source of flood risk to the low-lying parts of the Site is from **fluvial flood risk**. This is clear from the NRW draft maps for Flood Zones 2 and 3 in Figure 2-5. The area has been subject to detailed flood risk modelling as described in reports for the neighbouring Sites. Flood extent and depth maps are presented in this Report.

The NRW maps suggest that small areas would be allocated to **Surface Water** Flood Zones 2 and 3 (Figure 3-5). However, site investigations described in the companion SWMP confirm that the infiltration properties of the soils are very good across the Site. In any case, the shallow flooding that may be associated with the areas shown in the map are of no practical consequence for the proposed development.

Parts of the Site are in the area that could be affected by reservoir failure (Figure 3-2). The practical risk to the Site is considered to be low because of the relatively small contribution of the reservoirs to flood risk – reflected in the FARL (flood attenuation due to reservoirs and lakes) parameter of 0.988 which is close to the limiting value of 1.0. In any case, the flood extents are similar to those shown as flood zones 2 and 3 – so the reservoirs do not pose any additional increase in risk.

Figure 3-1: Catchment boundary for Clywedog to its confluence with Redwither Brook (FEH Web Service)



*Inset shows part of the boundary to the Bedwell Road bridge*

Table 3-1: Sources of flood risk affecting the site

<b>Key sources of flooding</b>	<b>Possibility at Site</b>
Fluvial (Rivers)	<i>Parts of the Site lie in Flood Zones 2 and 3 of the River Clywedog.</i>
Tidal	<i>N/a</i>
Groundwater	<i>None reported and unlikely given the elevated nature of the Site in relation to the valley of the Clywedog.</i>
Sewers	<i>None known to traverse the Site.</i>
Surface water	<i>Limited areas of surface water flooding on the Site from NRW mapping (Figure 3-5), though further comments are provided in Section 3.3</i>
Infrastructure failure	<i>NRW maps (Figure 3-2) suggest that low lying areas of the Site are in the reservoir flood risk zones</i>

*Based on NPPF Practice Guide*

Table 3-2: Catchment characteristics

	<b>Location:</b>	<b>SJ 38700 48950</b>
<b>AREA</b>	<b>Catchment area (km2)</b>	<b>86.29</b>
ALTBAR	Mean elevation (m)	186
ASPBAR	Mean aspect	93
ASPVAR	Variance of aspect	0.46
BFIHOST	Base flow index	0.524
BFIHOST19	Base flow index 2019	0.519
DPLBAR	Mean drainage path length (km)	14.61
DPSBAR	Mean drainage path slope	68.3
<b>FARL</b>	<b>Index of lakes</b>	<b>0.988</b>
FPEXT	Prop. of catchment in 1% FP	0.0624
FPDBAR	Mean flood depth (catchment)	0.533
FPLOC	Avg dist. of FP to outlet	0.844
LDP	Longest drainage path (km)	25.84
PROPWET	Proportion of time soil is wet	0.51
RMED-1H	Median 1 hour rainfall (mm)	10
RMED-1D	Median 1 day rainfall (mm)	34.7
RMED-2D	Median 2 day rainfall (mm)	43.4
SAAR	Average annual rainfall (mm)	879
SAAR4170	Ditto for 1941-1970 (mm)	886
<b>SPRHOST</b>	<b>Percentage runoff</b>	<b>36.03</b>
URBEXT1990	Urban extent 1990	0.0696
<b>URBEXT2000</b>	<b>Urban extent 2000</b>	<b>0.0986</b>

FEH Web Service

Figure 3-2: NRW Flood Risk from Reservoirs Map with approximate site boundary in red



[https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood\\_Risk/viewers/Flood\\_Risk/virtualdirectory/Resources/Config/Default&layerTheme=0](https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default&layerTheme=0) (accessed on 22<sup>nd</sup> June 2021)

### 3.3 Existing Surface Water Drainage Arrangements

Site survey showed that there is a watercourse draining through the centre of the Site (Figure 3-3). It follows the boundary between Fields 1 and 2 and flows under Cefn Road before flowing into the River Clywedog. The channel is well incised with bed levels falling from 1.5 m below to 1 m below general field level as one moves through the Site. Flowing water was visible in the upper reaches with standing water just upstream of Cefn Road.

The soil properties for the Site are illustrated in Figure 3-4 from the NSRI Soilscape web site. This suggests that the soils over the entire Site are “Naturally Wet”. Site investigations were undertaken specifically for this application; these showed that the soils had good drainage properties.



Furthermore, there was no evidence of groundwater to depths of hand augering (0.6 m and 1 m). The farmer, whose experience extended back over 40 years commented that this matched his general experience.

Figure 3-3: Watercourse flowing through Site

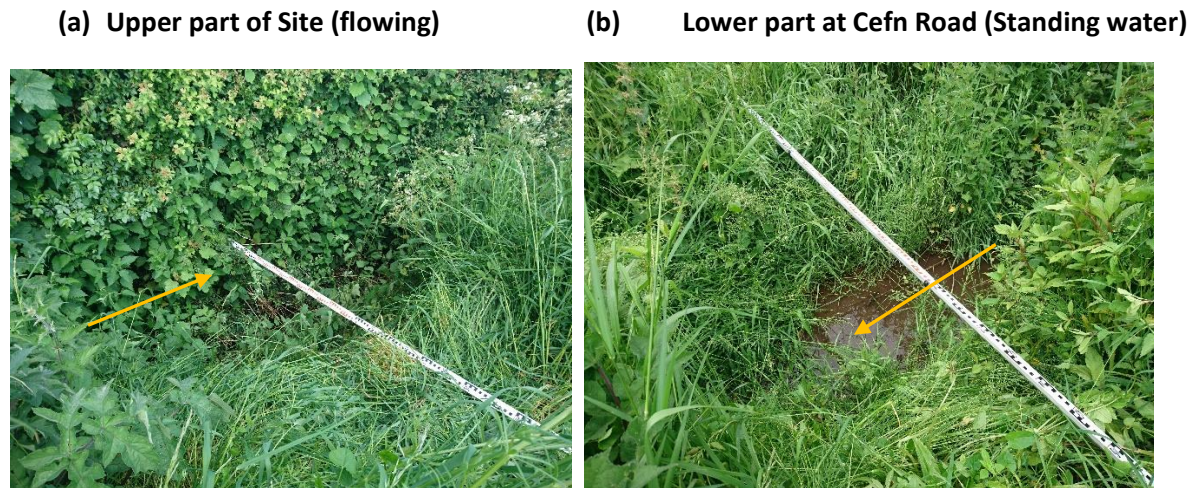


Figure 3-4: Soil Properties (NSRI Soilscape Website)

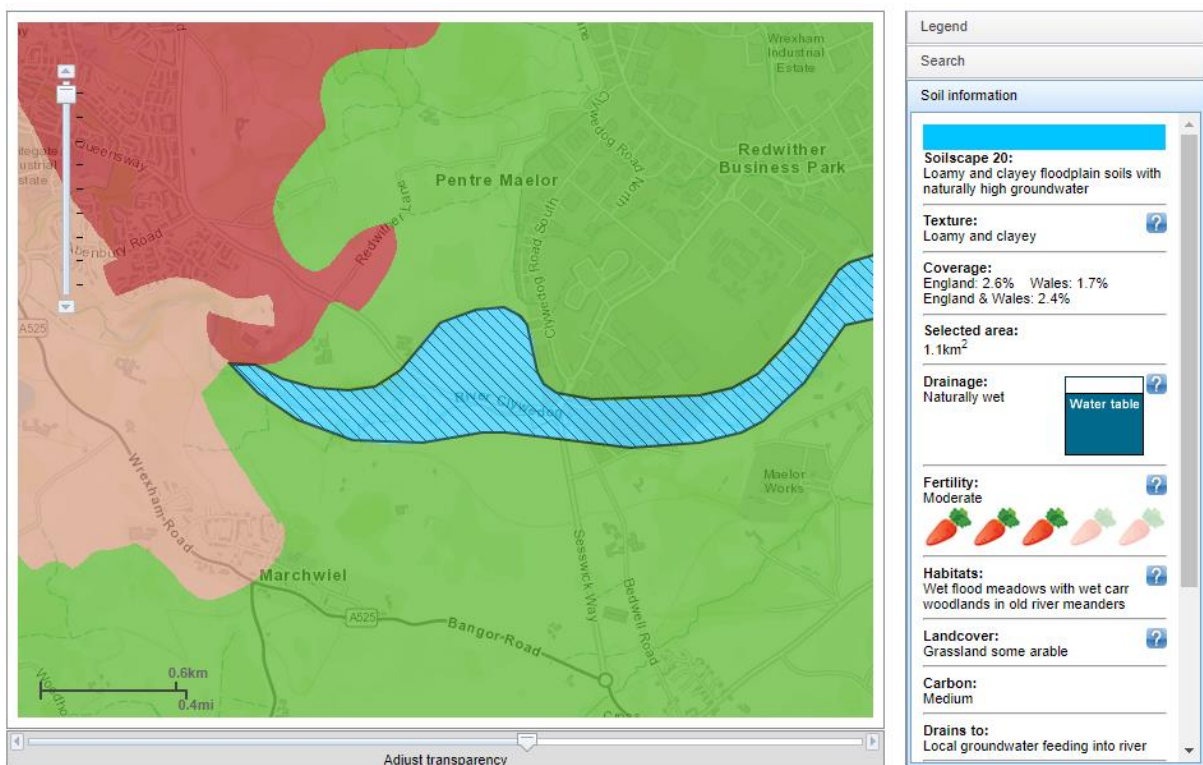
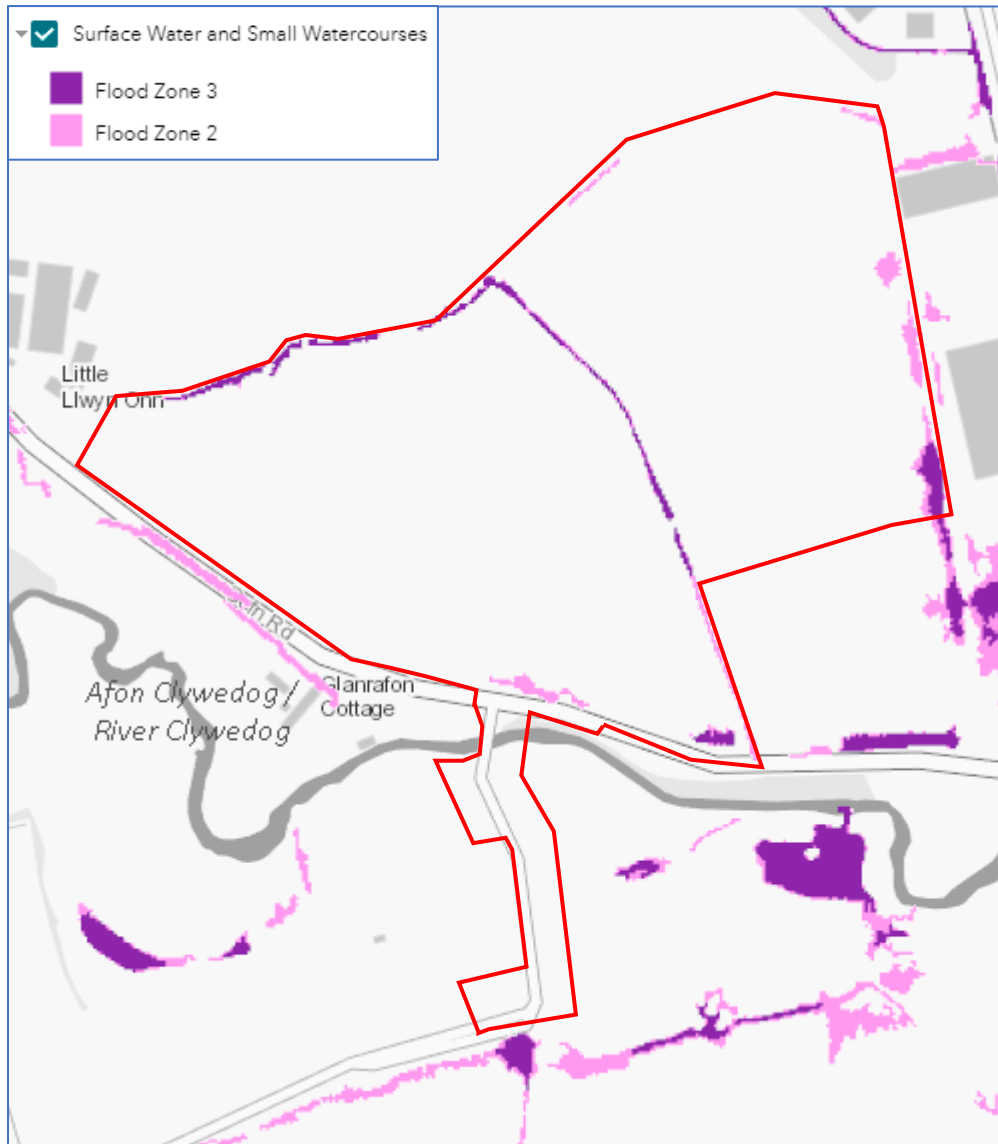


Figure 3-5: NRW Surface Water Flood Map with approximate site boundary in red



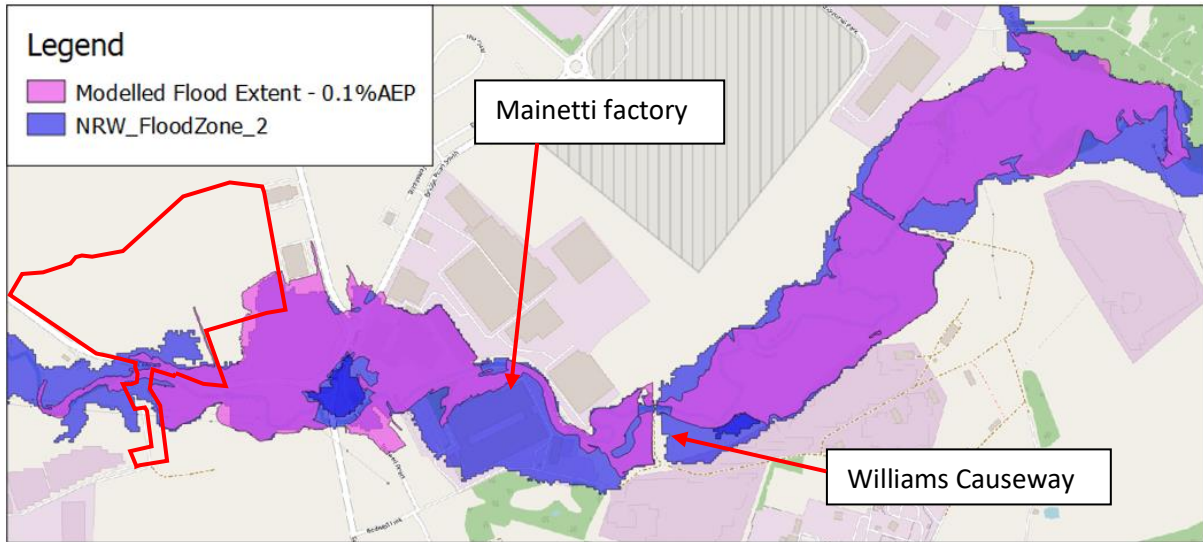
<https://flood-map-for-planning.naturalresources.wales/> (accessed on 5<sup>th</sup> October 2021)

### 3.4 Probability of Site Flooding

As noted previously, a hydraulic model has been developed for the River Clywedog to support investigations for Sites to the east of the current one. Results from the model suggested that there were minor differences compared with the flood extents on the NRW web site for much of the model domain, save for the Mainetti factory and the Williams causeway (Figure 3-6).

The differences in Field 1 and for the access to the sub-station result from being upstream of the boundary of the new model where computed levels are not reliable. If the current model had been extended, it is not expected that there would be any substantial difference compared with the NRW Flood extents.

Figure 3-6: Comparison of NRW and model extents (0.1% AEP)



## 4 Flood Risk Evaluation for the Proposed Development

### 4.1 The Development Proposals

The components of the development are shown in Figure 4-1 and comprise the following:

- Installation of solar panels
- Gravel tracks to provide internal access and around the batteries, transformers and ancillary stores;
- Impermeable surfaces comprising the rooves and concrete pads for the batteries, transformers, substation and ancillary stores;
- Temporary construction compound;
- Open fencing around site perimeter; and
- Shallow soil mound for storage of topsoil removed for creation of roads and other infrastructure.

There will be no electrical infrastructure, including solar panels, located in flood zones. The facility will be protected by an open style fence for security reasons.

There will be no ground raising within the flood zones. There will be storage of stripped top soil within the Site for later restoration. However, the soil storage will be close to the locations from where the soils has been removed, namely at locations of proposed infrastructure including the gravel access roads, as shown in Figure 4-1.

### 4.2 Flood Risk Management Measures to Protect the Site

Solar farms can be safely installed and operated in areas subject to flooding provided basic principles are followed. Foremost amongst these is that no electrical infrastructure should be located in flood areas. This principle has been fully adopted here. It is possible to safely locate solar arrays and associated cables in areas subject to flooding; however, even this will not be required for this Site. Accordingly, no flood risk measures will be required to protect the Site.

The Site will not be occupied, other than for routine or emergency maintenance visits. There is, accordingly, no requirement for a Flood Emergency Plan (FEP). Since all electrical infrastructure is to be located outside the flood zones, there is no need for any access to flood areas during a flood event. RAMS should include a reference to the risk of flooding being encountered and advising against any entry into areas that may be affected by flooding.

Electrical infrastructure will be located on concrete platforms. These are a nominal 0.2 m above local ground level and provides some reasonable protection for unmapped flood risk.

The Acceptability criteria are set out in Figure 6 and 7 of TAN15. For the proposed site:

- All electrical infrastructure will be flood free for the 1% +CC – a requirement for less vulnerable development (Figure 6); and
- There will be no flooding of electrical infrastructure for an extreme (0.1%) event (Figure 7).

A useful checklist from the previous TAN15 has been retained and is provided in Table A-1.

Figure 4-1: The Proposed Development (Drawing CE/321/4-2 Rev C, dated September 2021)



### 4.3 Off-Site Impacts and Mitigation

The principal off-site impacts relate to:

- Potential for increased runoff due to the new infrastructure
- Potential for increased flood levels due to the installation of solar infrastructure within the flood zones.

#### 4.3.1 *Increased runoff*

It is a fundamental principle of development that there should be no impact on third parties due to increased runoff from a development. This issue has been addressed through preparation of a companion Report as a Surface Water Management Plan. The main findings of the Report are as follows:

- i. The only features of the development that require mitigation are the new impermeable surfaces that total around 750 m<sup>2</sup>.
- ii. Infiltration testing has confirmed that the soils have good infiltration rates and thus that soakaways will provide a suitable way to mitigate the increases in runoff from impermeable surfaces.
- iii. Simulation has shown that the gravel areas adjacent to the proposed infrastructure provides sufficient area for mitigating runoff for the 1% AEP storm with allowance for climate change.

It is thus concluded that the proposed scheme will have no adverse impact on third parties in relation to increased runoff.

#### 4.3.2 *Impact on flood levels*

As noted previously, a Sequential Approach has been adopted with this proposal to ensure that all electrical infrastructure is located in the lowest flood risk zone. The only components that will be located in Flood Zones 2 and 3 on a permanent basis are fences. Since these will be located away from river channels and in areas of limited conveyance, their impact on peak flood levels and flood storage is expected to be minimal. No compensation measures are required in respect of these minor developments.

The temporary construction compound is to be located within Flood Zone 2. This will be in place for a maximum of six months and most likely during the favourable season for installation – namely the summer. There will be ample opportunity, in any case, for removal of plant should there be a risk of the compound being flooded.

### 4.4 Residual Risks

The residual risks arise from failure to undertake the required maintenance and from storms in excess of those for which the scheme has been designed.

The maintenance requirements for the SuDS components have been addressed in the companion SWMP Report. The components are mostly adjacent to internal roads which will facilitate access for

maintenance. Furthermore, all solar sites are subject to a strict monthly maintenance schedule for operational reasons. The SuDS maintenance requirements can thus be included within this broader operational maintenance schedule.

There are no “fluvial” components that need to be maintained. However, given the location of fences within the flood plain, there is a risk that debris may become attached to the fences resulting in a small blockage. The impacts of such a blockage would be small but nevertheless, the inspection and clearance of debris will be added to the routine maintenance schedule.

Should floods in excess of the design flood occur, there would be negligible impacts on the Site and no impact on third parties.

#### **4.5 Climate Change Impacts**

Climate change assumptions have been incorporated into the SWMP and flood modelling for the Site. Rainfall has been increased by 20% to account for projected increase in rainfall over the design life of the scheme.

## 5 Summary and Conclusions

This Report is an FCA for the proposed Solar Farm on Cefn Road, east of Wrexham (Cefn Road, Abenbury, Pentre Maelor, Wrexham, Wales, LL13 OPX). This Report should be read in conjunction with the companion Report that deals with Surface Water Management.

The main findings are as follows:

- i. The Site is located on land that lies in all three flood zones (1, 2 and 3) based on NRW flood zone maps.
- ii. Hydraulic modelling undertaken for a proposed development located downstream of the Site has confirmed the appropriateness of the NRW flood zones for the proposed Site.
- iii. A sequential approach has been adopted such that there is no electrical infrastructure, including solar panels, located in Flood Zones 2 and 3. In view of this, it was considered that there was no need for detailed hydraulic modelling to investigate the very limited impacts of the interventions on flood levels. This would, in any case have required the model to be extended since the proposed Site straddles the upstream boundary of the existing model.
- iv. The proposed development is currently classed as “Less Vulnerable” and is acceptable subject to the application of the “Justification Test”.
- v. Although the strict requirements of the Justification Test cannot currently be met, the sequential approach to location of electrical infrastructure and wider environmental benefits to the community are strongly supportive of the application.
- vi. The proposed solar development can be undertaken safely in flood risk areas without special mitigation. Key principles have been applied in its design – namely locating all electrical infrastructure outside flood zones other than cabling. Infrastructure is also to be mounted on concrete platforms which are a nominal 0.2 m above local ground level.
- vii. Since the Site will only be visited intermittently for maintenance and operational purposes, there is no need for any Flood Emergency Plan.
- viii. A companion Surface Water Management Report has shown that the increases in runoff due to the new impermeable surfaces created by the development can be mitigated a SuDS scheme. This will comprise infiltration using soakaways that comprise the gravelled areas around the proposed infrastructure.
- ix. Residual risks include those due to insufficient maintenance or due to conditions outside the design assumptions. Maintenance of the proposed SuDS component is straightforward and can be undertaken as part of routine monthly inspections, required anyway for the electrical infrastructure. The Site is considered robust in its ability to deal with conditions beyond the design assumptions.
- x. Climate change assumptions have been incorporated into the SWMP.

In summary, it is considered that the proposed scheme plus associated mitigation will have no practical impact on flood risk.



## 6 References

<b>Author</b>	<b>Date</b>	<b>Title/Description</b>
Centre for Ecology and Hydrology.	2018	The Flood Estimation Handbook Web Service. Available from: <a href="https://fehweb.ceh.ac.uk/">https://fehweb.ceh.ac.uk/</a>
CIRIA	2015	C753, The SuDS Manual.
Institute of Hydrology	1999	The Flood Estimation Handbook and subsequent guidance.
Marshall D.C.W. & Bayliss A.C	1994	Flood estimation for small catchments, IH Report No. 124, Institute of Hydrology, Wallingford and Hall, Hockin & Ellis
Welsh Government	2021	Technical Advice Note 15. Development, flooding and coastal erosion.

## Appendix A Site Specific Flood Consequences Assessment Checklists

Table A-1: Conditions of Acceptability Criteria (Section A1.12 of TAN15 - 2004)

No	Condition	Response
1	Flood defences must be shown by the developer to be structurally adequate particularly under extreme overtopping conditions (i.e. that flood with a probability of occurrence of 0.1%)	<i>No flood defences present.</i>
2	The cost of future maintenance for all new/approved flood mitigation measures, including defences must be accepted by the developer and agreed with the Natural Resources Wales	<i>N/a</i>
3	The developer must ensure that future occupiers of development are aware of the flooding risks and consequences	<i>This will be through any site maintenance schedules that will include SuDS components.</i>
4	Effective flood warnings are provided at the site	<i>The site will not be occupied. RAMS for any maintenance work will reference flood risks.</i>
5	Escape/evacuation routes are shown by the developer to be operational under all conditions	<i>No escape/evacuation needed; in any case, escape is clearly to higher ground from any flooded areas.</i>
6	Flood emergency plans and procedures produced by the developer must be in place	<i>None needed, save through the relevant RAMS.</i>
7	The development is designed by the developer to allow the occupier the facility for rapid movement of goods/ possessions to areas away from the floodwaters	<i>N/a</i>
8	Development is designed to minimise structural damage during a flooding event and is flood proofed to enable it to be returned to its prime use quickly in the aftermath of the flood	<i>All electrical infrastructure, other than cables and panels are located outside areas at risk of flooding. Solar panels will be set a nominal 0.2 m above local ground level with cable connections able to withstand inundation.</i>
9	No flooding elsewhere	<i>The Sequential approach means that there is no infrastructure to be located in flood zones. There are accordingly, no practical impacts on third party land.</i>

**Table A-2: Technical Requirements Checklist (Section 12/Fig 9 of TAN15)**

<b>Nr</b>	<b>Description</b>	<b>Cross Reference</b>
1	A location plan identifying all possible sources of flooding including overtopping and/or breach of existing defences and any in-channel structures that may be prone to blockage.	<i>The flood risk is primarily due to fluvial flooding from the River Clywedog. NRW flood extents are shown in Section 3.4 which accord well with baseline modelling undertaken for an adjacent (downstream) Site.</i>
2	A plan of the site showing existing and proposed levels related to Ordnance Datum.	<i>The ground levels will not change due to the development, save due to the soil mounds that are outside the areas at risk of flooding.</i>
3	A plan identifying any flood alleviation measures already in place.	<i>None present.</i>
4	An assessment of all sources of potential flooding including, but not confined to rivers, tidal, coastal, groundwater, surface flow or any combination of these.	<i>Section 3 and specifically Table 3-1.</i>
5	Existing and proposed cross-sections of the site showing proposed development and site levels relative to the source of flooding, and to anticipated water levels and associated probabilities.	<i>Not needed since there is no permanent intervention in flood zones 2 and 3.</i>
6	An assessment of peak flood depth and velocities at which various parts of the site might flood, the likely duration of flood events and impacts of flooding.	<i>Not needed as part of the development.</i>
7	Information regarding the extent and depth of past flood events and future predictions.	<i>Climate change allowances have been incorporated based on Welsh Government Guidance (Section 4.5).</i>
8	A plan of the area to show overland flow routes and appropriate access/evacuation routes from the proposed development site that are operational under all conditions.	<i>The site will be operable under all flood conditions. It will not be occupied so there is no requirement for access/evacuation.</i>
9	A plan and description of any structures which may influence local hydraulics, including bridges, pipes/ducts crossing the watercourse, culverts, screens, embankments or walls, overgrown or collapsing channels.	<i>The Site comprises two parcels of land bisected by the River Clywedog. A bridge crosses the River Clywedog close to the southern parcel of land. This bridge provides access to the Sewage Works operated by Dwr Cymru and is accordingly a key route.</i>
10	An assessment of the implications of any drains or sewers, existing or proposed, on the site during flood events.	<i>None present, other than minor agricultural ditches.</i>

11	An assessment of the flood storage volume that would be lost and/or displaced from the site.	<i>There is no loss of floodplain storage.</i>
12	An assessment of the run-off likely to be generated from the development.	<i>This has been addressed in a Companion SWMP.</i>
13	Details of flood avoidance, mitigation and resilience measures to be implemented.	<i>N/a</i>
14	Details to demonstrate that the development will not cause or exacerbate the nature and frequency of flood risk elsewhere.	<i>A sequential approach has been adopted such that there is no electrical infrastructure to be located in flood zones. The only interventions will thus comprise fences, which are not considered to pose any practical flood risk.</i>
15	An assessment of the risks after the construction of any necessary mitigation measures.	<i>n/a</i>
16	A clear and comprehensive summary of the assessment describing the outcomes and recommendations.	<i>Section 5.</i>

## Appendix B Pre-Application Response from NRW



Ein cyf/Our ref: CAS-162794-G2J1  
Eich cyf/Your ref: Solar Pre-app

Maes Y Ffynnon,  
Penrhosgarnedd,  
Bangor,  
Gwynedd  
LL572DW

Wrexham County Borough  
Council, The Guildhall,  
Wrexham,  
LL11 1AY

ebost/email:  
northplanning@cyfoethnaturiolcymru.gov.uk

06/09/2021

Dear Mr Bolton,

### PRELIMINARY PRE-APPLICATION ADVICE

**PROPOSAL:** Proposed Solar Farm

**LOCATION:** Little Llwyn Onn, Abenbury, Wrexham

Thank you for consulting Cyfoeth Naturiol Cymru / Natural Resources Wales about the above pre-application enquiry, which we received on 05/08/2021.

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

Our Flood Risk Map confirms the application site lies partially within Zone C2 of the Development Advice Maps (DAM) as contained in TAN15.

Section 6 of TAN15 requires the Local Planning Authority to determine whether the development at this location is justified. Therefore, we refer you to the tests set out in section 6.2 of TAN15. If the Local Planning Authority consider the proposal meets the tests set out in criteria (i) to (iii), then the final test (iv) is for the applicant to demonstrate through the submission of an FCA that the potential consequences of flooding can be managed to an acceptable level.

This site should be considered similar in vulnerability and impact to the downstream solar energy proposal under P/2021/0676. That is to say, hydraulic modelling was provided to assess third party impacts as a result of effective increased 'roughness' within the floodplain.

The current site consists of land parcels to the north and south of Afon Clywedog, a designated main river and bisected by Cefn Road. The potential sub-station location to the south is outside the current DAM C2 extent. Any vulnerable mechanical & electrical equipment relating to the sub-station should be set a nominal distance above ground level to safeguard against any unmapped flood risk.

With regards to the northern, solar panel portion of the proposal, there are more panels at perceived risk than the enquiry letter infers. Our initial aim should be that all panels and fencing (which could cause a barrier to flood flows) should be flood free and that those panels do not have an adverse impact on third parties.

An FCA was compiled by the same consultant for the downstream site which included hydraulic modelling and we encourage the same approach to be taken again if it cannot be demonstrated that flood risk impacts are acceptable.

An FCA should consider whether hydraulic modelling is necessary to assess the consequences of flooding, informed by local flood risk information from residents, landowner and highways department (to confirm whether Cefn Road has a history of fluvial flooding).

We do not have enough information yet to consider whether detailed modelling is proportionate for this case but the consultant will need to apply a staged approach to that assessment.

We refer you to our [website](#) and [Guidance Note 028 Modelling for Flood Consequence Assessments](#) for further advice.

#### **Flood Risk Activity Permit/ Main River**

The proposed development is near the River Clywedog, a designated main river. If development works in this area are within 8 metres of the river, you may need to apply for a Flood Risk Activity Permit. We refer you to our [website](#) for further advice.

#### **Pollution Prevention**

The main considerations needed if this proposal is to go ahead are as follows:

The site is within the Dee Water Protection Zone. Given that battery storage facilities are intended to be situated on site the applicant will have to gain consent from the DPZ for the storage of potentially hazardous/corrosive materials on site. This is dependent on the thresholds of controlled substances being used/stored on site. Please see [Dee Water Protection Zone](#) for further information and application advice.

Any consequent application should confirm the following:

- Connection plans and location between the main site and the southern substation parcel as well as how the applicant intend to connect the power lines to serve the sewage works.
- Confirmation of either above or below ground systems

The site is also less than 20m from the Clywedog River which is a major tributary of the River Dee. As a result, please see the following guidance outlining the precautions that should be implemented during the construction phase:

During the construction phase the developer should take any precaution to prevent contamination of surface water drains and local groundwater. Oils and chemicals should be stored in bunded areas and spill kits should be readily available in case of accidental spillages. For further guidance please visit <http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

If waste material is to be used for construction purposes, the activity must be registered with Natural Resources Wales. For further information please contact the local Environment Team at [WrexhamFlintshireEnvironmentTeam@cyfoethnaturiolcymru.gov.uk](mailto:WrexhamFlintshireEnvironmentTeam@cyfoethnaturiolcymru.gov.uk)

Any movement of waste material must be accompanied by a waste transfer notes in order to comply with the Waste duty of Care regulations.

We refer you to our [website](#) for further advice.

### Protected Species

Our records show there may be protected species on / in the vicinity of the site. Wrexham Industrial estate and its environs is considered to be of national importance for the great crested newt. Additional ecology features of the Wrexham Industrial Estate include its butterfly interest.

In our view, the proposals will need to consider protected species issues including great crested newt, which has been recorded within 150m of the boundary of the proposed solar farm. We would therefore expect the design of the solar farm to include a specific ecology area targeted at the conservation of GCN.

The covering letter by Corylus confirms that the application will be accompanied by Preliminary Ecological Assessment/Ecological Impact Assessment and surveys. We advise liaison with the LPA ecologist to discuss and agree the full scope of any surveys required.

We also note the southern, substation compartment is included in the red line of the proposed P/2020/0363 (Sesswick Way MARCHWIEL - Glass house with packing facility and offices, energy centre, recovery plant and reservoirs). This application is currently subject to Appeal and our advice included a detailed long-term site management plan and post - construction monitoring of no less than 25 years.

We refer you to our [website](#) for further advice.

## Protected Site – SAC River Catchment

Our advice is given on the understanding that there will be no new foul drainage requirements arising from the proposal.

We note the application site is within the catchment of the River Dee and Bala Lake Special Area of Conservation (SAC). As you are aware, on the 21<sup>st</sup> January 2021, we published an evidence package outlining phosphorus levels for all river SACs across Wales. As part of this package, we issued a [Planning Position Statement](#), in which we advised that any proposed development that might increase the amount of phosphate (or phosphorus) within a river SAC catchment could lead to damaging effects to the SAC. Therefore, such proposals should be screened through a Habitats Regulations Assessment (HRA), to determine whether they are likely to have a significant effect on the SAC.

However, the application as submitted is unlikely to increase the amount of phosphorus entering the catchment. Therefore, we are satisfied that the proposal is not likely to have a significant effect on the River Dee and Bala Lake SAC.

### 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.

Yours sincerely,

**Joy Evans**

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





**Planning**

**Landscape**

**Architecture**

**Hydrology**

**Ecology**