

MYNYDD FFORCH DWM WIND FARM

Flood Consequence Assessment

Prepared for: Naturalis Energy Developments Ltd

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Appendix A: Proposed Development Layout

1.0 Introduction

SLR Consulting (SLR) has been appointed by Naturalis Energy Developments Ltd (“the Client”) to prepare a Flood Consequence Assessment (FCA) for the construction and operation of up to 6 wind electricity generating turbines, a solar photovoltaic array and associated infrastructure located approximately 6km to the east of Neath and 4km to the south of Resolven on land at and adjacent to Mynydd Fforch Dwm.

This FCA has been prepared by SLR Consulting Ltd under the direction of a Technical Director in Hydrology who specialises in flood risk and associated planning matters.

1.1 Site Location

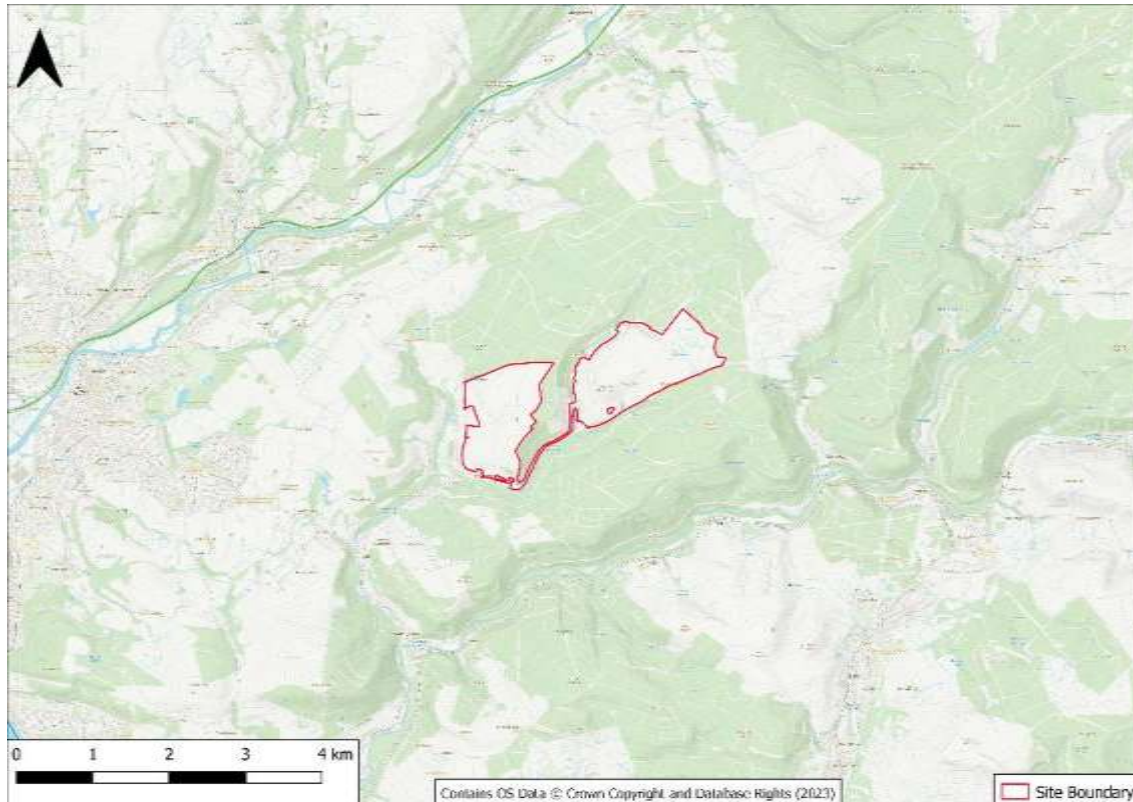
The site is centred around National Grid References (NGR): SS 82507 97701 and SS 80769 97523 and currently comprises of pastureland, plantation and open county. The site comprises of two main parcels of land, one on the north east boundary of Tonmawr at Mynnydd Blaenafon (MB) and the other to the east of this parcel at Mynydd Fforch Dwm (MFD).

The site boundary encompasses an area of approximately 287ha. The site is bound to the north by the Pelenna Forest and more dense forestry to the south. Woodland and pastureland bound the site to the east, as well as adjacent wind farms at Pen y Cymoedd and Fynnon Oer.

Tonmawr bounds the site to the south west / west. Fforch Dwm road routes through the south of the site providing a direct route from MB and Tonmawr to MFD. A plan detailing the site location is shown below in Figure 1-1.

A mine water treatment plant bounds the MFD area of the site to the south west at Pelenna house, before discharging into the Afon Pelenna which flows adjacent to the southern boundary of the MB area. The MB area is also bound to the west by numerous mine water treatment plants which are fed by groundwater springs off the adjacent topographic slope.

Figure 1-1
Site Location Plan



1.2 Development Description

As well as the permanent infrastructure of the proposed development, temporary works areas will also be used during the construction phase of the wind farm and solar farm. The development proposals, which are assessed in this FCA, include:

- Six wind turbines and associated crane pads, laydown areas and turning heads;
- Upgraded and new access tracks;
- Temporary construction compounds (TCC);
- Substation compounds; and
- Solar farm array panels with associated equipment.

An indicative plan showing the location of all elements of the proposed development is included at Appendix A.

1.3 Background and Aims

The aim of the FCA is to advise the planning application for the proposed development in relation to flooding consequences and outline:

- the potential for the development to be impacted by flooding;
- the impacts of the works associated with establishing the development on flooding; and
- the proposed measures which could be incorporated to mitigate any identified risk.

The report has been produced in accordance with Planning Policy Wales (PPW)¹ and its associated Technical Advice Note 15 (TAN15)². Reference has also been made to the Neath Port Talbot County Borough Council (NPTCBC) Strategic Flood Consequence Assessment (SFCA)³.

With reference to the indicative Development Advice Map⁴ produced by Natural Resources Wales (NRW), some elements of the development proposals are noted to be within Zone C2, which is defined as areas of the floodplain which are without significant flood defence infrastructure. With reference to TAN15, a Justification Test is required to be met for proposed new development in areas considered to be at risk of flooding (Zone C). The Justification Test includes consideration of acceptability of consequences for the works in Zone C, to indicate that the development can take place.

An extract of the Development Advice Map (DAM) is provided at Figure 2-1 and the classification system is discussed at Section 2.1.

Recent advice from NRW confirms that when undertaking assessments, the Flood Map for Planning (FMfP)⁵ represents more up-to-date information for assessing flood risk and that this mapping should be used instead of the DAM mapping. This assessment therefore refers to DAM flood zoning in the context of TAN15 and the Justification Test but uses the FMfP mapping to assess flood risk.

1.4 Sources of Information

This report has been produced in consultation with NRW and NPTC and through reference to the following information sources:

- Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales (Welsh Government, 2022);
- UK Climate Projections 2018 (UKCP18);
- Flood Consequences Assessments: Climate change allowances. (Welsh Government, September 2021);
- Local Flood Risk Management Strategy (NPTCBC, 2013);
- NRW Development Advice Map and Flood Map for Planning (NRW, 2022);
- Open-source LiDAR data, 2m DTM (NRW, 2022);
- Planning Policy Wales (PPW) (Welsh Government, 2021);
- Technical Advice Note 15 (TAN15): Development and Flood Risk (Welsh Assembly Government, 2004);
- NPTCBC Local Development Plan 2011-2026, Strategic Flood Consequence Assessment – Stage 1 & 2, September 2014; and
- Technical Advice Note 15: Development, flooding and coastal erosion – consultation document (Welsh Government, January 2023)

1 Planning Policy Wales Edition 11, Welsh Government. February 2021

2 Technical Advice Note 15: Development and Flood Risk to Planning Policy Wales, Welsh Assembly Government, 2004

3 Neath Port Talbot County Borough Council Local Development Plan 2011-2026, Strategic Flood Consequence Assessment – Stage 1 & 2, September 2014

4 Natural Resources Wales, Long Term Flood Risk Maps (accessed October 2022)
<https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en>

5 Natural Resources Wales, Flood Map for Planning (accessed October 2022)
<https://flood-map-for-planning.naturalresources.wales/>

2.0 Site Suitability

The overarching aim of TAN15 is to ensure that new development is “directed away from Zone C and towards suitable land in Zone A, otherwise to Zone B, where river or coastal flooding will be less of an issue”.

2.1 Development Advice Map

TAN15 defines three Development Advice Zones (A, B, and C), which are shown in Figure 1 of TAN15 and summarised in Table 2-1. Table 2-1 describes the composition and use of these zones to control and manage development.

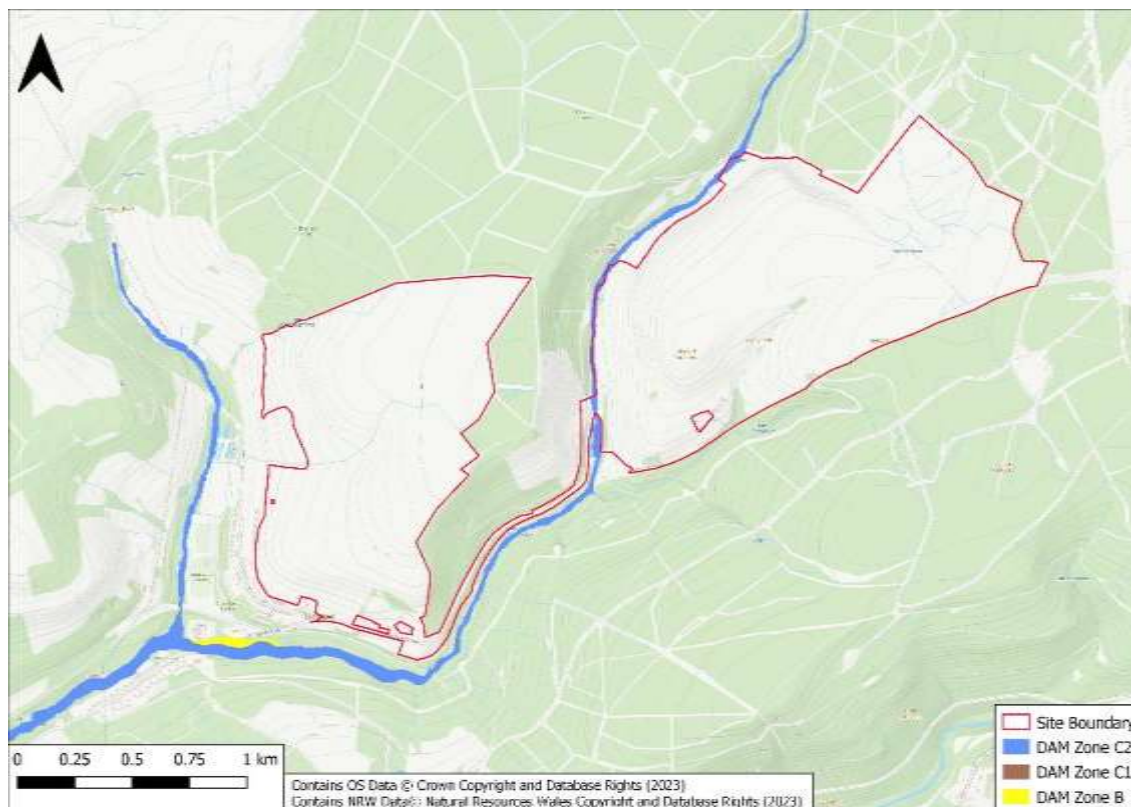
Table 2-1: Development Advice Zones

Zone	Sub-zone	Description of Zone	Use within the precautionary framework
A		Considered to be at little or no risk of fluvial or tidal/coastal flooding	Used to indicate that justification test is not applicable and no need to consider [fluvial or tidal/ coastal] flood risk further
B		Areas known to have been flooded in the past evidenced by sedimentary deposits	Used as part of precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further
C		Based on Environment Agency/ NRW extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences
	C1	Areas of the floodplain which are developed and served by significant infrastructure, including flood defences	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences
	C2	Areas of the floodplain without significant flood defence infrastructure	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered

Source: Planning Policy Wales TAN15, accessed March 2023

The DAM indicates the extents of the Development Advice Zones in Wales. The proposed development contains land classed as Zones A, B and C (see Figure 2-1) which are discussed below at Section 2.2.

Figure 2-1
Extract of the Development Advice Map



2.1.1 Updated planning guidance

The existing version of TAN15 was issued in 2004 and a review of the original guidance was carried out in 2017. At the time of reporting, new guidance is expected to be implemented in June 2023, which will follow the submission of the Mynydd Fforch Dwm application for planning consent. Planning guidance with respect to these proposals will remain under TAN15 in its current form. Following recent advice from NRW, it is not expected that changes to the planning guidance will have a significant impact on how the project proceeds.

2.2 Planning Policy

The Planning Policy Wales¹ ensures that flood risk is taken into account at all stages in the planning process and that development is sustainable.

The NPTCBC Local Development Plan (2011-2026)⁶ does not contain any planning policy specific to Flood Risk, however the following paragraphs summarised below provide guidance with regard to the planning application:

- Paragraph 5.5.13. Drainage systems should be designed to ensure that developments have no detrimental effects on the water environment or on food risk. Normally this will involve the use of Sustainable Drainage Systems (SuDS) techniques.
- Paragraph 5.3.127 Proposals will need to demonstrate that it would not cause any unacceptable impacts to the environment and the amenity of local residents or communities. Particular regard will be given to the potential impact on landscape, nature conservation and wildlife interests of the site and adjoining land, pollution or disturbance to ground or surface water supply or drainage, areas of historical, cultural and archaeological importance, the likely generation of pollution or contamination, flooding and food

⁶ Local Development Plan (2011-2026), Neath Port Talbot County Borough Council, Adopted January 2016, https://www.npt.gov.uk/media/7321/ldp_written_statement_jan16.pdf?v=20170727124344

risk, access and traffic generated to and from the site, and the potential for noise, dust and vibration arising from the methods of working.

It is envisaged that the points covered in Paragraph 5.3.127 will be clarified within the Geology, Hydrology, Hydrogeology and Peat ES Chapter.

2.3 Flood Risk Classification

Works that are within Zone C2 of the DAM and which will require assessment are shown on Figure 2-1 and are limited to the proposed new crossing over Nant Blaenpelenna where the access route enters the MFD area of the site.

Remaining areas of the application boundary are within the DAM Zone A which is land considered to be at little or no risk of fluvial or coastal/ tidal flooding.

2.3.1 Proposed new crossing of Nant Blaenpelenna

The new access track proposed across the Nant Blaenpelenna will be a replacement of an existing crossing for the track to Fforch Dwm Farm. The crossing point is upstream of Pelenna House, in an area designated as DAM Zone C2. It is considered as part of this application that a new bridge crossing would be installed. The bridge would be suitably sized so that there is no restriction to flow within the watercourse that would be greater than the restriction presented by the current crossing structure. The bridge will also be designed such that it does not reduce the floodplain storage or increase flood risk upstream of the crossing. Whilst flooding of the crossing could occur during extreme storms, this is not considered to have detrimental impacts. The design of a new crossing would be subject to Ordinary Watercourse Consent approval by NPTCBC.

2.4 Flood Risk Vulnerability

It is acknowledged in TAN 15 that only less vulnerable development should be considered in Zone C2 subject to application of the justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered for this Zone. It should therefore be emphasised that the areas for development are wholly within DAM Zone A (i.e., the lowest risk flood zone) apart from the proposed replacement bridge crossing for the Afon Blaenpelenna. The proposed crossing is considered to be a less vulnerable development type with respect to flooding.

2.4.1 Anticipated Lifetime of Development

It is envisaged that the project will have an anticipated operational lifetime of development of 35 years.

3.0 Baseline Site Appraisal

3.1 Existing Site Description

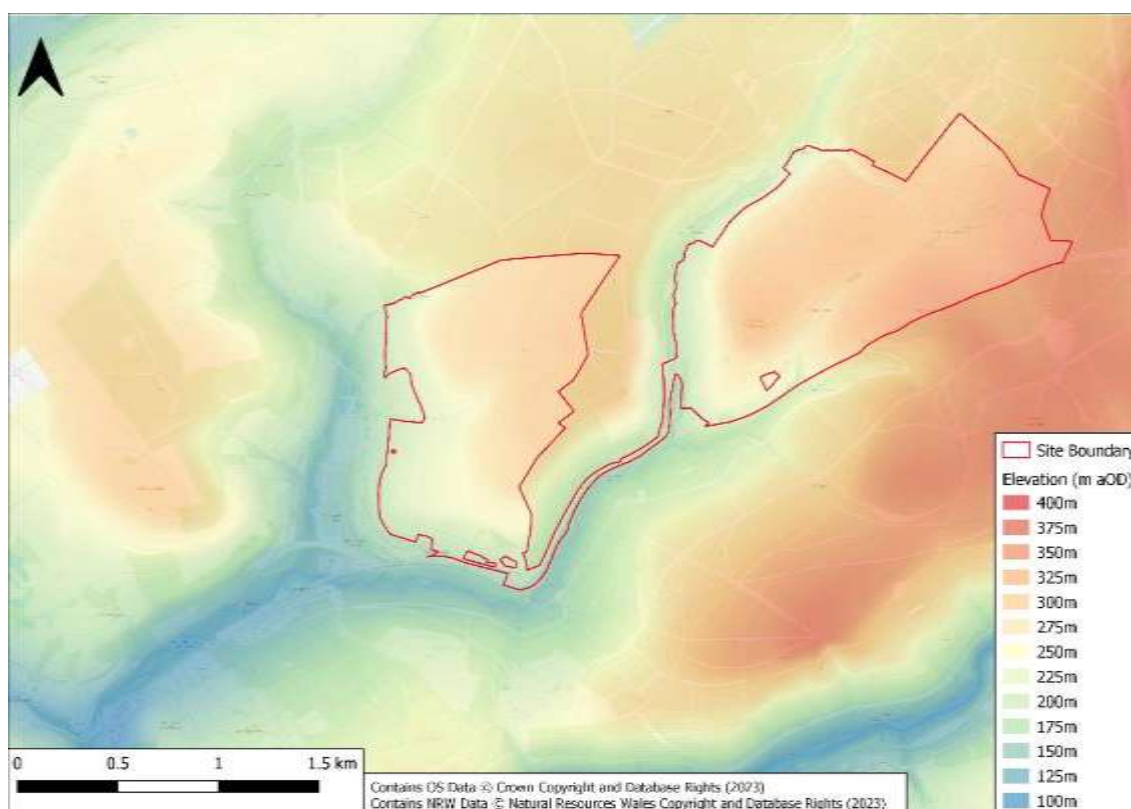
The site boundary is formed of the main energy infrastructure design areas and access routes over a total area of 287ha. The main development area (the MFD and MB Design Areas) are as identified in Section 1.1 and these areas are where the main parts of the development, such as the proposed wind turbines, solar photovoltaic array and associated ancillary infrastructure, will be located.

Land use at the existing site is largely pastureland, plantation and open countryside. Around the site, there are large areas of commercial forestry, specifically between the valleys of Vale of Neath to the north west and Afon Afan to the south. The wider land use locally is forested bands of upland between river valleys and small villages, set within small scale farmland with dispersed farms and individual dwellings throughout.

3.2 Topography

LiDAR topographic data for the site and wider area has been downloaded from the NRW open data website⁷ and is contained in Figure 3-1 and Figure 3-2.. The LiDAR Data is based off a 2m DTM (Digital Terrain Model) which is a bare earth model and thus excludes built features and vegetation.

Figure 3-1
Regional Topography

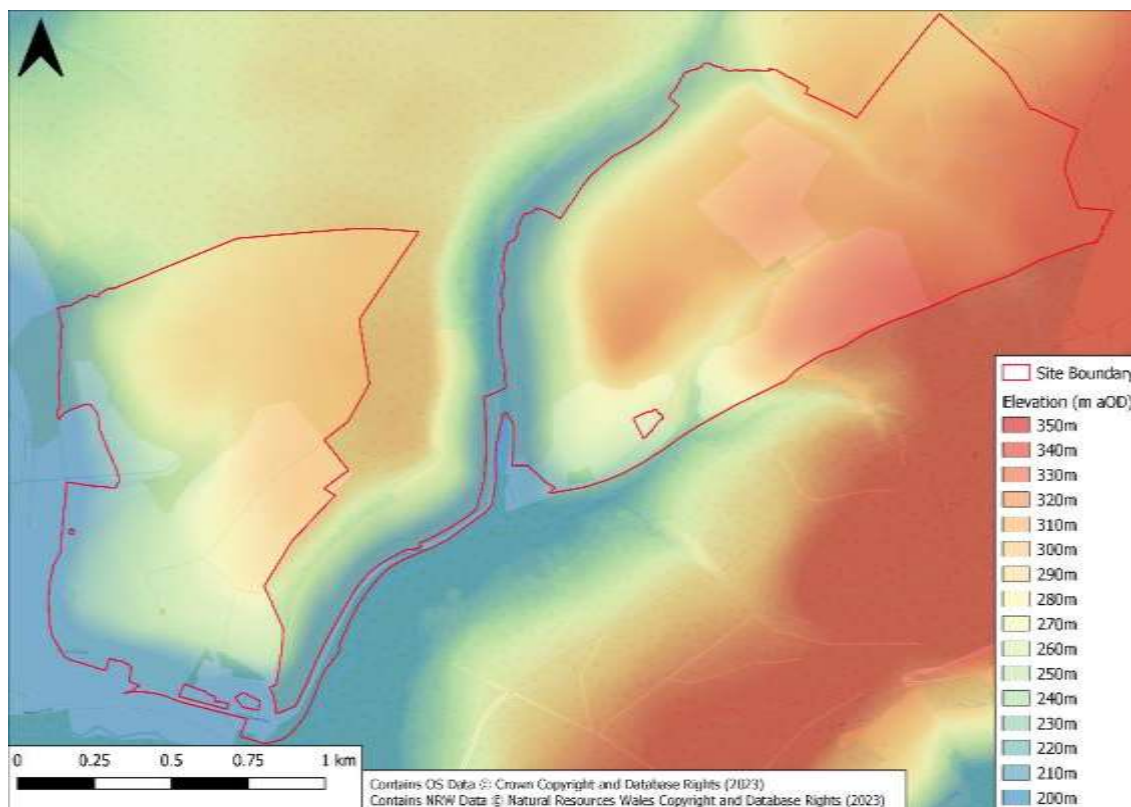


The regional topography presented in Figure 3-1 indicates the wider area is dominated by the local hydrology with steep river valley banks and slopes dropping off from plateaus of the proposed development areas. Ground levels locally vary from 373m above Ordnance Datum (aOD) to the south east of the site at the peak of Mynydd

⁷ Natural Resources Wales, Lle geoportal, <http://lle.gov.wales/Catalogue/Item/LidarCompositeDataset/?lang=en>

Nant-Y-Bar to lower than 100m aOD in the base of the Afan Valley to the south and Afon Pelenna valley to the west of the site. The site is situated across the plateau of two elevated hilltops of Mynydd Fforch Dwm to the east and Mynydd Blaenafon to the west and topography declines in accordance with river valleys locally.

Figure 3-2
Site Topography



The site topography ranges from approximately 350m aOD along the eastern boundary of the MFD area and declines away from this higher ground to the north west, west and south west to approximately 200m aOD along the Nant Blaenpelenna watercourse in the north and west of the MFD site area and 180m aOD along the Nant Fforch Dwm River at the access point to Mynydd Fforch Dwm in the west.

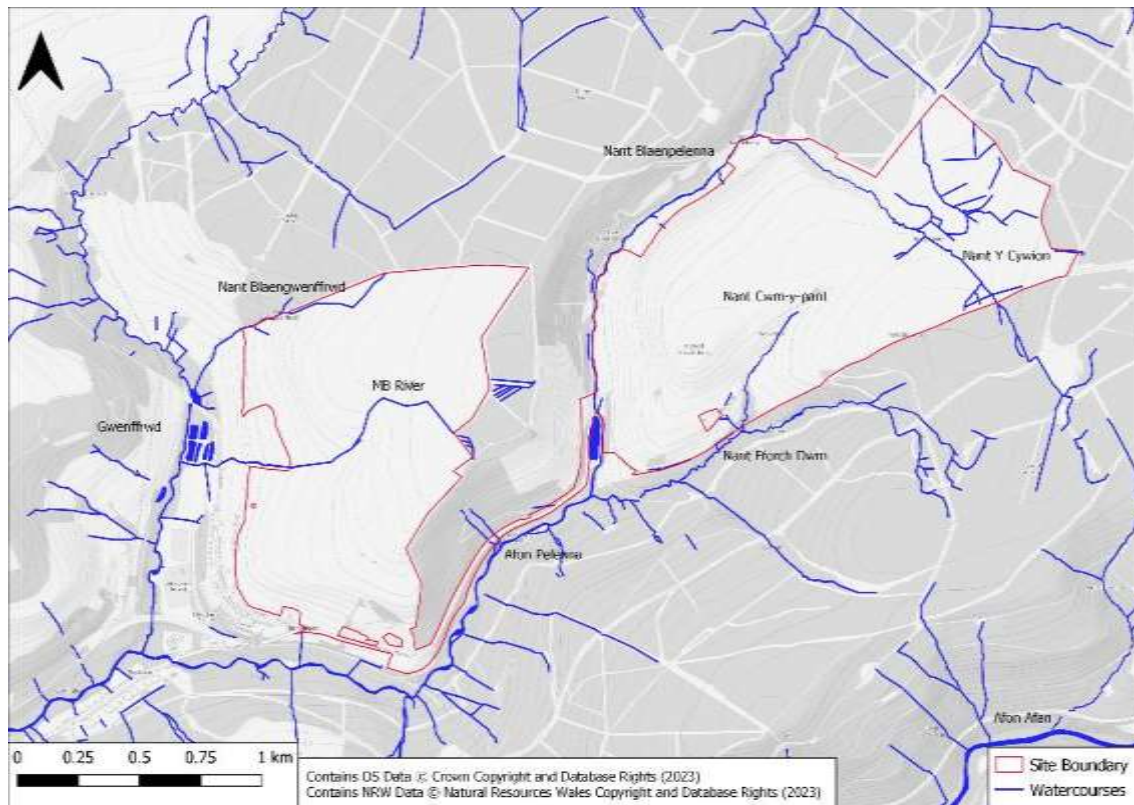
The westernmost MB development area is also situated on a hillcrest with a larger flat plateau in the north east, elevated to around 310m aOD. Ground levels fall steeply on this part of the site to the west (190m aOD) and south (155m aOD) in accordance with the Gwenffrwd valley through Tonmawr village in the west and the Afon Pelenna valley in the south.

Ground levels along the access corridor in the south which connects both main development areas slopes in line with the prevailing local topography along the Nant Blaenpelenna and the Afon Pelenna river valley from around 185m aOD at the Nant Blaenpelenna crossing to around 160m aOD at Tonmawr.

3.3 Hydrology

There are a number of hydrological features on and around the site which are identified below in Figure 3-3.

Figure 3-3
Local Hydrology



Nant Cwm-y-pant is sourced from Mynydd Fforch Dwm and flows south west through the site to discharge into Nant Fforch Dwm in the south of this area of the site. Using topographic data, Nant Cwm-y-pant is estimated to drain a catchment area of around 0.4km² which comprises land on the site.

Nant Fforch Dwm flows from north east to south west, to the south of the application site boundary and joins the Afon Pelenna at a confluence at Pelenna house, some 200m south west of the Mynydd Fforch Dwm site area. The Nant Fforch Dwm channel at the confluence drains a catchment area⁸ of around 1.86km² comprised mainly of commercial forestry and agricultural land use. The channel is formed of a number of small tributaries which convey flows northwards from the hill at Mynydd Nant-y-bar to the south of the site.

The Afon Pelenna is formed by the confluence between Nant Fforch Dwm and Nant Blaenpelenna at Pelenna House. At this point the channel drains a total catchment area⁸ at around 8.06km². The Afon Pelenna flows largely in a south westerly direction away from the site to discharge into the Afon Afan in Pontrhydyfen, c.3.7km south west of the site.

Nant Blaenpelenna flows south west and south along the northern and western boundary of Mynydd Fforch Dwm towards Pelenna House. At Pelenna House, the channel drains an upstream catchment area⁸ of approximately 6.07km² of predominantly commercial forestry and pastureland. The channel is formed from numerous small tributary channels, including Nant y Cywion; and Nant Twynpumerw, sourced at Twyn Pumerw 1km north east of the site. The Nant Blaenpelenna drains all of the north and western areas of Mynydd Fforch Dwm. At Pelenna House, there is a piped offtake from the river into a mine water treatment plant. Flows into the treatment plant are discharged through a series of cascading wetlands to improve the water quality (especially in relation to iron oxide seeping into the channel from groundwater caused by previous mining activity) and then its discharged back into the river system following the final tier of treatment.

⁸ Flood Estimation Handbook Web Service, UK Centre for Ecology and Hydrology, <https://fehweb.ceh.ac.uk/Map>

Nant y Cywion is a network of small channels which lie within the peatland area of Mynydd Fforch Dwm on the plateau to the east. Flows from Nant y Cywion flow into the Nant Blaenpelenna at a confluence 470m north of the site. the small network of channels drains a catchment area⁸ of 0.69km² of largely peat or peaty soils. Some of the channel network on the upland plateau (approximately 0.2km²) drains north east away from the site and Nant y Cywion.

Nant Blaengwenffrwd flows in a westerly direction along the northern boundary of Mynydd Blaenafon into Gwenffrwd. At the site, the channel drains a catchment area⁸ of 0.54km² which largely comprises the peat and peaty soils at the top of the plateau. There is an additional unnamed tributary of Gwenffrwd which discharges into Gwenffrwd at a confluence approximately 290m west of the site. At this location, Gwenffrwd drains a total catchment area⁸ of 5.36km². Prior to the confluence with the unnamed tributary, there is an offtake from Gwenffrwd to a mine water treatment plant (Whitworth Treatment System Neath). Treated flows then discharge back into the watercourse downstream.

Gwenffrwd flows southwest from its source along Michaelston forest before heading south east toward Mynydd Blaenafon. At its closest point, the channel is 205m west of the site and receives flows from on site tributaries before discharging into the Afan Pelenna at Tonmawr, 470m south west of the site, draining a total upstream catchment area⁸ of 6.06km².

Afan Afan at its closest point, is 1.5km south of the site draining a total upstream catchment area⁸ of 53.58km². The channel flows in a south westerly direction and joins with the Afan Pelenna at Pontrhydyfen to make a large Afon Afan system. This larger channel flows south west from Pontrhydyfen discharging into Swansea Bay at Port Talbot some 9.2km south west of the site.

3.4 Geology

The National Soils Resources Institute, Soilsdapes website⁹, identifies “Slowly permeable wet very acid upland soils with a peaty surface” on the peaty upland plateaus in the eastern areas of both Mynydd Fforch Dwm and Mynydd Blaenafon, “Freely draining acid loamy soils over rock” on the valley sides and steep slopes with “Very acid loamy upland soils with a wet peaty surface” across the remainder of the site.

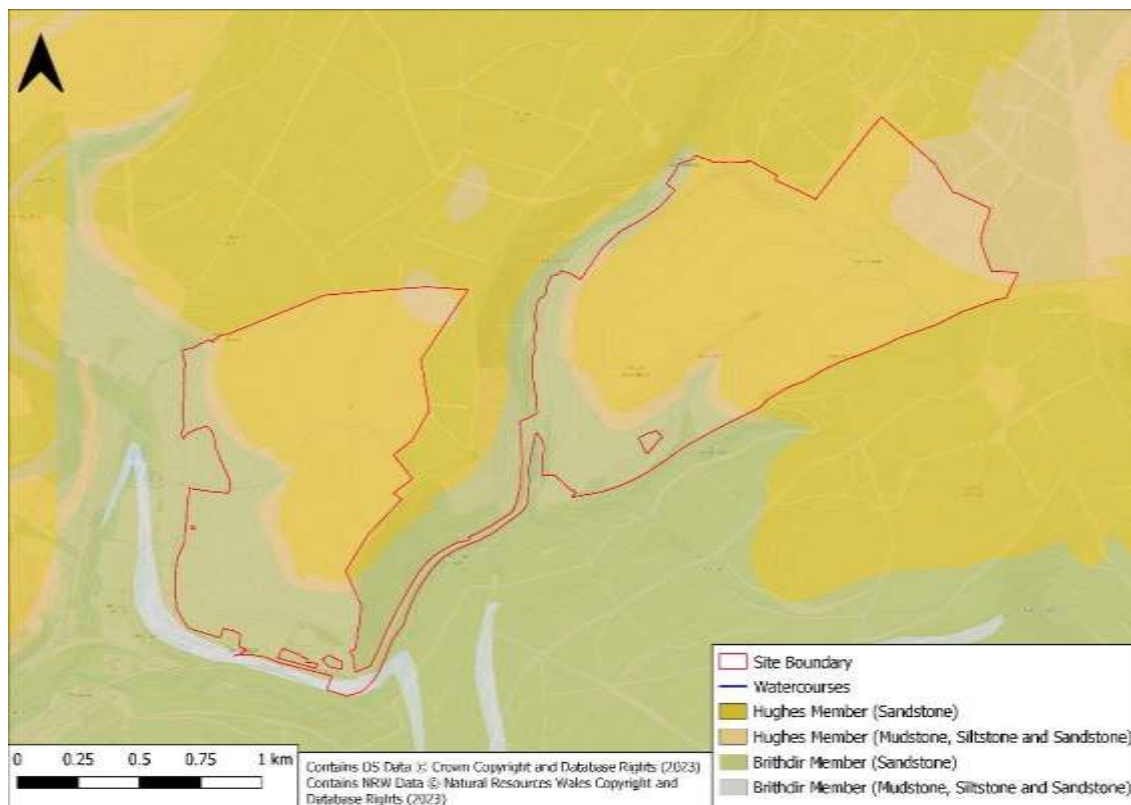
British Geology Survey (BGS) mapping¹⁰ indicates that the site is underlain by bedrock geology of the Hughes Member (Sandstone), Hughes Member (Mudstone, Siltstone and Sandstone), Brithdir Member (Sandstone) and Brithdir Member (Mudstone, Siltstone and Sandstone). The main development areas are located on Hughes Member (Sandstone) and while the bedrock geology locally is typically sandstone, the Mudstone and Siltstone outcrops of both formations have limited lateral extent across the site and wider area.

This data is presented below in Figure 3-4.

9 Soilsdapes online soil map, Cranfield Soil and Agrifood Institute, <http://www.landis.org.uk/soilsdapes/>

10 BGS Geology of Britain Viewer, available at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Figure 3-4
Bedrock Geology Locally



BGS mapping of superficial deposits indicates peat is present on the plateau of Mynydd Fforch Dwm to the east and on the peak of the hilltop, however based on intrusive ground investigations (peat probing), peat and peaty soils are present on the eastern plateaus of both Mynydd Fforch Dwm and Mynydd Blaenafon, generally no deeper than 1.0m in depth. Peat is not present on the hill top of Mynydd Fforch Dwm in the west of this site area, as indicated in the BGS superficial geology mapping.

Superficial deposits of Glacial Till/Diamicton are noted on the site along the valleys of Nant Fforch Dwm and Afon Pelenna to the south as well as Gwenffrwd to the west. Glaciofluvial Deposits of sand and gravel are found at the north of Mynydd Fforch Dwm for a small extent at Nant Blaenpelenna

3.5 Hydrogeology

The Hughes Member (Sandstone), Hughes Member (Mudstone, Siltstone and Sandstone), Brithdir Member (Sandstone) and Brithdir Member (Mudstone, Siltstone and Sandstone) are designated as a 'Secondary A' Aquifers¹¹, 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".

With regards to superficial geology, the Glaciofluvial deposits are also classified as Secondary A whereas the Glacial Till / Diamicton is classified as a Secondary (undifferentiated) aquifer. These are defined as "Secondary aquifers where it has not been possible to attribute A or B status and the layer has been designated both a minor and non-aquifer in different locations to due to the variability of the rock type". Given that the underlying bedrock is sandstone, we would expect the Till to comprise of large amounts of sand eroded through glacial processes.

11 Magic Map, DEFRA, <https://magic.defra.gov.uk/MagicMap.aspx>

The peat deposits are classified as an unproductive aquifer, defined as “layers that have negligible significance for water supply or baseflow to rivers, lakes and wetlands”.

A review of NRW data indicates the site is not located in a Source Protection Zone (SPZ).

We would expect that regionally, groundwater levels are in continuum with the local watercourses downgradient of the site along the Afon Afan corridor. There are however a number of groundwater springs on and around the site which are captured and discharge into mine water treatment plants for passive treatment of flows, prior to discharge into the river network. These springs are likely to be associated with shallow groundwater flows within the upper peat or peaty soil deposits.

3.6 Existing Drainage Regime

The site is currently undeveloped and therefore surface water runoff from the site will discharge to ground or pass overland in line with the local topography into watercourses locally. It is anticipated that the peat and peaty soil areas store a large amount of incidental rainfall, reducing the amount or rate of runoff from these areas. Infiltration is likely to occur in the more permeable layers however during extreme rainfall we would expect most runoff to discharge into the local watercourse networks.

The site is rural in nature and therefore we would not expect that significant drainage is provided for Fforch Dwm Road or the existing farmyard. Irrespective of this, we would expect that some runoff from these developed areas of the site is routed (via a sewerage/piped network) or flows overland into the Nant Fforch Dwm and Afon Pelenna to the south.

3.6.1 Justifying the Location of Development

As the proposed development areas of the site lie in DAM Zone A, Section 9 of TAN 15 states that no justification of the location of development needs to be made.

3.6.2 Acceptability Criteria

in line with the Acceptability Criteria (Section 9 of TAN 15), the proposed development must not result in an increase in flooding elsewhere. Trackside drainage or drainage of crane pad areas would be implemented in accordance a construction management plan, using principals to safeguard the local environment. This would ensure the proposed development did not result in an increase in flood risk elsewhere.

4.0 Assessment of Flooding Consequences

TAN15 sets out how the potential consequences of a flooding event should be assessed and provides guidance on the technical requirements for undertaking such an assessment. The key objectives of the assessment relevant to the proposals are to develop a full appreciation of:

- the consequences of flooding on the development;
- the consequences of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1%; and
- the assessment can be used to establish whether appropriate mitigation measures can be incorporated within the design of the development to ensure that development minimises risk to life, damage to property and disruption to people.

This section of the FCA outlines an assessment of potential flooding consequences of the proposed development in line with TAN15.

The NRW FMfP has been used to assess the risk of flooding taking into account the effect of existing flood defences. Flood defences reduce, but do not completely remove the chance of flooding as they can be overtopped or fail.

4.1 Potential Sources of Flooding

There are a number of potential sources of flooding and these include:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal sources;
- Flooding from surface water or pluvial flooding;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

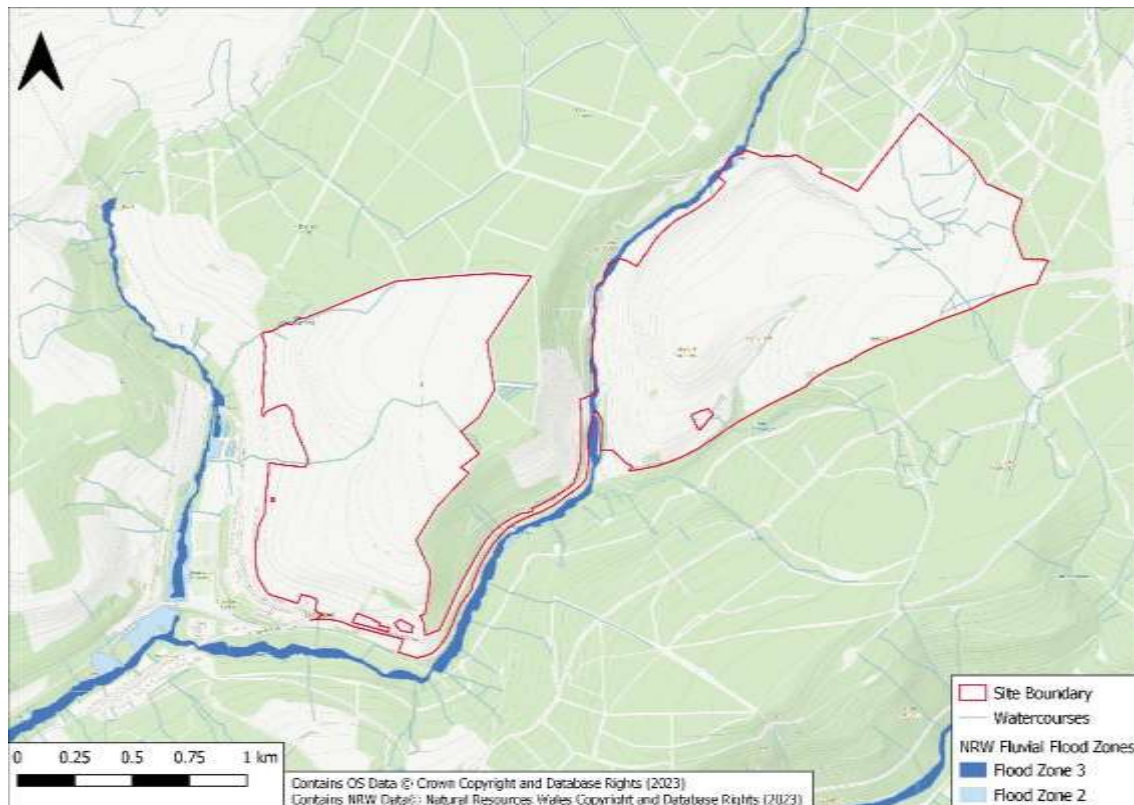
The flood risk from each of these potential sources is discussed below.

4.1.1 Flooding from Rivers or Fluvial Flooding

With reference to the Development Advice Map (Figure 2-1 and the FMfP, the majority of the site is in DAM Zone A or Flood Zone 3 on the FMfP and therefore located outside an area having less than 0.1% Annual Exceedance Probability (AEP) or less than 1 in 1,000-year annual probability of flooding from fluvial sources. An extract of the FMfP is included at Figure 4-1 below.

There are some minor areas considered to be in DAM Zone C2 (Flood Zone 3) associated with the Nant Blaenpelenna along the northern and western boundary of Mynydd Fforch Dwm. This flood flow pathway is associated with the immediate Nant Blaenpelenna watercourse corridor and intersects with the existing track bridge crossing for the access to Fforch Dwm Farm.

Figure 4-1
Extract of NRW Flood Map for Planning – Fluvial Flood Risk



Upgrades to this access track are proposed, including a new watercourse crossing to replace the existing bridge structure at this location. The new structure will be subject to an Ordinary Watercourse Consent application which would be considered by NPTCBC and will therefore be of an appropriate design to ensure that an appropriately sized crossing is used. The crossing will need to ensure that flood risk and flow conveyance are considered as part of the design process. As this is not a permanently manned site, flooding of the road for short periods of time is not considered significant.

Other smaller watercourses and field drains on the site will be intersected by proposed tracks and infrastructure and will be subject to Ordinary Watercourse Consent applications. All new crossings or culverts will be designed to ensure flood risk is minimised and flow conveyance is maintained for design events.

Proposed mitigation

The Nant Blaenpelenna is not within and NRW defined Flood Warning area however the catchment does drain to an area which is served by NRW flood warnings (the River Afan at Port Talbot). Advance warning of a flood event potentially affecting the Nant Blaenpelenna crossing would potentially be available, using this downstream warning area as an indicator. The manager of the works (principal contractor during construction and site operator during the operational phase) will be required to sign up to the flood warning service to receive a phone call or text message in the event of a potential flood threat to the Nant Blaenpelenna. This will be secured within the Construction Method Statement (CMS) which forms part of the outline Construction Environmental Management Plan (CEMP). Any personnel due to work at the site could then be contacted and alerted to the potential for flooding at the crossing. This procedure would be confirmed in the site-specific working method statements.

Site storage of fuel and chemicals shall be away from the crossing point. Similarly, no refuelling shall take place on Fforch Dwm Road, downgradient of the crossing point. During construction of the new crossing, small plant will be taken from the works area refuelled at a designated fuelling area established on higher ground.

Flooding from rivers or fluvial sources is very low and not considered further.

4.1.2 Flooding from the Sea or Tidal Sources

All watercourses local to the site are fluvial in nature. Similarly, the site is elevated above 160m aOD and is remote from the coast (c.9km away).

Flooding from the sea or tidal flooding is considered negligible and not considered further.

4.1.3 Flooding from Surface Water or Pluvial Flooding

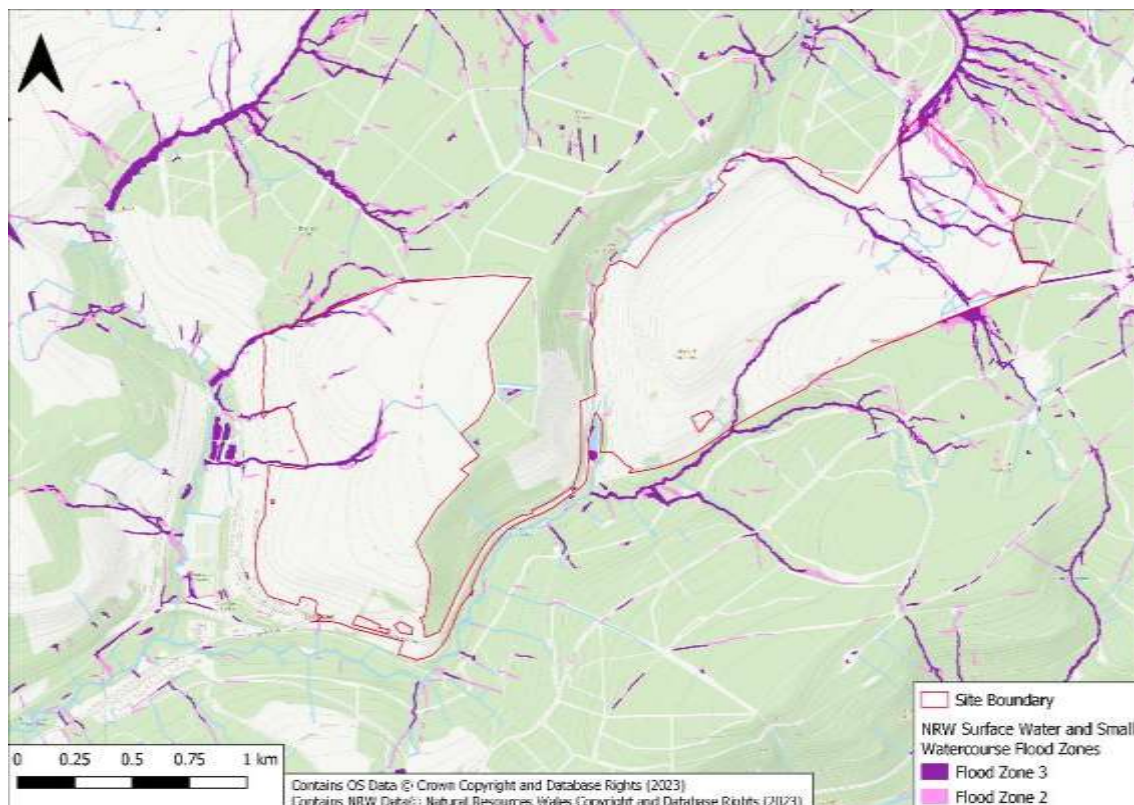
It is understood that rainfall onto the site which is not infiltrated to ground or stored within the soils on site will flow overland in line with the topography into watercourses locally. As the small watercourses are not inherently modelled within the Development Advice Map or the FMfP on fluvial/tidal flood risk, we would potentially expect elevated areas of surface water flood risk within these smaller channels during extreme rainfall.

The detailed surface water flood risk maps published by NRW in the FMfP, shows areas potentially at risk of flooding from surface water. The surface water flood risk categories are defined as:

- Flood Zone 2: Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change;
- Flood Zone 3: Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

An extract of NRW flood risk for Surface Water and Small Watercourses is provided in Figure 4-2.

Figure 4-2
Extract of NRW Flood Map for Planning – Surface Water and Small Watercourses



Mapping contained in Figure 4-2 supports the conceptual understanding confirming that the majority of the site is at very low risk of flooding with areas of elevated risk confined to existing river and drainage channels on and around the site. Typically, this flow would be confined to the existing channels. In areas where proposed access tracks may progress over surface water flow pathways noted in Figure 4-2, a sufficiently sized culvert will be provided to ensure flows can progress downstream.

A new area of access track is proposed adjacent to the surface water flow pathway at Mynydd Fforch Dwm which is routed south west towards Nant Fforch Dwm. Culverts / drainage will be required beneath the track to allow upgradient flows to discharge beneath the road into the channel / valley feature rather than causing flooding at the road.

Proposed mitigation

The risk of flooding during construction will be mitigated through the implementation of appropriate temporary drainage and a drainage strategy in line with principles set out in a CEMP. Any drainage channels temporarily crossed or disrupted due to construction activities will be reinstated at the completion of works. With these measures in place, it is considered that the construction activities will pose a low risk to flooding elsewhere.

The risk of flooding at the Nant Blaenpelenna crossing and at all other smaller watercourse crossings required across the site for site access and which will be used during the operational phase of the development will be managed through appropriate design. All proposed new crossings will be subject to Ordinary Watercourse Consent from NPTCBC.

Other than where crossings are required, all working areas, refuelling and storage areas will be set back from water features by at least 10 m where practicable.

On this basis, and the implementation of appropriate flow conveyance features, surface water flood risk to the site is assessed to be low and not considered further.

4.1.4 Flooding from Groundwater

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. This form of flooding is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

As detailed in Section 3.2, the areas of the site to be developed are generally elevated across topographic peaks to above 250m aOD and are raised above local river valley features (i.e., not low lying). We would expect that groundwater levels downgradient of the site are in continuum with the Afon Afan. British Geological Survey Borehole Record SS79NE167, located 400m west of the site in Tonmawr and elevated to around 136m aOD, struck water 18m below ground level, giving a groundwater elevation of around 118m aOD and therefore significantly below site ground levels. In the event the water table did rise considerably, groundwater seepage would emerge through springs and progress away from the site in line with local topography. Any subsurface development (cable routing etc) at lower elevations would be adequately cased /lined to mitigate any impacts of groundwater interference.

Flood risk from groundwater is low and is not considered further.

4.1.5 Flooding from Sewers and Mains

The site is located in a rural setting, and it is unlikely there is significant sewerage and mains infrastructure present. We would expect that any infrastructure would be routed beneath road networks locally. These are typically elevated below the proposed development areas of the site and therefore a failure in either system would not result in significant flooding at proposed development areas. Similarly, if this infrastructure was present on the access road (Fforch-Dwm) onto the site, flows would flow in line with local topography to the

west but would likely progress off the road in a southerly direction into watercourses locally. Shallow overland flows may occur, but we would not expect severe flooding.

Flood risk from sewers and mains is low and is not considered further.

4.1.6 Flooding from Reservoirs, Canals and Other Artificial Sources

With Reference to NRW FMfP, the site is not in an area considered at risk of flooding following the failure of a reservoir.

There are no canals or other artificial sources in the vicinity of the site which could potentially post a flood risk.

Flood risk from reservoirs, canals and other artificial sources is negligible and is not considered further.

4.1.7 Flooding from Infrastructure Failure

The site is not afforded protection from flood defences, nor are there any sewerage pumping stations or other significant infrastructure within the vicinity of the site which may pose a flood risk.

Flood risk from Infrastructure Failure is therefore very low and is not considered further.

4.1.8 Event Exceedence and Residual Risk

The mitigation measures proposed as part of the construction phase works will be set out in a CEMP which will include a Construction Method statement (CMS) and drainage strategy. An outline version of the CEMP is provided with the planning application and is considered appropriate to mitigate against any residual risks or event exceedence scenarios.

4.2 Flood Risk Summary

A summary of the potential sources of flooding and the flood risk arising from them is presented in Table 4-1.

Table 4-1
Potential Sources of Flooding

Potential Source of flooding	Flood Risk at the Site
Rivers or Fluvial Flooding	Very Low
Sea or Tidal Flooding	Negligible
Surface Water or Pluvial Flooding	Low
Groundwater	Low
Sewers	Low
Reservoirs, Canals and other Artificial Sources	Negligible
Infrastructure Failure	Low

The flood screening assessment indicates that the site is not a significant risk of flooding. This is provided that measures to allow flows to progress downstream are implemented, as detailed above.

5.0 Climate Change

In September 2021, NRW¹² issued updated guidance on the impacts of climate change on flood risk and drainage to be used in flood consequence assessments in support of relevant planning applications. This guidance sets out peak rainfall intensity, sea level, peak river flow, and extreme wave heights are all expected to increase in the future as a result of climate change.

The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios.

Concerns relating to offshore wind speed and wave height are only of relevance in contexts that are in direct proximity to the open coast or other large open bodies of water. There are also no associated risks of tidal flooding from nearby waterbodies. The main areas of risk to the proposed development site relate to blocking surface water flow pathways, which would require suitably sized built infrastructure to allow flows to progress downstream.

On this basis, only the changes to peak fluvial flow at the Nant Blaenpelenna crossing and changes to peak rainfall intensity are relevant at the site to represent the potentially heightened risk of river and surface water flooding respectively.

Design of the new Nant Blaenpelenna crossing will take into consideration potential increases in fluvial flow due to climate change as part of the design process and will be reviewed as part of the Ordinary Watercourse Consent application.

5.1.1 Peak Rainfall Intensity

Table 2 of the NRW Climate Change Guidance is reproduced below in Table 5-1. This shows the anticipated changes in peak rainfall intensity for use in small catchments. Both the central and upper estimates should be assessed to understand the range of impact. As a minimum, development proposals should be assessed against the central estimate to inform design criteria.

Table 5-1
Change to extreme rainfall intensity (compared to a 1961-90 baseline)

Applies Across all of Wales	Total potential change anticipated for 2020s (2015-2039)	Total potential change anticipated for 2050s (2040-2069)	Total potential change anticipated for 2820s (2070-2115)
Upper Estimate	10	20	40
Central Estimate	5	10	20

As per NRW guidance, any culvert installed on the site should be designed with a 10% climate change uplift for peak rainfall intensity to ensure flow conveyance features are suitable throughout the development 35-year lifetime.

5.1.2 Peak Fluvial Flows

Table 1 of the NRW Climate Change Guidance is reproduced below in Table 5-2. This indicates that for the central estimate during the anticipated lifetime of development (35 years), a 25% uplift is required to assess peak fluvial flows.

¹² Flood Consequences Assessments: Climate Change allowance. Natural Resources Wales, September 2021

Table 5-2
Extract of Table 1 Peak river flow allowances by river basin district
(using 1961 to 1990 baseline)

River Basin District	Total potential change anticipated by 2020s	Total potential change anticipated by 2050s	Total potential change anticipated by 2080s
West Wales			
Upper end estimate	25%	40%	75%
Change Factor / Central estimate	15%	25%	30%
Low end estimate	5%	10%	15%

6.0 SURFACE WATER MANAGEMENT

There will potentially be an increase in hardstanding associated with works within the proposed development. Within the temporary compound work areas, turbine laydown areas and the substation location the made ground or topsoil will be stripped and a capping layer of crushed stone introduced to provide an area of hardstanding. Some areas may include small temporary buildings or welfare facilities and storage areas may include impermeable bunding. Surface water around turbine foundation earthworks will also require management.

There will therefore be a small potential increase in the rate and volume of surface water runoff generated at the construction work areas. Given the size and lifetime of the works areas, any increase in surface water runoff associated with these activities is considered to be relatively minimal and short-term. The immediate surrounding land is greenfield, on which no buildings or development are located, therefore the consequence of relatively small increases in overland flow onto these areas is considered to be minimal.

All work areas will be required to control surface water within the application boundary and this control will be likely to include attenuation and settlement areas to manage and treat surface water runoff. Discharges to the water environment will be at controlled rates and will be either to infiltration or through discharge of clean water to local surface water features.

All temporary work areas will be fully reinstated following completion of construction activities.

Principles for control of surface water in all work areas will be defined within the CEMP.

A permanent surface water drainage plan will be developed as part of the final CEMP for permanent infrastructure that will remain on site following construction.

7.0 JUSTIFICATION TEST

Under TAN15 there is a requirement for any proposed work within Zone C to be subject to the Justification Test, including acceptability of consequences. Criteria that must be demonstrated in order to justify development within DAM flood Zone C, are as follows:

- i) Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,
- ii) Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
and,
- iii) It concurs with the aims of PPW and meets the definition of previously developed land; and,
- iv) The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in TAN15 found to be acceptable.

With regard to part i) of the Justification Test, it is considered that the minor works areas within Zone C (new crossing over Nant Blaenpelenna) are justified as this is a critical element for the construction phase of Mynydd Fforch Dwm Wind Farm, which is classified as a Development of National Significance (DNS). This is a project which provides the opportunity to contribute towards meeting the UK Government's targets for generating energy from a renewable source.

With regard to part iii) of the Justification Test, the works within Zone C are related to the installation of the new Nant Blaenpelenna crossing. This is a replacement structure for an existing crossing and will be designed to meet the criteria necessary for Ordinary Watercourse Consent. Following the works there will be no change to existing land use.

With regard to part iv) of the Justification Test, this FCA has assessed the potential consequences of a flooding event for the works areas. The acceptability criteria for proposed aspects of the development within DAM flood Zone C are set out in Appendix 1, Part C of TAN15 and are reproduced in Table 7-1 below. An extra column has been added to demonstrate how the proposed development meets the criteria.

Table 7-1: Acceptability criteria for proposed developments within Zone C

Acceptable consequences for nature of use	Evidence to demonstrate how the proposed development meets the criteria
Flood defences adequate	Not applicable
Agreement for construction and maintenance costs secured	Not applicable.
Occupiers aware of flood risk	Through signing up to the downstream Flood Warning Service, site users will be made aware of the potential flood risk at the crossing.
Escape/evacuation routes present; Effective flood warning provided; Flood emergency plans and procedures	The manager of the construction works would sign up to the flood warning service to receive a phone call or text message in the event of a potential flood threat to the working areas. Any personnel due to work at the site could then be contacted and alerted to the flood risk.

Flood resistant design	The new crossing will be a bridge structure and will be designed to be water compatible. If necessary, the design will include consideration of overtopping of the bridge deck during high flow conditions.
No increase in flooding elsewhere	Given that the proposed crossing will be a replacement structure and that the design will be subject to Ordinary Watercourse Consent, there is no risk of increased flooding from this work.

8.0 Conclusions

SLR Consulting (SLR) has been appointed by Naturalis Energy Developments Ltd (“the Client”) to prepare a Flood Consequence Assessment (FCA) for the construction and operation of up to six wind electricity generating turbines, a solar photovoltaic array and associated infrastructure located approximately 6km to the east of Neath and 4km to the south of Resolven on land at and adjacent to Mynydd Fforch Dwm.

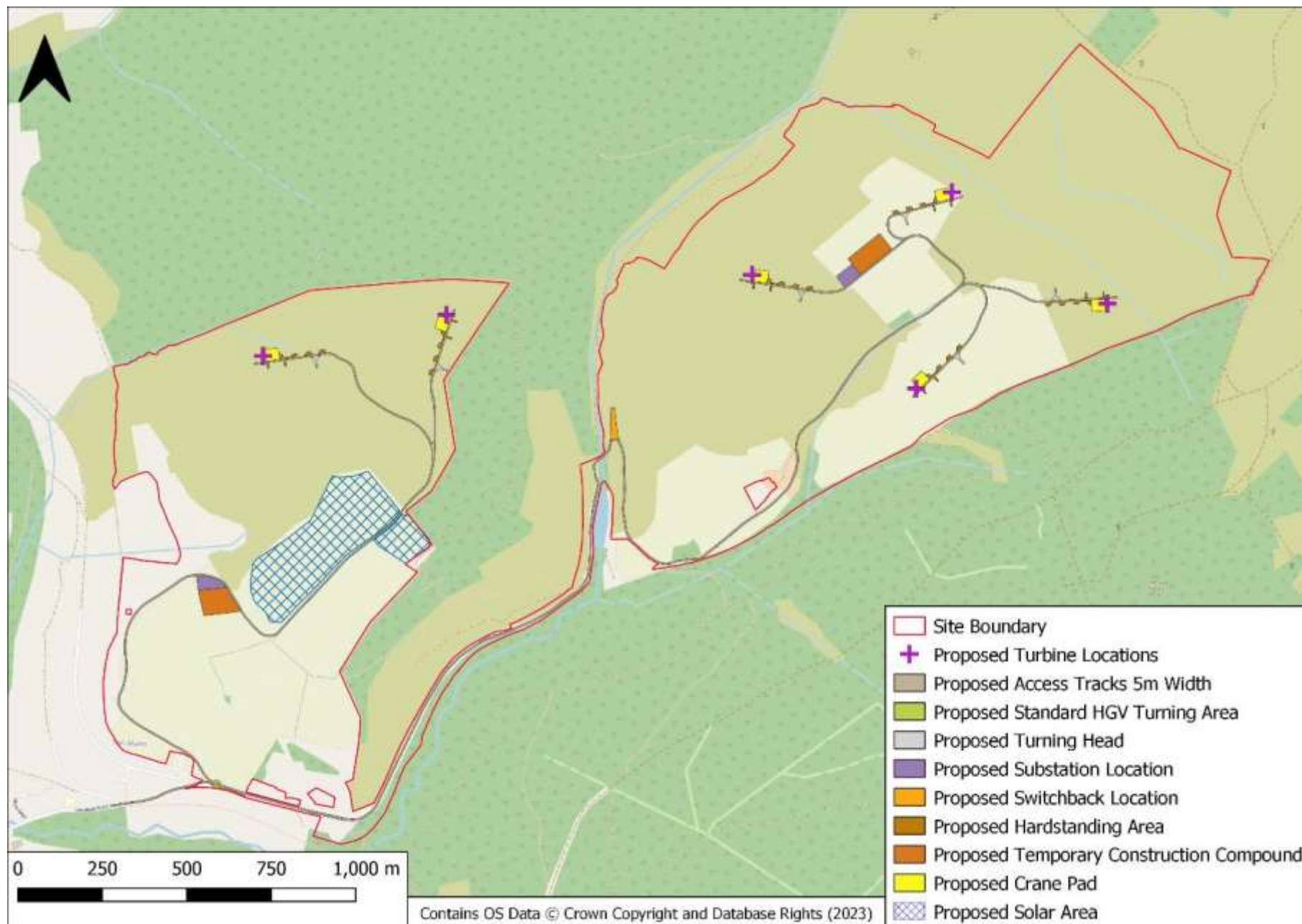
A flood consequence assessment, detailed in Section 4.0, has reviewed the flood risk posed by a range of potential sources and concluded that there are no significant risks of flooding at the site. A new crossing of the Nant Blaenpelenna is the only works within Zone C as defined by the Development Advice Map and this construction will not increase flood risk elsewhere. Therefore, no further justification for the development is required.

The main operational risk, of which sufficient mitigation will be installed to prevent, arises from blockage of surface water and drainage channel pathways due to the proposed development (access tracks etc). Consequently, sufficiently sized culverts will be required on site for flow conveyance preventing surface water flood risk or significant alterations to local hydrology. In line with NRW guidance, the design of the conveyance structures should consider a 10% uplift in peak rainfall intensity to accommodate for changes impacting from climate change.

The proposed development will not increase runoff rates from the site which would inherently impact flood risk elsewhere. Any drainage which is required for access tracks or the crane pads will be provided for in a CEMP using environmental best practice.

APPENDIX A

Proposed Development Layout



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