



Development • Planning • Environment

AFONEITHA ROAD, PENYCAE

FLOOD CONSEQUENCES ASSESSMENT

Final Report v1.0

August 2018

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Flood Consequences Assessment
Final Report v1.0

Client: Mr D. W. Roberts

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This document has been prepared solely as a Flood Consequences Assessment for Mr D. W. Roberts. This report is confidential to Mr D. W. Roberts and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by Mr D. W. Roberts for the purposes for which it was originally commissioned and prepared.

Contents

	Page
Signature Sheet	i
Contents	ii - iii
List of Tables, Figures & Appendices	iv
1 INTRODUCTION	1
1.1 Purpose of Report	1
1.2 Structure of the Report.....	1
2 PLANNING POLICY AND GUIDANCE	2
2.1 NATIONAL Planning Policy and Guidance.....	2
2.2 Local Planning Policy and Guidance	3
2.3 Consents	3
2.4 Relevant Documents	4
3 SITE DETAILS AND PROPOSED DEVELOPMENT	5
3.1 Site Location	5
3.2 Existing and Proposed Development.....	5
3.3 Waterbodies in the Vicinity of the Site	5
3.4 Ground Conditions	6
3.5 Site Levels	6
3.6 Access and Egress	6
4 REVIEW OF FLOOD RISK.....	7
4.1 Flood Zone Designation	7
4.2 Historical Records of Flooding.....	8
4.3 Fluvial Flood Risk – Afon Eitha	8
4.4 Flood Risk from Reservoirs, Canals and Other Artificial Sources	10
4.5 Flood Risk from Groundwater	11
4.6 Flood Risk from Surface Water	12
5 FLOOD RISK MITIGATION MEASURES.....	14
5.1 Flood Mitigation	14
5.2 Flood Risk Elsewhere.....	14
5.3 Access and Egress	14
5.4 Flood Defence Consent	14
6 SURFACE WATER MANAGEMENT	15
7 SUMMARY	16

8	RECOMMENDATIONS.....	17
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List of Tables

Table 1:	1 in 1,000 Annual Probability Event Modelled Max Flood Data	9
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List of Figures

Figure 1:	Site Location	5
Figure 2:	Development Advice Map	7
Figure 3:	Natural Resources Wales Flood Risk Map	8
Figure 4:	Modelled Node Locations	9
Figure 5:	Afoneitha Road Bridge (Downstream Face)	10
Figure 6:	Risk of Flooding from Reservoirs Map	11
Figure 7:	Groundwater Flooding Hazard Map	12
Figure 8:	Natural Resources Wales Risk of Flooding from Surface Water	13

List of Appendices

Appendix A:	Topographic Survey
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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Mr D. W. Roberts to undertake a Flood Consequences Assessment (FCA) for the proposed development of land located off Afoneitha Road, Penycae.

This FCA has been prepared in accordance with the requirements of Technical Advice Note 15 (TAN15): Development and Flood Risk.

1.2 STRUCTURE OF THE REPORT

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Presents national and local flood risk and drainage planning policy
- Section 3** Provides background information relating to the development site, the development proposals, ground conditions and existing site access arrangements
- Section 4** Assesses the potential sources of flooding to the development site
- Section 5** Presents flood risk mitigation measures based on the findings of the assessment
- Section 6** Presents a summary of key findings
- Section 7** Presents the recommendations

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY AND GUIDANCE

2.1.1 Technical Advice Note 15; Development and Flood Risk

The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high risk areas (i.e. Zone C) only those development which can be justified should be located in such areas.

2.1.1.1 Justification Test

In accordance with Paragraph 6 of TAN15 for the Justification Test to be passed it must be demonstrated that:

- 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 Planning Policy Wales (PPW) and meets the definition of previously developed land (PPW Fig 2.1); 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 sections 5 and 7 and appendix 1 found to be acceptable.

2.1.1.2 Surface Water Drainage

TAN15 provides an overview of the requirements for the management of surface water to ensure that development does not increase flood risk at the site or elsewhere.

Paragraph 8.3 of TAN15 states “...the aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce runoff where possible. It is accepted that there may be practical difficulties in achieving this aim”.

2.1.2 Welsh Government

2.1.2.1 Climate Change Allowances for Planning, August 2016

A consultation letter¹ and supporting guidance note² issued by Welsh Government in August 2016 sets out allowances for climate change for use in FCAs submitted in support of planning applications.

¹ Welsh Government consultation letter 23 August, 2016 (Ref: CL-03-16)

² <https://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>

When considering new development proposals, TAN15 states that it is necessary to take account of the potential impact of climate change over the lifetime of development. The Welsh Government guidance note states that 'residential development is assumed to have a lifetime of 100 years while a lifetime of 75 years is assumed for non-residential developments. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change'.

The climate change allowances detailed within the Welsh Government guidance note are informed by latest available information on climate change projections and allowances are provided for different epochs (periods) of time over the next century.

The guidance note should be applied to planning applications (full, outline and reserved matters) submitted from 1 December 2016.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

Wrexham County Borough Councils (WCBC) Unitary Development Plan (UDP) was the adopted development plan from 1996 to 2011. Although the adopted UDP expired at the end of 2015, it remains the adopted development plan for the county.

The following policies are relevant in respect of flood risk:

Policy EC12 - Development and Flood Risk

Development (including the raising of land) within the defined flood plains will only be permitted if it:-

- a) Would not be subject to an unacceptable risk of flooding on-site; and/or
- b) Does not result in unacceptable risk of flooding on or off-site; and/or
- c) Does not adversely affect flood management or maintenance schemes

Policy EC13 – Surface Water Run-off

Development which would results in an unacceptable adverse impact on the water environment due to additional surface water run-off will not be permitted.

WCBC is currently preparing a Local Development Plan (LDP) which is due to replace the current adopted UDP in spring 2019.

2.3 CONSENTS

An Environmental Permit for Flood Risk Activities may be required from Natural Resources Wales (NRW) for work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

Further information can be found by visiting the NRW website³.

³ <https://naturalresources.wales/apply-for-a-permit/flood-risk-activities/flood-risk-activity-permits-information/?lang=en>

If the location of an activity is on any watercourse that lies within an Internal Drainage District (IDD) an application will need to be made to NRW for a Flood Risk Activity Permit.

Ordinary Watercourse Consent may be required from the lead local flood authority for work to an ordinary watercourse..

Undertaking activities controlled by local Byelaws (made under the Water Resources Act 1991) also requires the relevant consent.

2.4 RELEVANT DOCUMENTS

The FCA has been informed by the following documents:

- Preliminary Flood Risk Assessment (PFRA), WCBC, November 2017
- Flood Risk Management Plan (FRMP) 2016-2021, WCBC, July 2016
- Local Flood Risk Management Strategy (LFRMS), WCBC, April 2013

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The site is located off Afoneitha Road, Penycae at Ordnance Survey National Grid Reference SJ 288 452 as shown in **Figure 1**. The application site is approximately 0.19 hectares (ha) in area.

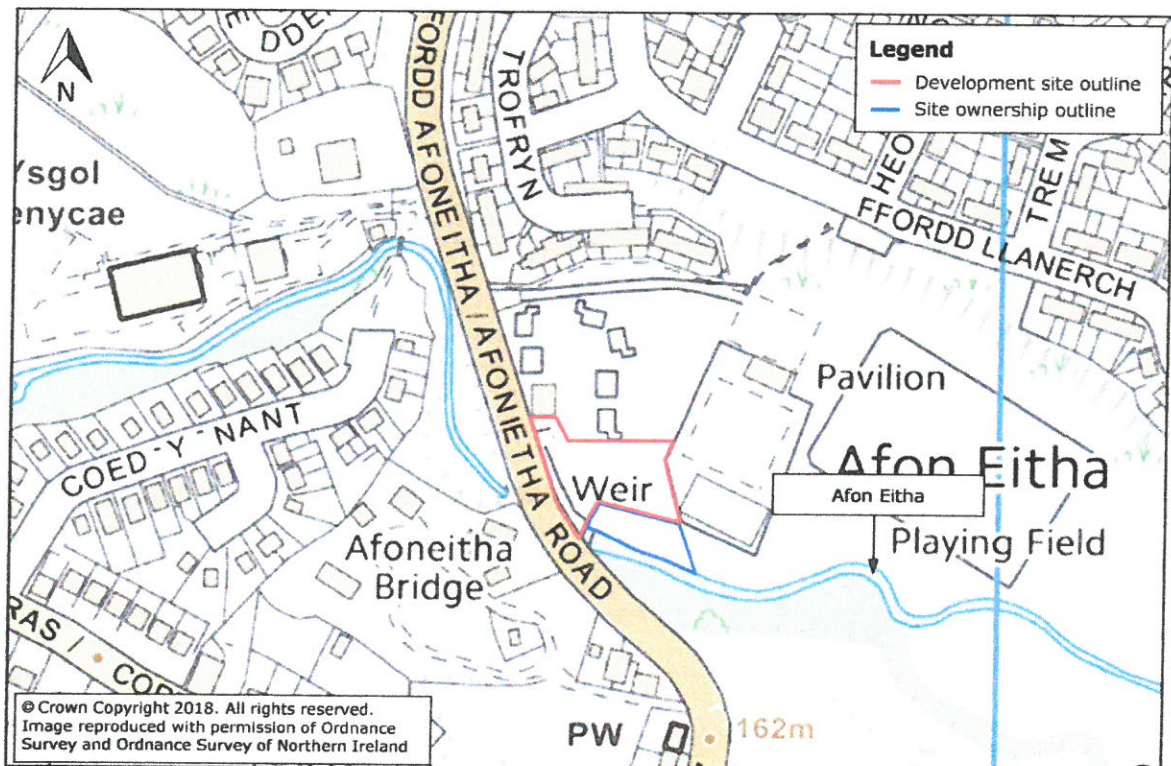


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The existing site consists of undeveloped greenfield land.

Proposals are for an outline planning permission for the construction of less than ten residential dwellings.

TAN15 classifies residential development as 'highly vulnerable' land use⁴.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

Afon Eitha is located to the south of the site, flows in an easterly direction and is classified as a 'main river'.

⁴ TAN15, Figure 2

3.4 GROUND CONDITIONS

According to the Soilscares maps produced by the National Soils Research Institute⁵, soil conditions at the site and within the surrounding area are described as 'loamy and clayey soils with impeded drainage'.

British Geological Survey (BGS) borehole records⁶ located approximately 160 m north-east of the site indicate that the underlying ground conditions comprise an initial layer of clay followed by sand and mudstone. Groundwater was not encountered.

3.5 SITE LEVELS

A topographic survey of the site has been undertaken by PM Surveys UK Ltd and is provided in **Appendix A**.

The application site has levels in the region of 159.90 to 161.50 metres Above Ordnance Datum (m AOD), with levels generally falling to the south-east. The land to the south of the site (within the ownership boundary) comprises levels in the region of 157.50 to 153.80 m AOD.

Bed levels of the Afon Eitha adjacent to the site are shown to be between 152.80 to 152.60 m AOD.

3.6 ACCESS AND EGRESS

Existing access is provided via Afoneitha Road to the west which has levels in the region of 160.40 to 160.70 m AOD in the vicinity of the site.

⁵ Soilscares www.landis.org.uk/soilscares/

⁶ www.bgs.ac.uk/data/boreholescans/home.html, Ref: SJ24NE38/R, SJ24NE38/B

4 REVIEW OF FLOOD RISK

4.1 FLOOD ZONE DESIGNATION

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. TAN15 defines flood zones as follows⁷:

- **Zone A.** Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- **Zone B.** Areas known to have been flooded in the past evidenced by sedimentary deposits.
- **Zone C.** Based on the NRW extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two zones:
 - **Zone C1.** Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
 - **Zone C2.** Areas of the floodplain without significant flood defence infrastructure.

The Flood Zones are currently shown on the NRW Flood Risk Map and do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

4.1.1 Development Advice Map

According to the latest Development Advice Map the vast majority site is located within Zone B with a small portion of the south-western corner being located in Zone C2 (**Figure 2**).

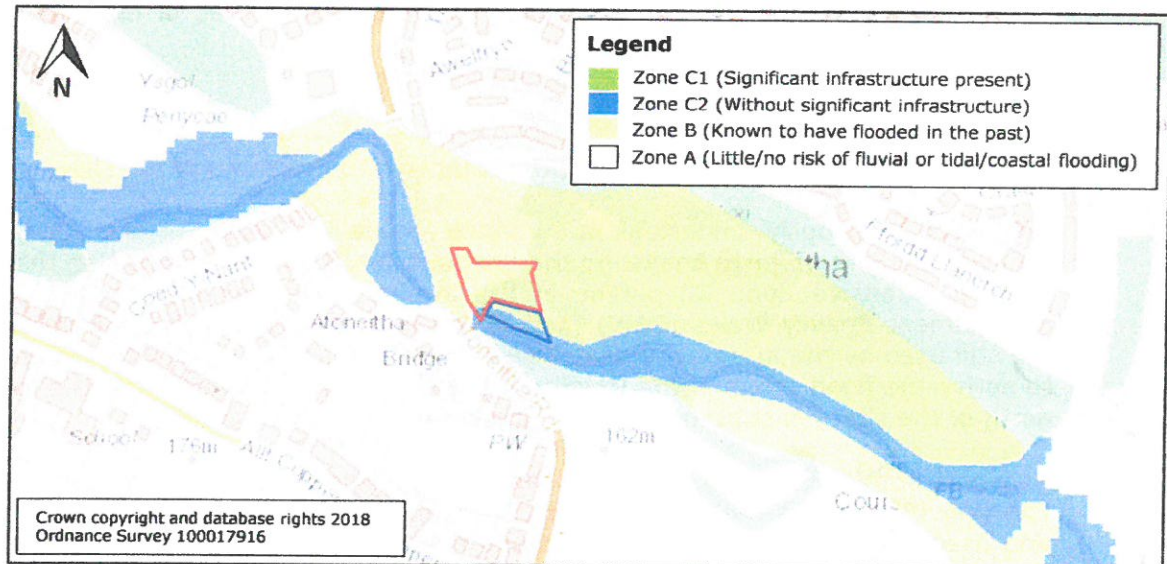


Figure 2: Development Advice Map
(Source: NRW website)

4.1.2 Natural Resources Wales Flood Risk Map

According to the NRW Flood Risk Map (**Figure 3**) the vast majority of the site is located outside the 1 in 1,000 annual probability flood outline, with a small portion of the south-western corner being located within the 1 in 100 annual probability flood outline.

⁷ TAN15, Figure 1

The site is not shown to be located within an area benefiting from flood defences, which supports the partial Zone C2 classification.



Figure 3: Natural Resources Wales Flood Risk Map
(Source: NRW website)

4.2 HISTORICAL RECORDS OF FLOODING

According to NRW historic flood outlines⁸, there are no records of the site previously being affected by flooding.

4.3 FLUVIAL FLOOD RISK – AFON EITHA

As outlined in **Section 3.3** the Afon Eitha is located to the south of the site.

Weetwood previously undertook a hydraulic modelling study of the Afon Eitha in January 2006⁹ in order to challenge the previous Development advice Map that showed a more extensive Zone C2 outline in the locality. This was ultimately accepted by Environment Agency Wales (EAW) (now NRW) and the model outputs from that study are still used by the aforementioned Development Advice Map and NRW Flood Risk Map to derive the flood zones in the vicinity of the site. It is understood that the land to the north of the site was subsequently developed for residential purposes.

As a part of the Weetwood modelling study, a hydrological assessment was undertaken. The unit hydrograph methodology described in the Flood Estimation Handbook (FEH) was used for deriving the design flows and hydrographs, with WINFAP-FEH being used to ratify the unit hydrograph estimates. Using this method, the peak flow for the 1 in 1,000 annual probability event (used to define Zone C) was calculated to be 29.0 m³/s.

It is noted that the HEC-RAS model and the methods used to derive hydrology may now be regarded as out-dated.

⁸ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

⁹ Weetwood Hydraulic Modelling Report, dated 31 January 2006 (Ref: 513 v3 FRA)

Given the age of the previous Weetwood HEC-RAS model, the 2018 topographic survey (**Appendix A**) has been used to validate the original survey data. This identified that the two datasets were generally well synchronised.

4.3.1 Modelled Flood Levels

The previously modelled peak flood levels derived for the 1 in 1,000 annual probability event at the upstream and downstream face of the Afoneitha Road bridge (**Figure 4**) are presented in **Table 1**.

Table 1: 1 in 1,000 Annual Probability Event Modelled Max Flood Data

Modelled Node	Peak Flood Level (m AOD)
6 (upstream of bridge)	158.39
5 (downstream of bridge)	154.85

Given that the ground levels at the application site (**Appendix A**) are shown to be in the region of 159.90 to 161.50 m AOD and that the flood level downstream of the bridge is estimated to be 154.85 m AOD, the site would be expected to remain dry in the modelled 1 in 1,000 annual probability event. Moreover, the site would be between 5.05 and 6.65 m above the modelled flood level. This significant freeboard should afford sufficient confidence to offset any uncertainty relating to the age of the previous Weetwood model.

In addition, ground levels along Afoneitha Road are shown to be above 160.40 m AOD affording a 2 m freeboard above the upstream water level during a 1 in 1,000 annual probability event.

In light of the above, undertaking further modelling is not considered necessary especially in light of the small scale of the proposals.

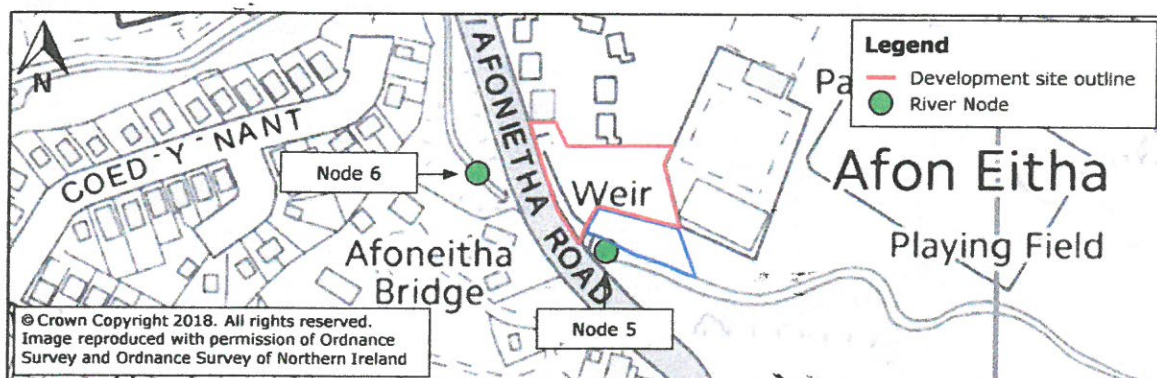


Figure 4: Modelled Node Locations

4.3.2 Bridge Blockage

The previous Weetwood modelling study did not include a blockage assessment of Afoneitha Road bridge.

It should be acknowledged that a smaller bridge structure is located approximately 130 m upstream of Afoneitha Road bridge, which would reduce the likelihood of a blockage occurring at Afoneitha Road bridge itself. In addition, the land use within the locality, particularly between the two bridges, also indicates that a significant bridge blockage would be unlikely.

Following a site visit on 10 July 2018, the bridge was clear from debris at both the upstream and downstream faces (**Figure 5**).

In the unlikely event that a significant blockage of Afoneitha Road bridge occurs an assessment of levels in **Appendix A** has been undertaken to determine where overland flow may be directed. This suggests that if floodwaters were to weir onto Afoneitha Road, this would be expected to flow to the south/south-east along the carriageway before flowing back into the watercourse downstream of the site, rather than onto the site itself.

In light of the above, the site is unlikely to be at risk of flooding from the Afon Eitha in up to a 1 in 1,000 annual probability event.

Irrespective, any residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

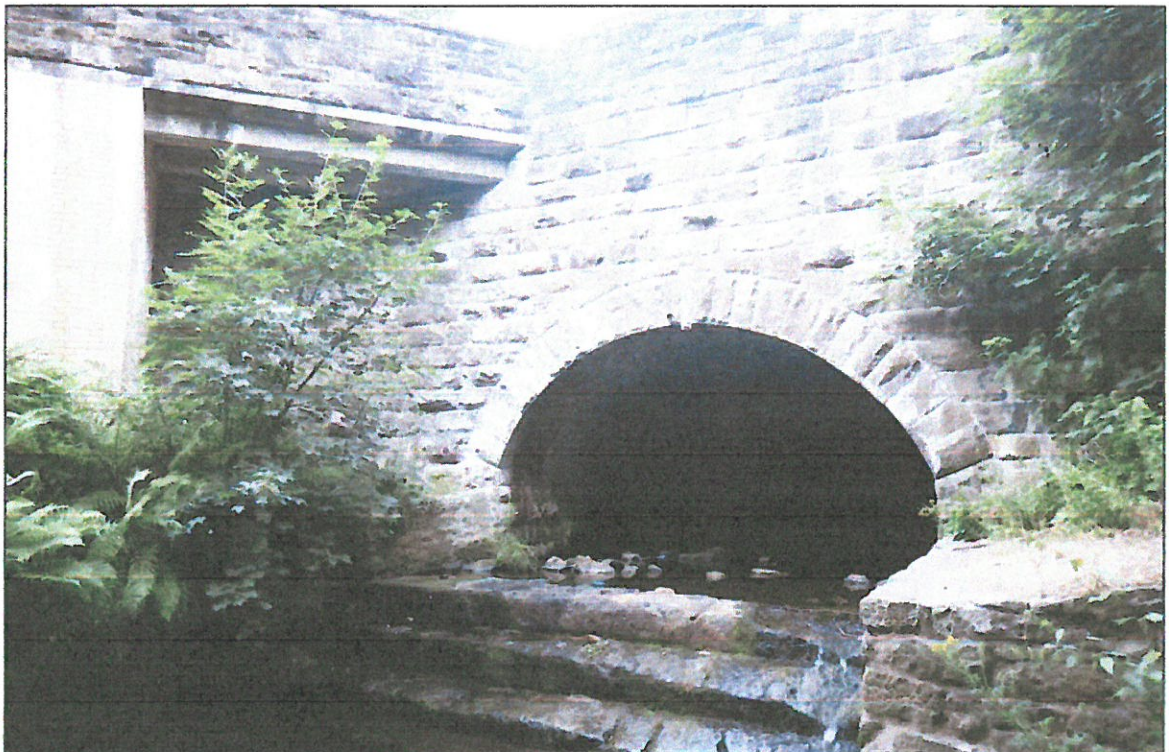


Figure 5: Afoneitha Road Bridge (Downstream Face)

4.4 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

The NRW Risk of Flooding from Reservoirs map (**Figure 6**) indicates the site may be susceptible to reservoir flooding from Penycae Top and Bottom reservoirs, with maximum flood depths expected to be between 0.3 and 2.0 m. However, reservoir flooding is extremely unlikely to happen as all large reservoirs are regularly inspected by reservoir panel engineers and essential safety work is carried out.

There is no recent history of flooding from the aforementioned reservoirs within this area. The risk of flooding from such sources is considered to be low.

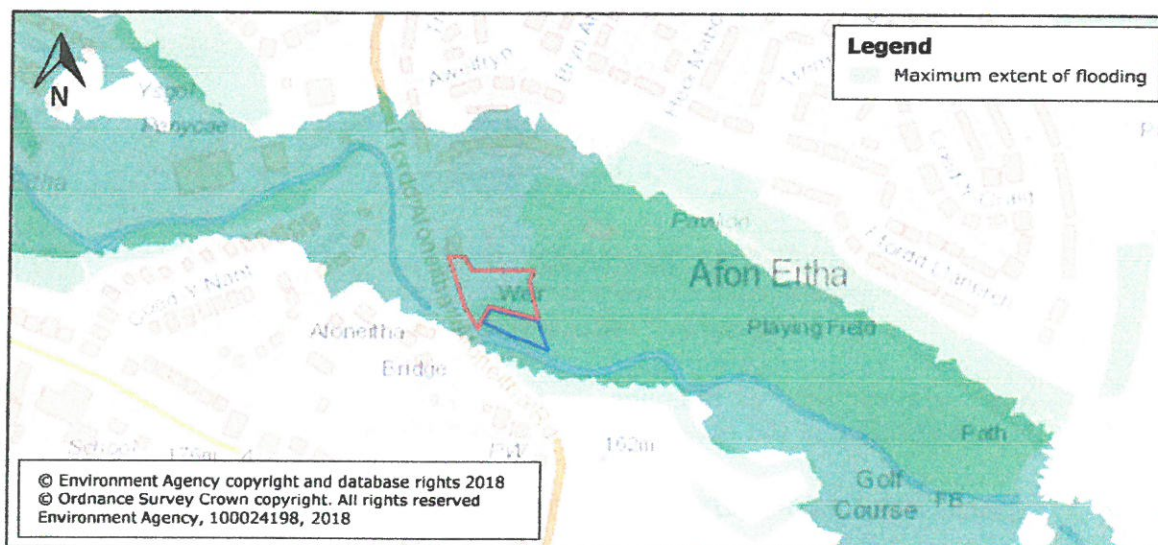


Figure 6: Risk of Flooding from Reservoirs Map
(Source: NRW website)

There are no canals or other artificial waterbodies located within the immediate vicinity of the site. The site is therefore considered to be at a low risk of flooding from reservoirs, canals and other artificial sources.

4.5 FLOOD RISK 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. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

According to the BGS Groundwater Flooding Hazard map (**Figure 7**) the susceptibility of groundwater flooding at the site is considered to be moderate to significant. However, given the local topography, which falls to the south/south-east towards the Afon Eitha, the potential for significant depths of groundwater flooding at the site itself is considered to be low.

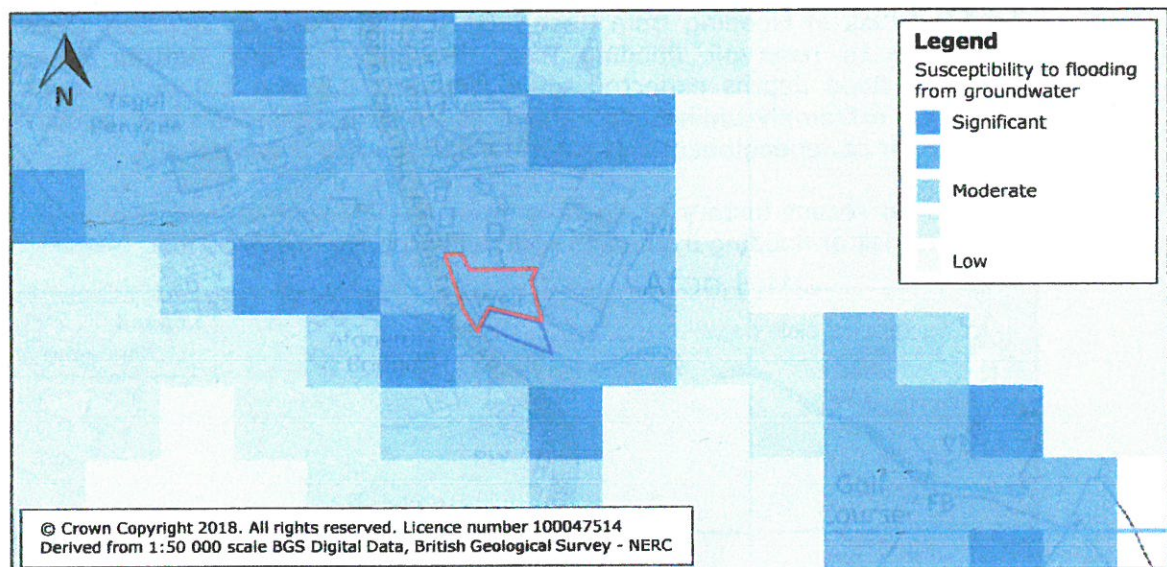


Figure 7: Groundwater Flooding Hazard Map
(Source: Findmaps)

Any residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

4.6 FLOOD RISK FROM SURFACE WATER

Surface water flooding results from rainfall-generated overland flow, before the runoff enters any watercourse or sewer, or where the sewerage/drainage systems and watercourses are overwhelmed and therefore unable to accept surface water.

Surface water flooding is usually associated with high intensity rainfall events but may also occur with lower intensity rainfall where the ground is saturated, developed or otherwise has low permeability resulting in overland flow and ponding within depressions in the topography.

The NRW Risk of Flooding from Surface Water map (**Figure 8**) indicates the site to be at very low risk.

The risk of surface water flooding at the site is assessed to be very low. However, any residual flood risk from this source will be addressed through the mitigation measures as detailed in **Section 5**.

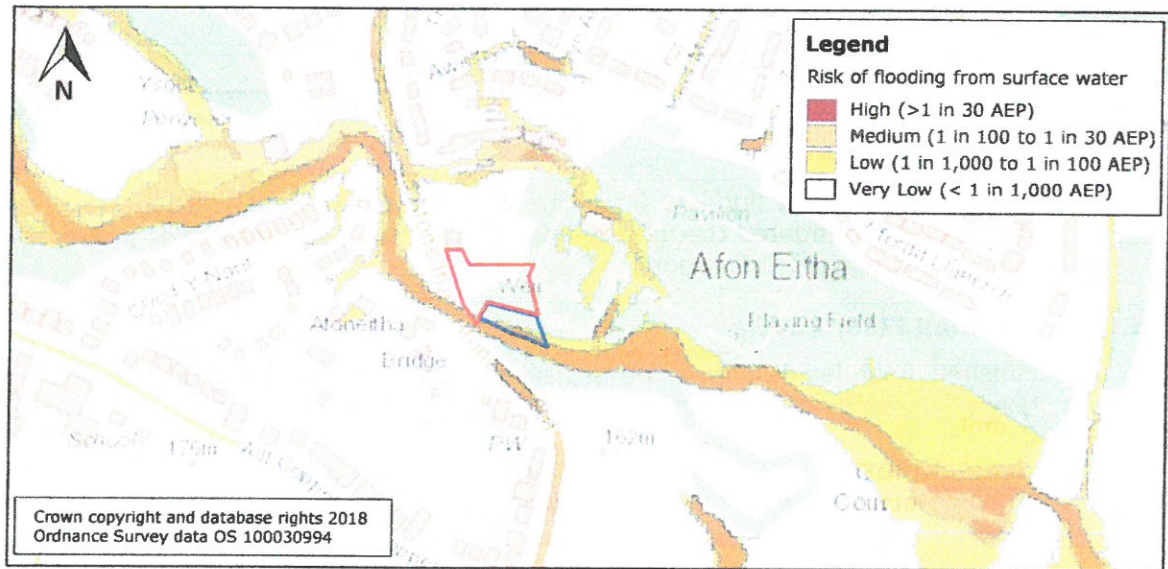


Figure 8: Natural Resources Wales Risk of Flooding from Surface Water
(Source: NRW website)

5 FLOOD RISK MITIGATION MEASURES

5.1 FLOOD MITIGATION

Any residual risk of flooding from the Afon Eitha, reservoirs, groundwater and surface water will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1.1 Finished Floor Levels

Finished floor levels should be set at a minimum of 0.30 m above adjacent ground levels following reprofiling of the site.

This will enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy¹⁰.

5.2 FLOOD RISK ELSEWHERE

Any proposal to modify ground levels should demonstrate that there is no increase in flood risk to the development itself, or to any existing buildings which are known to, or are likely to flood.

In accordance with A1.2 of TAN15, developers must ensure there will be no loss of flood flow or flood storage capacity for floods up to the severity of the 1 in 1,000 annual probability fluvial event.

The developable area of the site lies considerably above the modelled 1 in 1,000 annual probability event fluvial flood level and therefore should have no detrimental impact on flood risk elsewhere.

5.3 ACCESS AND EGRESS

Given that Afoneitha Road is shown to be raised 2 m above the upstream 1 in 1,000 annual probability flood level, access and egress for the site is considered to be safe.

5.4 FLOOD DEFENCE CONSENT

A minimum 8 m undeveloped buffer strip has been provided adjacent to the Afon Eitha for maintenance purposes.

¹⁰ Making Space for Water, Taking forward a new Government strategy for flood and coastal erosion risk management in England, March 2005, Dept for Environment, Food and Rural Affairs

6 SURFACE WATER MANAGEMENT

It is understood¹¹ that surface water drainage for the application site has been dealt with as part of the construction of the residential development at the land to the north. Drainage infrastructure has been implemented at the site to allow for a future connection.

¹¹ Meeting between Weetwood and Mr D. W. Roberts, 21 June 2018

7 SUMMARY

This FCA has been prepared on behalf of Mr D. W. Roberts and relates to the proposed development of a land off Afoneitha Road, Penrycae.

According to the latest Development Advice Map the vast majority site is located within Zone B with a small portion of the south-western corner being located in Zone C2.

The site is not assessed to be at risk of flooding from Afon Eitha.

There may be moderate risk of groundwater emergence at the site.

The risk of flooding from surface water, reservoirs, canals and other artificial sources is considered to be low.

Finished floor levels should be set at a minimum of 0.30 m above adjacent ground levels following reprofiling of the site.

Access and egress is considered to be safe in up to a 1 in 1,000 annual probability event.

The developable area of the site lies considerably above the modelled 1 in 1,000 annual probability event fluvial flood level and therefore should have no detrimental impact on flood risk elsewhere.

A minimum 8 m undeveloped buffer strip has been provided adjacent to the Afon Eitha for maintenance purposes.

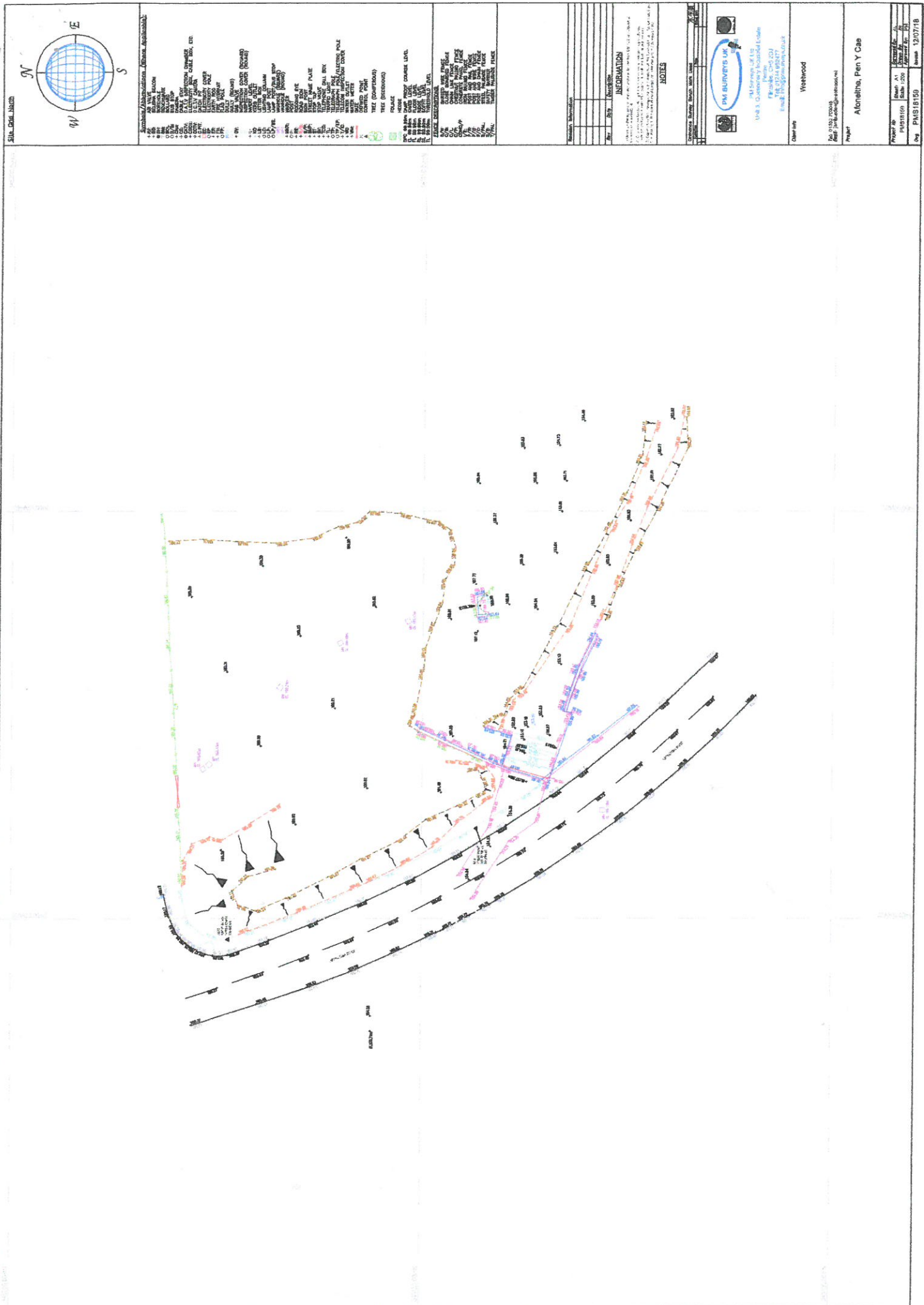
8 RECOMMENDATIONS

This FCA has demonstrated that the proposed development may be completed without conflicting with the requirements of TAN15 subject to the following:

- Finished floor levels to be set 0.30 m above adjacent ground levels
- An 8 m undeveloped buffer strip to be provided adjacent to the Afon Eitha for maintenance purposes

APPENDIX A:

Topographic Survey



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Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
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