

Weetwood

Development • Planning • Environment

CAERNARFON ROAD, BANGOR

FLOOD CONSEQUENCES ASSESSMENT

Final Report v1.3

February 2019

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Flood Consequences Assessment
Final Report v1.3

Client Bampton Property Group Limited

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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Bampton Property Group Limited to prepare a Flood Consequences Assessment (FCA) report to accompany a planning application for the proposed redevelopment of land off Caernarfon Road, Bangor.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15).

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** Addresses the effect of the proposed development on surface water runoff
- Section 7** Presents a summary of key findings
- Section 8** Presents the recommendations

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY AND GUIDANCE

2.1.1 Technical Advice Note 15

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 land¹; 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 that *"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 letter² and supporting guidance note³ 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 – Planning Policy Wales, Edition 10, December 2018 (Section 3.51)

² Welsh Government consultation letter 23 August, 2016 (Ref: CL-03-16)

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.

2.1.2.2 Statutory Standards for Sustainable Drainage Systems

From 7 January 2019, the Flood and Water Management Act 2010 (Schedule 3) requires new developments to include Sustainable Drainage Systems (SuDS) features that comply with national standards.

New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 m² require approval before construction can commence from the SuDS Approval Body (SAB) to ensure compliance with the SuDS standards.

The SAB will also require to adopt the SuDS unless the scheme serves only a single property or is a publically maintained road to which Section 41 of the Highways Act 1980 applies.

The statutory standards are as follows:

Standard S1; Surface water runoff destination

- Priority Level 1: Surface water runoff is collected for use;
- Priority Level 2: Surface water runoff is infiltrated to ground;
- Priority Level 3: Surface water is discharged to a surface water body;
- Priority Level 4: Surface Water is discharged to surface water sewer, highway drain, or another drainage system;
- Priority Level 5: Surface water runoff is discharged to a combined sewer.

Standard S2; Surface water runoff hydraulic control

1. Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5 mm.
2. The surface water runoff rate for the 1:1 annual probability event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.
3. The surface water runoff (rate and volume) for the 1:100 annual probability event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.

³ <https://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>

4. The surface water runoff for events up to the 1:100 annual probability (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.
5. The risks (both on site and off site) associated with the surface water runoff for events greater than the 1:100 annual probability should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.
6. Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.

Standard S3; Surface water quality management

Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Standard S4; Amenity

The design of surface water management systems should maximise amenity benefits.

Standard S5; Biodiversity

The design of the surface water management system should maximise biodiversity benefits.

Standard S6; Design of drainage or construction, operation and maintenance

1. All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effective, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
2. All elements of the surface water drainage system should be designed to ensure maintain and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effective, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
3. The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

2.2.1 Joint Local Plan, July 2017

The Anglesey and Gwynedd Joint Local Development Plan (JLDP) was adopted on 31 July 2017. The JLDP concentrates on sustainable development, and aims to achieve the following;

- Guide the development of housing, retail, employment and other uses;
- Include policies which will aid the Local Planning Authority's decision with regard to planning applications;
- Protect areas to ensure the maintenance and enrichment of the natural and built environment.

The following policies are relevant in respect of flood risk and drainage:

Policy PS6; Alleviating and adapting to the effects of climate change

In order to alleviate the effects of climate change, proposals will only be permitted where it is demonstrated that they have fully taken account of and responded to the following:

- Implementing sustainable water management measures in line with the objectives in the Western Wales River Basin Management Plan;
- Locating away from flood risk areas, and aim to reduce the overall risk of flooding within the plan area and areas outside it, taking account of a 100 years and 75 years of flood risk in terms of the lifetime of residential and non-residential development, respectively, unless it can be clearly demonstrated that there is no risk or the risk can be managed;
- Be able to withstand the effects of climate change as much as possible because of its high standards of sustainable design, location and sustainable building methods;
- Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems.

Policy PCYFF 6; Water Conservation

Proposals should incorporate water conservation measures where practicable, including Sustainable Urban Drainage Systems (SuDS). All proposals should implement flood minimisation or mitigation measures where possible, to reduce surface water run-off and minimise its contribution to flood risk elsewhere.

2.3 CONSENTS

An Environmental Permit for Flood Risk Activities may be required from the 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 at <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 assessment has been informed by the following documents:

- Local Flood Risk Management Strategy (LFMS), Gwynedd Council (GC), February 2013
- Strategic Flood Consequences Assessment (SFCA), Level 1, GC, February 2015

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The approximately 1.25 ha site is located on land situated off Caernarfon Road at Ordnance Survey National Grid Reference SH 566 704, as shown in **Figure 1**.

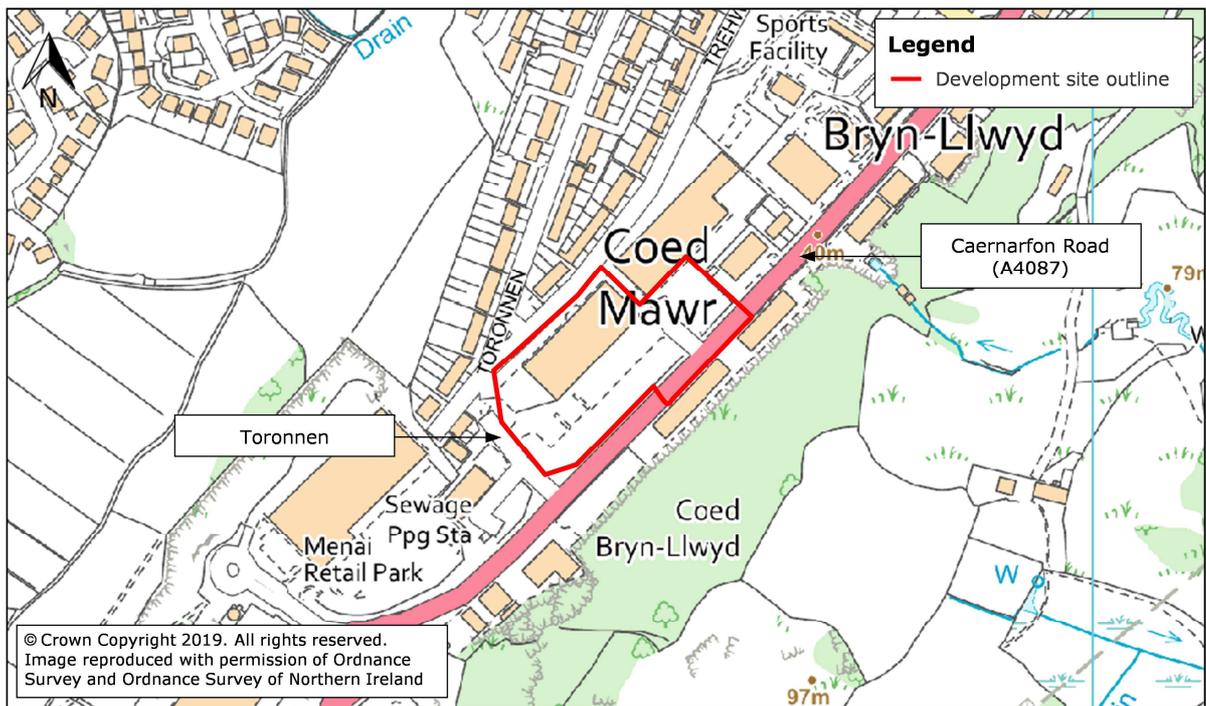


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The site currently consists of a single commercial warehouse (2,300 m²) (former Blakemore Cash and Carry) and associated infrastructure.

Proposals are for the demolition of the former cash and carry and erection of a Foodstore (1,801 m²) (Use Class A1), car park, access and landscaping at former Blakemore Cash and Carry site; and reconfiguration of access and car park arrangements fronting the existing Dunelm store at Caernarfon Road, Bangor (Drawings showing the proposed development are attached at **Appendix A**).

TAN15 classifies commercial development as less vulnerable land use.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

The River Adda flows beneath the site within a 750 mm diameter culvert, flowing in a north-east direction. There are three manholes associated with the River Adda within the site boundary. **Figure 2** illustrates the assumed alignment of the River Adda and the location of watercourse manholes.

The River Adda discharges into the Menai Strait, approximately 3.1 kilometres (km) north-east of the site.

Watercourse A is located approximately 0.1 km north-east of the site and flows in a north-westerly direction, discharging into the River Adda.

At its closest point the Menai Strait is located approximately 1.2 km north-west of the site.

The River Adda is classified as a main river. Watercourse A is classified as an ordinary watercourse.

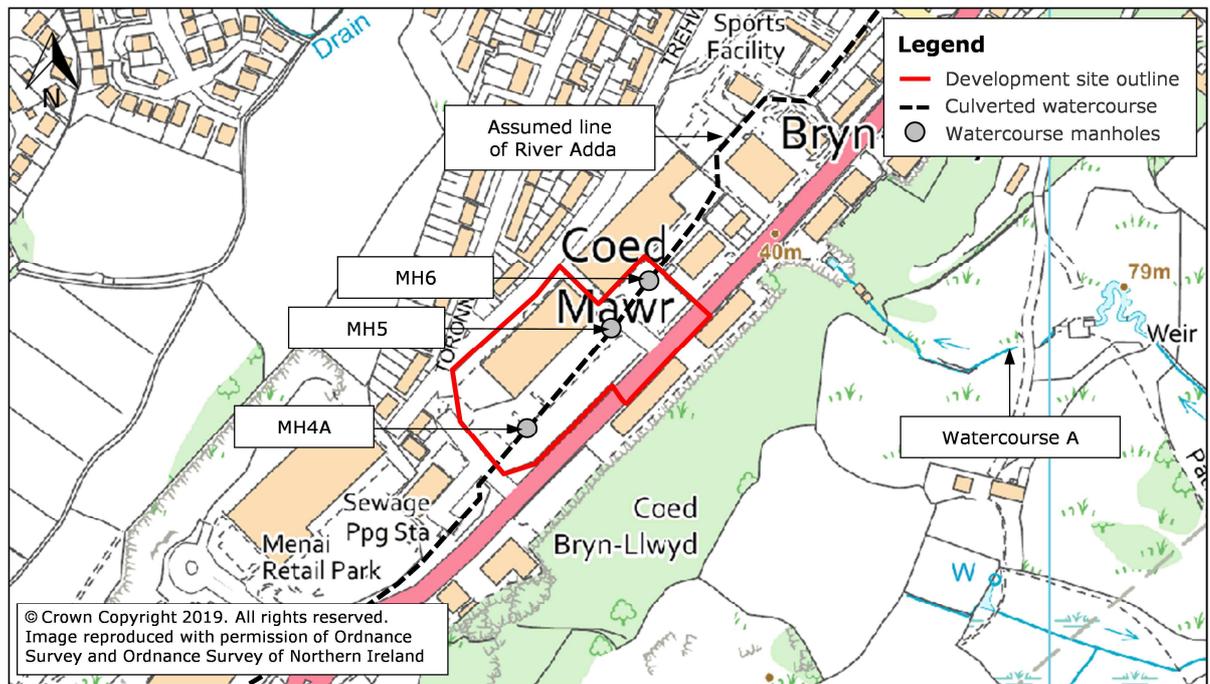


Figure 2: Location of Waterbodies

3.4 GROUND CONDITIONS

National Soils Research Institute mapping⁴ classifies soil conditions at the site and within the surrounding area as 'freely draining slightly acid loamy soils'.

British Geological Survey (BGS) borehole records⁵ located approximately 0.1 km north-east of the site indicate ground conditions to be comprised of layers of 'grey silt with bands of shale' between 0.7 and 51.7 m below ground level (bgl).

BGS Surface Geology mapping⁶ indicates the underlying bedrock formation comprises 'Minffordd Formation - Sandstone And Conglomerate, Interbedded', which is overlain by 'Alluvium - Clay, Silt, Sand And Gravel' superficial deposits.

3.5 SITE LEVELS

A topographic survey of the majority of the site was undertaken by the Greenhatch Group in January 2016 and is provided in **Appendix B**.

⁴ www.landis.org.uk/soilscapes/

⁵ www.bgs.ac.uk/data/boreholescans/home.html, Ref: SH57SE2

⁶ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Site levels are shown to be in the region of 38.4 to 41.5 metres Above Ordnance Datum (m AOD), with levels falling from the north-west to the southern boundaries of the site.

LiDAR data has been utilised to illustrate levels in the north-eastern section of the site, with ground levels shown to be in the region of 38.1 to 40.2 m AOD.

3.6 ACCESS AND EGRESS

Access and egress for the site is currently provided via Toronnen to the south-west and Caernarfon Road, which is located adjacent to the south-eastern boundary of the site.

Levels along Toronnen are generally shown to be in the region of 38.9 to 40.9 m AOD, with levels shown to fall from north to south.

Levels along Caernarfon Road are shown to be in the region of 39.1 to 39.4 m AOD, with levels shown to rise from south-west to north-east.

4 REVIEW OF FLOOD RISK

4.1 FLOOD ZONE DESIGNATION

Flood zones refer to the probability of river and sea flooding. TAN15 defines flood zones as follows:

- 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 Natural Resources Wales] 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 shown on the Development Advice Map. The zones do not account for possible future changes in flooding due to the impact of climate change or the presence of flood defences (although areas benefitting from flood defences may be indicated).

According to the Development Advice Map (**Figure 3**) most of the site is located in Zone C2, with areas along the north/north-western boundary located within Zone A and areas along the south-western boundary located within Zone B.

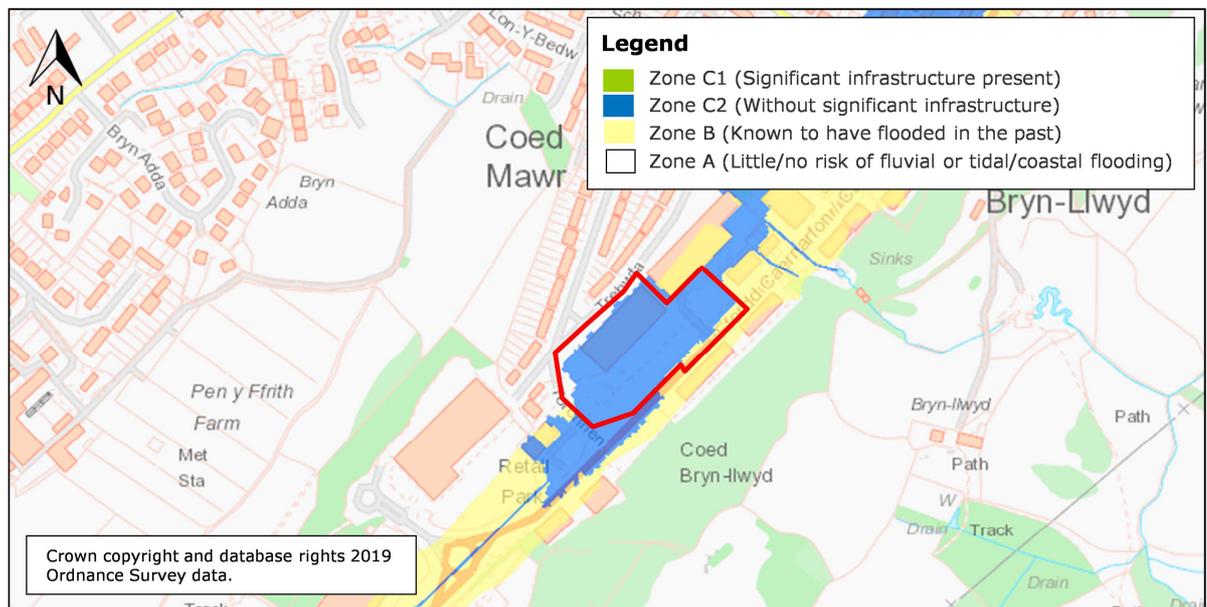


Figure 3: Development Advice Map
(Source: NRW website)

The Flood Risk Map (Rivers and Sea) (**Figure 4**) indicates that most of the site is located within the undefended 1:1,000 annual probability flood outline, with a small area in the north-east located within the defended 1:100 fluvial / 1:200 tidal annual probability flood outline, indicating that the site does in fact benefit from some defences

and identifies discrepancies between the Flood Risk Map (Rivers and Sea) and the Development Advice Map.

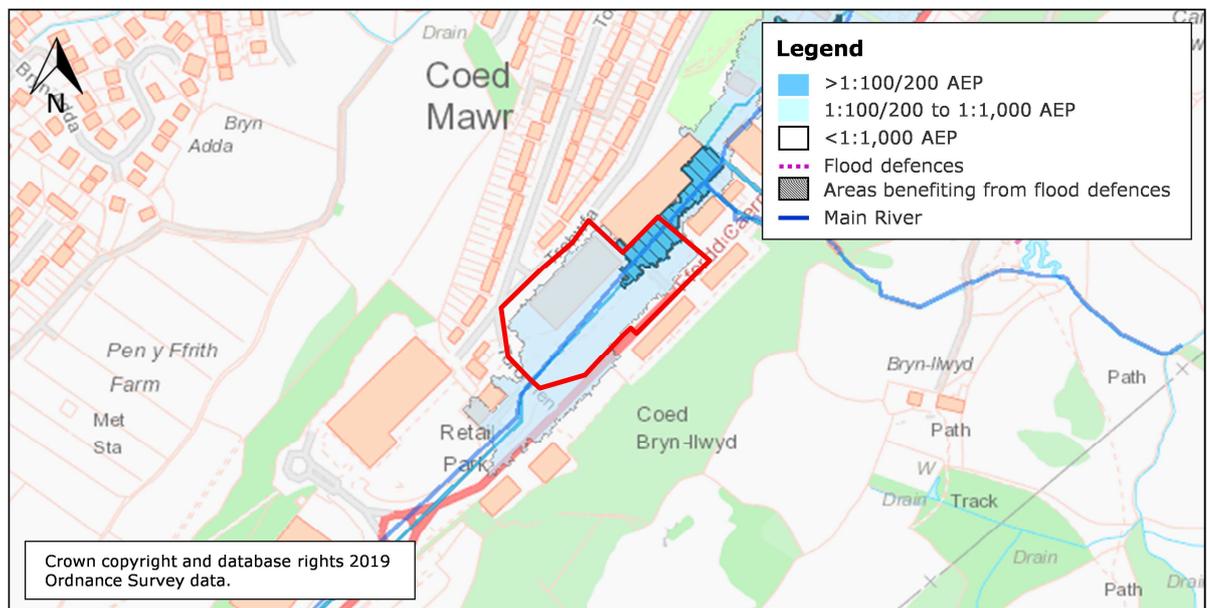


Figure 4: Flood Risk Map (Rivers and Sea)
(Source: NRW website)

4.2 JUSTIFICATION TEST

As most of the site is classified as being in Zone C2, any new development should only be permitted if the Justification Test is passed (see **Section 2.1.1**).

It is considered that the redevelopment of the site will help sustain the existing settlement; meeting point (i) of the Justification Test. Point (iii) of the Justification Test is met as the site can be regarded as 'previously developed land'. This report aims to address point (iv) of the Justification Test.

4.3 HISTORICAL RECORDS OF FLOODING

According to the NRW historic flood outlines database⁷, there are no historical flood events that have impacted the site.

4.4 TIDAL / COASTAL FLOOD RISK – MENAI STRAIT

As discussed **Section 3.3**, the Menai Strait is located approximately 1.2 km north-west of the site.

Site levels are at or greater than 38.1 m AOD (see **Section 3.5**). Given still water maximum tide levels that occur in the Menai Strait will be significantly lower than this the site cannot be at risk of tidal flooding.

⁷ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

4.5 FLUVIAL FLOOD RISK – RIVER ADDA

Aforementioned in **Section 3.3**, the River Adda flows beneath the site within a 750 mm diameter culvert, flowing south-west to north-east.

4.5.1 Flood Defences

NRW's Flood Risk Map (Rivers and Sea) (refer to **Figure 4**) indicates that the north-eastern area on site benefits from defences. As indicated in Section 1.2 of the Afon Adda Flood Alleviation Scheme Study (December 2008) modelling report, flood defences in the form of flood storage areas are located upstream of Bangor. Given that the defences are in the form of flood storage areas rather than hard defences, failure of these structures is unlikely to occur.

4.5.2 Modelled Flood Levels and Extents

Modelled extents have been provided by NRW for the present day defended 1:1,000 annual probability event and the 1:100 plus 20% climate change (+CC) annual probability event. These have been taken from the Afon Adda Flood Alleviation Scheme Study (December 2008), which consists of a dynamically linked 1D-2D model produced by Halcrow Group Limited.

The corresponding modelling report indicates that the design standard of the River Adda flood alleviation scheme is to cater for flows during the 1:100 annual probability event. Therefore, no flooding of the site is expected during the 1:100 annual probability event.

Modelled flood extents suggest that the site is expected to remain dry in up to 1:100 +CC (20%) annual probability event. However, during the 1:1,000 annual probability event (**Figure 5**), a portion of the northern extent of the site may be expected to flood as a result of the existing culverted watercourse surcharging through manholes at and within the vicinity of the site.

In order to derive an anticipated flood level on site in the absence of detailed modelled flood depths during the 1:1,000 annual probability event, the flood extent for the 1:1,000 annual probability event has been overlain on LiDAR data (**Figure 5**). Ground levels around the 1:1,000 annual probability event flood extent have subsequently been interrogated and appear to correspond to approximately 38.5 to 38.8 m AOD.

It may therefore be reasonable to conservatively assume a peak flood level of 38.8 m AOD during the 1:1,000 annual probability event. With site levels generally shown to be in the region of 38.1 to 41.5, a maximum flood depth of 0.7 m may be expected within the northern portion of the site during this scenario.

Modelled velocities are provided in Appendix E of the aforementioned modelling report. During the 1:1,000 annual probability event velocities are shown to be 0.00, 0.03 and 0.12 m³/s in the vicinity of MH4A, MH5 and MH6 respectively (manhole locations illustrated on **Figure 2**). All of these are within the indicative tolerable conditions identified for commercial developments within A1.15 of TAN15.

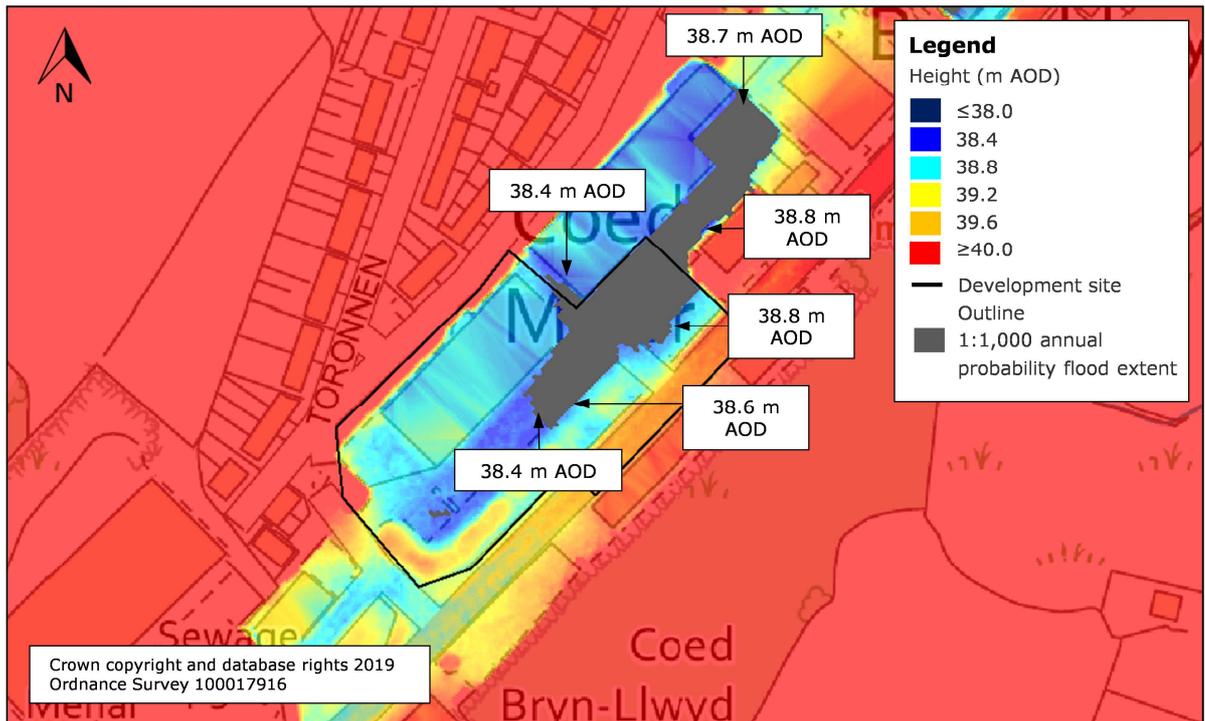


Figure 5: River Adda 1:1,000 Annual Probability Modelled Flood Extent with Spot Levels

(Source: Afon Adda Flood Alleviation Scheme Study, December 2009)

In accordance with Welsh Government guidance for climate change released in December 2016, a +30% increase in peak river flow should be considered to account for the 75 year lifetime of development for such 'less vulnerable' proposals within the West Wales region.

Given that the Afon Adda Flood Alleviation Scheme Study predates 2016, a +30% increase in peak river flow has not been modelled as part of that original study. However, reasonable assumptions can be made from the information available. As indicated in Table 4.2 of the modelling report associated with the aforementioned study, combined peak flows during the 1:100 annual probability event are 2.79 m³/s. Applying an increase of 30% to these peak flows would equate to 3.63 m³/s, which is significantly less than the modelled peak flows of 5.75 m³/s that are expected during the 1:1,000 annual probability event. Therefore, the 1:1,000 annual probability event is considered the 'worst case scenario'.

In order to determine whether the site may be expected to flood during a 1:100 +CC (30%) annual probability event, a simple level-discharge relationship has been assessed to estimate peak flood levels for the 1:100 +CC (30%) annual probability event. Appendix D of the modelling report provides maximum flood levels within the culvert during the 1:100 and 1:100 +CC (20%) annual probability events, which are 37.72 and 37.87 m AOD respectively. As such, a maximum flood level of 37.95 m AOD has been calculated for the 1:100 +CC (30%) annual probability event. This is lower than ground levels at the site and lower than the cover levels of all three manholes on site; therefore, no flooding would be anticipated on site during this scenario. As the site would be expected to remain dry, no land raising should be required in order for the proposed development to comply with section A1.14 of TAN15.

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

4.6 FLUVIAL FLOOD RISK – WATERCOURSE A

As discussed in **Section 3.3**, Watercourse A is located approximately 0.1 km north-east of the site and flows in a north-westerly direction

No detailed hydraulic modelled information is available for Watercourse A. In such instances, NRW's Surface Water Flood Risk map (**Figure 6**) can often be used as a reasonable proxy for assessing flood risk from small watercourses. This suggests that Watercourse A connects into the River Adda downstream of the site and is unlikely to be a source of flood risk to the site itself.

4.7 FLOOD RISK FROM SURFACE WATER

The Surface Water Flood Risk map (**Figure 6**) indicates that most of the site is at 'low' to 'high' risk of surface water flooding which coincides with depressions in the local topography. There are small areas along the north/north-western and south-western boundary of the site shown to be at 'very low' risk of flooding.

Potential depths and velocities (**Figure 7** and **Figure 8**) for the low, medium and high risk surface water flood events are also provided by NRW. These indicate that depths at the location of the proposed foodstore are less than 0.3 m and velocities less than 0.25m/s. Flooding of up to 0.9 m may be anticipated in other areas of the site.

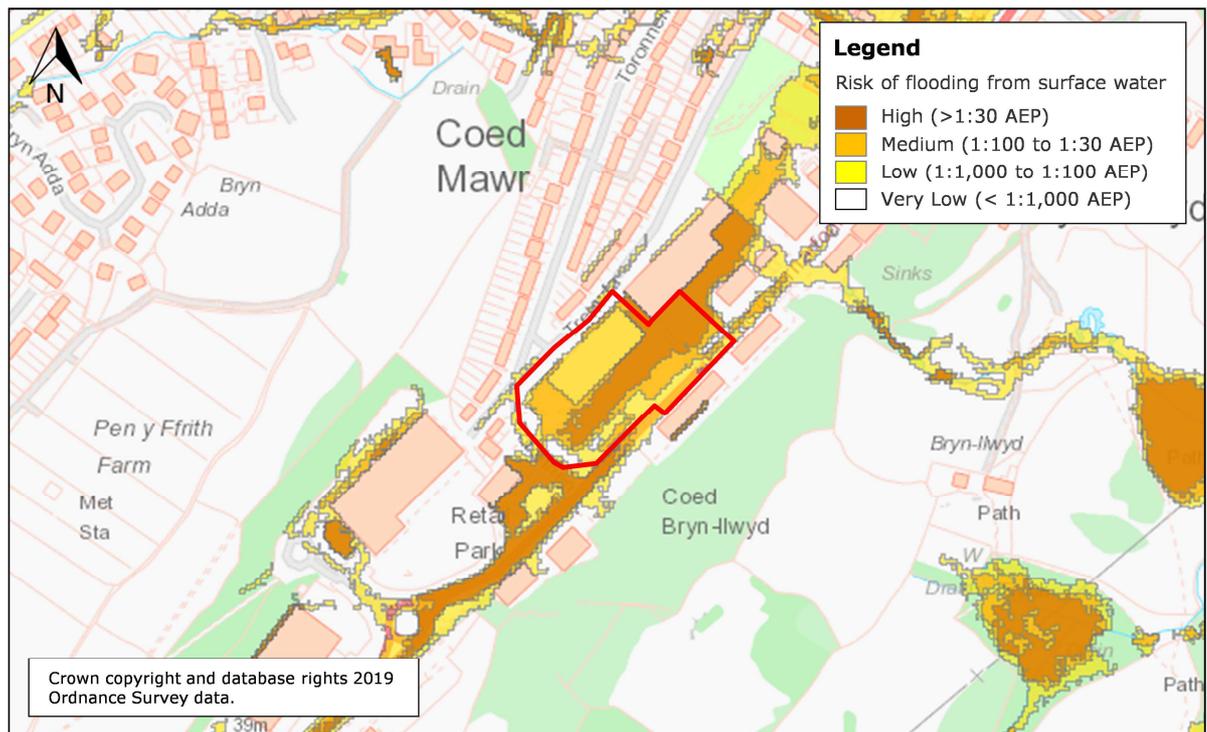


Figure 6: Surface Water Flood Risk
(Source: NRW website)

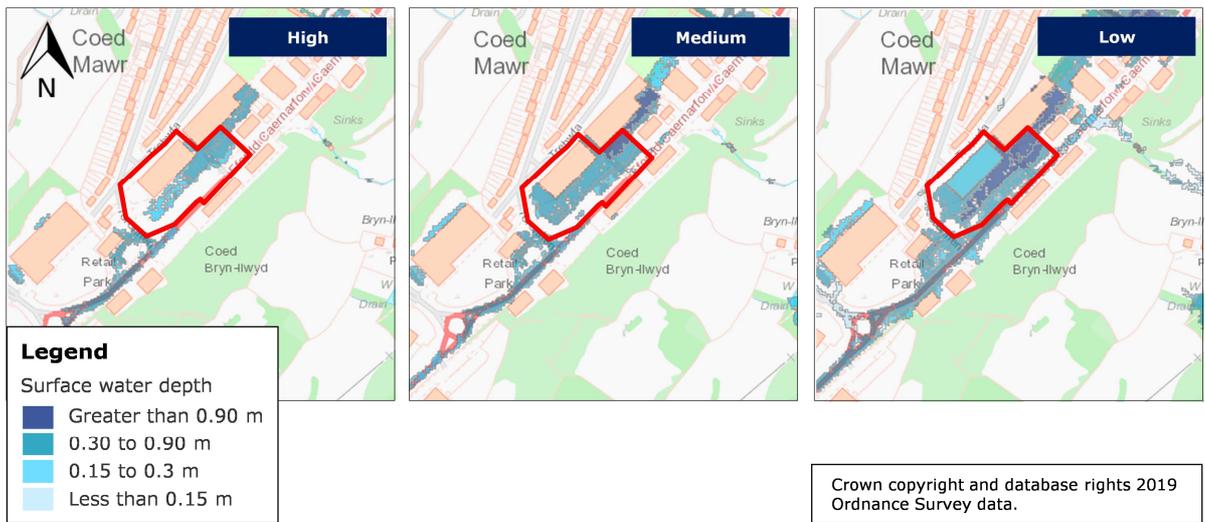


Figure 7: Surface Water Flood Risk - Depth
(Source: NRW website)

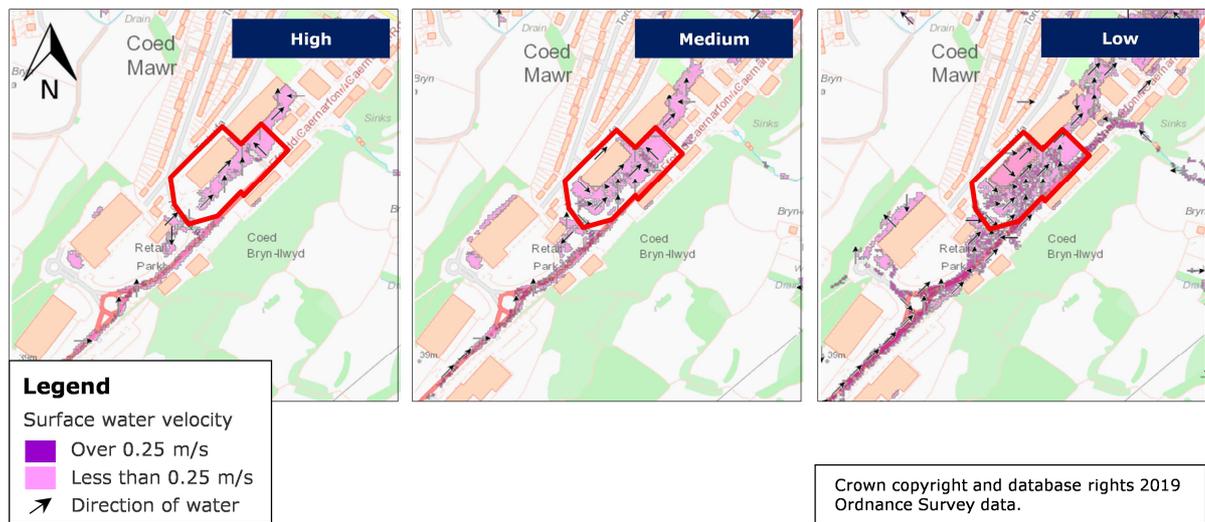


Figure 8: Surface Water Flood Risk - Velocity
(Source: NRW website)

Dŵr Cymru Welsh Water (DCWW) has been consulted to ascertain whether it holds any records of highways flooding at or within the vicinity of the site. DCWW has advised⁸ that their records indicate that there are no recorded instances of previous sewer flooding events at the site.

GC has been consulted⁹ to ascertain whether it holds any records of sewer flooding at the site. At the time of writing a response is awaited.

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

⁸ Email from DCWW to Weetwood dated 17 January 2019

⁹ Email from Weetwood to GC dated 10 January 2019

4.8 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

There are no canals or other impounded waterbodies located within the immediate vicinity of the site. The Reservoir Flood Risk map indicates that the site is not at risk of flooding from such sources.

The site is therefore not assessed to be at risk of flooding from reservoirs, canals or other artificial sources.

4.9 FLOOD RISK FROM GROUNDWATER

As detailed in **Section 3.4** ground conditions at the site and within the surrounding area are described as 'freely draining'. There may therefore be the propensity for some groundwater flooding.

According to the BGS Groundwater Flooding Hazard map (**Figure 9**) the susceptibility to groundwater flooding is moderate.

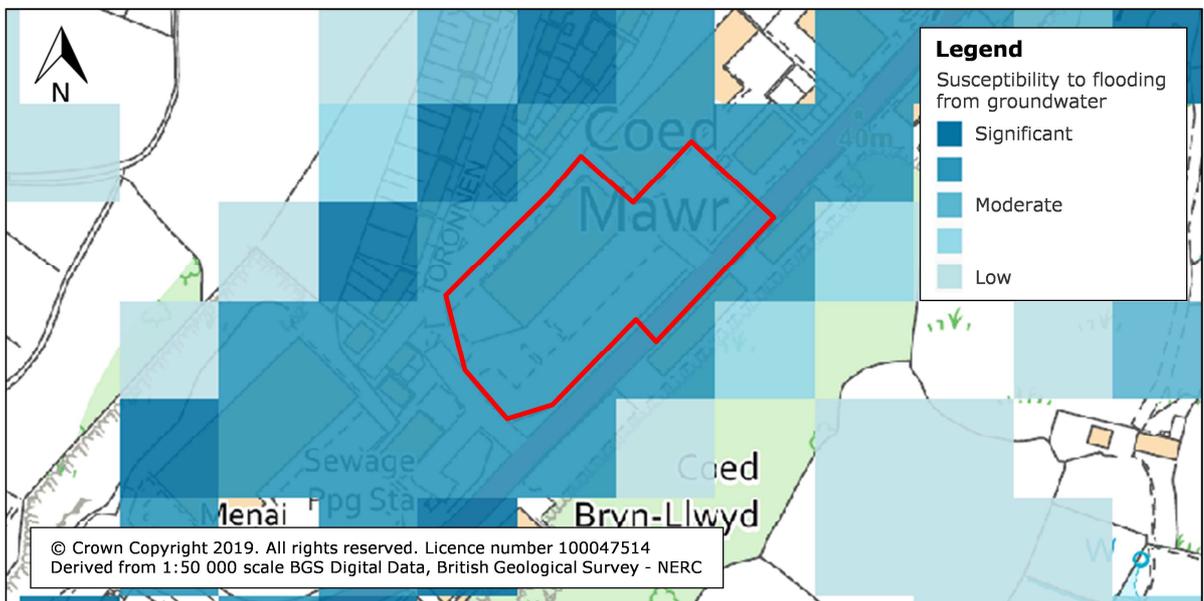


Figure 9: Groundwater Flooding Hazard Map
(Source: Findmaps)

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

5 FLOOD RISK MITIGATION MEASURES

The flood risk to the site from fluvial, groundwater and surface water sources will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1 FINISHED FLOOR LEVELS

As discussed in **Section 4.5.2**, a peak flood level of 38.8 m AOD may be expected on site in up to a 1:1,000 annual probability event.

It is understood that finished floor levels for the proposed development will be set at 39.0 m AOD. This should ensure that the proposed building remains dry in up to the 1:1,000 annual probability event.

In accordance with Building Regulations Approved Document C, finished floor levels should also be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site. Where this is not achievable due to level access requirements, levels should fall away from the property to achieve a level of 0.15 m below finished floor level as soon as practicable.

This will, subject to the implementation of an appropriately designed surface water drainage scheme (**Section 6**), enable any potential overland flows to be conveyed safely across the site without affecting property.

5.2 FLOOD RESISTANT AND RESILIENT CONSTRUCTION

In order to mitigate any residual flood risk from surface water flood resistant and resilient construction techniques should be incorporated into the design of the building, in line with government guidance¹⁰. These include design features and finish materials to minimise the entry of water and/or reduce the damage in the unlikely event of the development being inundated.

5.3 WATERCOURSE MAINTENANCE

As discussed in **Section 3.1**, the River Adda flows beneath the site within a 750 mm diameter culvert in a north-easterly direction. NRW have reaffirmed¹¹ that a minimum 8 m undeveloped buffer strip from the outside edge of the culvert should be provided either side of the culverted River Adda. This will allow for future maintenance.

Consent should be sought from NRW for any proposed works that may be considered necessary to or within the vicinity of the culverted River Adda.

5.4 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.

¹⁰ Improving the Flood Performance of New Buildings: Flood Resilient Construction. Dept for Communities and Local Government. May 2007.

¹¹ Email from NRW to Weetwood dated 23 January 2019

In accordance with A1.2 of TAN15 the consequences of the development on flood risk elsewhere should be assessed for up to the 1:1,000 annual probability event. It is understood that NRW seek to ensure that, where necessary, climate change and breach and blockage scenarios are considered for assessing the impact on flood risk elsewhere.

As discussed in **Section 3.2**, the footprint of the proposed building will be less than existing and will increase the storage capacity of the existing floodplain. Therefore, the proposed development is unlikely to increase flood risk elsewhere and may actually help to reduce flood risk elsewhere.

5.5 ACCESS AND EGRESS

Dry access and egress should be available during the 1:100 and 1:100 +CC annual probability events. Some flooding along Toronnen and Caernarfon Road may be expected from fluvial and surface water sources during a 1:1,000 annual probability event with flood depths and velocities between 0.3 to 0.9 m and more than 0.25 m/s respectively.

5.6 FLOOD PLAN

Recognising the risk of surface water flooding to the access roads, it is recommended that a Flood Plan is prepared in consultation with GC emergency planning team.

The objectives of the plan would be to:

- Ensure all occupiers and visitors are aware of the potential risk of flooding and the procedures that should be implemented in the event that flooding is expected or has occurred
- Reduce the risk to property and life
- Reduce the likelihood of anyone entering flood waters
- Reduce the likelihood of a disorganised response to potential or actual flooding

This would be achieved by setting out the measures that would need to be taken in the event that potential flooding is forecast, during flooding and following an 'all-clear' notification. The plan would achieve this by:

- Summarising the roles and responsibilities for flood response and management
- Describing how flood warnings are issued, flood warning codes and what they mean, and other sources of flood information
- Setting out how to respond safely in the event that flooding is forecast or occurs

The site is included in an NRW flood warning area (**Figure 10**). This provides the opportunity for the relevant response procedures set out in the Flood Plan to be invoked in response to receipt of a flood warning from NRW.

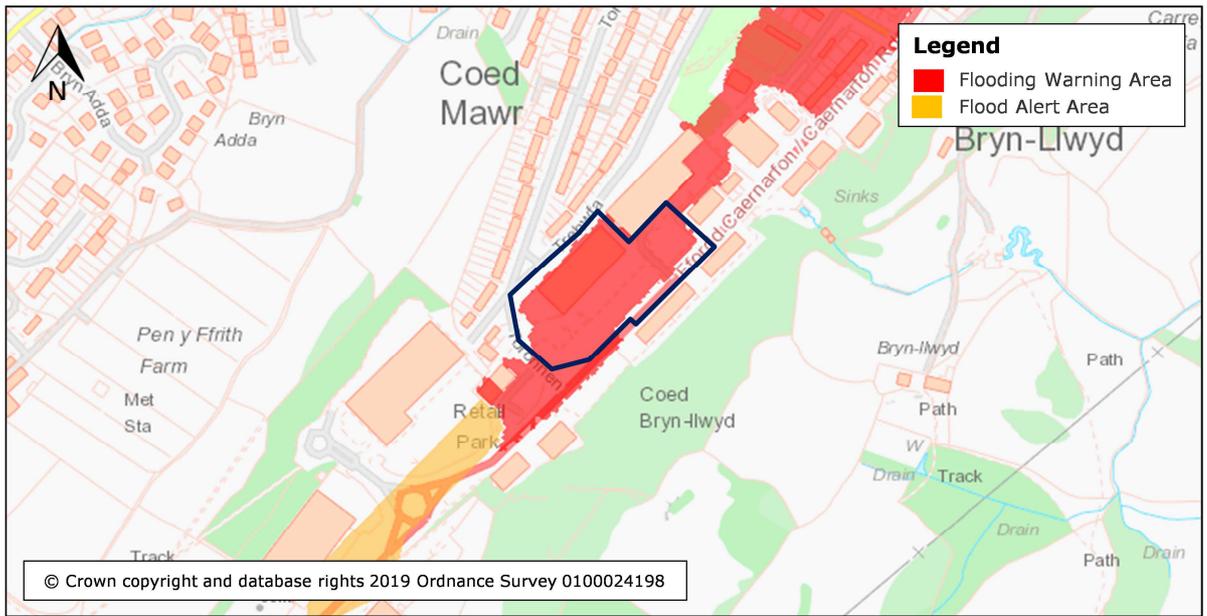


Figure 10: Flood Warning Areas
(Source: NRW website)

6 SURFACE WATER MANAGEMENT

Surface water management has been addressed by GHD in a separate report that will be submitted in support of the application.

7 SUMMARY

This report has been prepared on behalf of Bampton Property Group Limited and relates to the proposed redevelopment of land off Caernarfon Road, Bangor.

According to the Flood Risk Map (Rivers and Sea) the proposed development is located in the undefended 1:1,000 annual probability flood outline, with a small area in the north-east located within the defended 1:100 fluvial / 1:200 tidal annual probability flood outline, indicating that the site does in fact benefit from some defences and highlights discrepancies with the Development Advice Map.

The site meets points (i) and (iii) of the Justification Test. This FCA addresses point (iv) of the Justification Test.

The site is not at risk of flooding from tidal sources, reservoirs, canals or other artificial sources but there is some risk of flooding from fluvial, surface water and groundwater sources.

Modelled flood extents suggest that the site is expected to remain dry in up to 1:100 +CC (20%) annual probability event associated with the River Adda. However, during the 1:1,000 annual probability event, inundation of floodwaters may be expected in the northern section of the site. Based upon a comparison of the 1:1,000 annual probability flood extent and LiDAR it may be reasonable to assume a peak flood level of 38.8 m AOD during this event, which would result in a maximum flood depth of 0.7 m within the northern portion of the site during this scenario.

Given that the Afon Adda Flood Alleviation Scheme Study predates 2016, a +30% increase in peak river flow has not been modelled as part of that original study. An assessment of modelled peak flows indicates that flows during the 1:100 +CC (30%) annual probability event would be expected to be significantly less than the modelled peak flows expected during the 1:1,000 annual probability event. Therefore, the 1:1,000 annual probability event has been considered as a 'worst case scenario'.

Irrespective, a simple level-discharge relationship has been developed to estimate peak flood levels for the 1:100 +CC (30%) annual probability event, based on the maximum flood level within the culvert during the 1:100 and 1:100 +CC (20%) annual probability events. This indicates that a maximum flood level of 37.95 m AOD may be expected during the 1:100 +CC (30%) annual probability event. Therefore, no flooding would be anticipated on site during this scenario.

It is understood that finished floor levels for the proposed development will be set at 39.0 m AOD. This should ensure that the proposed building remains dry in up to the 1:1,000 annual probability event. Finished floor levels should also be set 0.15 m above adjacent ground levels. Where this is not achievable due to level access requirements, levels should fall away from the property to achieve a level of 0.15 m below finished floor level as soon as practicable. These measures will address fluvial and groundwater flood risk.

The flood risk from surface water may result in flood depths at the location of the proposed foodstore of less than 0.3 and velocities less than 0.25 m/s. Flood resistant and resilient construction techniques should be incorporated into the design of the building, in line with government guidance, in order to address any residual risk of surface water flooding.

The footprint of the buildings on site will reduce following redevelopment. Therefore, the storage capacity of the existing floodplain will increase and flood risk elsewhere may reduce.

Some flooding along Toronnen and Caernarfon Road may be expected from fluvial and surface water sources during a 1:1,000 annual probability event with flood depths and velocities between 0.3 to 0.9 m and more than 0.25 m/s respectively. Recognising this it is recommended that a Flood Plan is prepared in consultation with GC Emergency Planners prior to occupation of the buildings. Site managers should register with NRW to receive flood warnings.

Surface water management has been addressed by GHD in a separate report that will be submitted in support of the application.

8 RECOMMENDATIONS

This report has demonstrated that the proposed development may be completed in accordance with the requirements of planning policy subject to the following:

- Finished floor levels to be set at a minimum of 39.0 m AOD
- Finished floor levels to be set 0.15 m above adjacent ground levels. Where this is not achievable due to level access requirements, levels should fall away from the property to achieve a level of 0.15 m below finished floor level as soon as practicable
- The latest best practice flood resistant and resilient construction techniques to be incorporated into the design of the building
- Flood Plan to be developed in consultation with GC
- The detailed drainage design produced by GHD should be submitted to and approved by the local planning authority prior to the commencement of development, including necessary consents from NRW and SAB approval

APPENDIX A:

Development Proposals

APPENDIX B:

Topographic Survey

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Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
River Realignment and Restoration
Water Framework Directive Assessments
Flood Defence Consent Applications
Sequential, Justification and Exception Tests
Utility Assessments
Expert Witness and Planning Appeals
Discharge of Planning Conditions

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