AUSTIN PARTNERSHIP

CONSULTING ENGINEERS

Project Title:
Residential Development
Former St Cuthberts Church
Clarence Road Embankment
Grangetown
Cardiff

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United Welsh Housing Association

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FLOOD CONSEQUENCE ASSESSMENT

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1.0 Introduction

Austin Partnership Ltd Consulting Civil and Structural Engineers has been commissioned by Mr Simon Lewis Land Manager, United Welsh Housing Association to produce a Flood Consequence Assessment in support a new residential development at the former St Cuthberts Church, Clarence Road Embankment, Grangetown, Cardiff. The development proposal is to demolish the former church and construct a bock of twelve residential flats over three floors.

The requirement for the assessment is triggered by the site's location within Zone C1 of the Welsh Assembly's Development Advice Maps.

The purpose of the report is to assess in detail the risk of flooding to the site in question and assess its suitability for development in accordance with the Technical Criteria set out in Technical Advice note 15 (TAN 15) (2004). It is supported by information provided by Natural Resources Wales which is referenced and embedded within the content of the report.

2.0 Planning Policy Guidance

"The general approach of PPW, supported by the TAN, is to advise caution in respect of new development in areas at high risk of flooding"

"The Operation of a precautionary framework is governed by a Development Advice Map containing three zones (A, B, C with subdivision into C1 and C2) which should be used to trigger the appropriate planning tests in relations to sections 6 and 7 and appendix 1"

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

3.0 Development Advice Maps

The site as identified by the Local Planning Authority falls within **Zone C1** of the Development Advice Maps. TAN15 states that highly or less vulnerable can be located within this designation, subject to a Flood Consequence Assessment fulfilling the criteria of Section 7 and Appendix 1 of the Technical Advice Note. Furthermore, the development should be justified.

4.0 Nature of Development

Section 5 of TAN 15 outlines several development categories as part of the precautionary framework. The development specific to this application is mixed use, but due to the highly vulnerable element it will classified as "Highly Vulnerable Development" under the TAN – subject to the highest risk denominator.

Highly Vulnerable development is accredited to residential development, public buildings, hotels etc.

5.0 Justification of Development

The development concurs with the aims of Planning Policy Wales and meets the definition of previously developed land. The potential consequences of a flooding event for the development being assessed are addressed in Section 9.

6.0 Site Location

The site is located within a built up residential area in the urban constraints of Cardiff. A site plan is included in Appendix A of this report. This area is also built up of other mixed use development. The main access road adjoining the site is Pomeroy Street that connects this site to Clarence road which is the main road bridge that provides access to Cardiff bay and further north into Grangetown.

The area is located at the southern margins of the city with Cardiff Bay situated immediately south of the area. The site is general flat in this area with site levels at 8.50 m AOD at road level.

7.0 Hydrological Setting

The site is situated close to major river systems that pass through the urban area of Cardiff area. The river Taff is located some 100 metres to the west of the site. The area is considerably low lying in nature with Cardiff Bay and the Severn Estuary being located 2km south of the site. There are no other known water features such as; issues, springs, drains present in proximity to the site, although there is a large amount of urban drainage infrastructure.

Figure 1 shows the current flood map at this location. This represents the undefended fluvial flood/tidal extents derived from nationally generalised modelled data and historical flood outlines. There has been known historical flooding in the general area such as a major flood in December 1979. This was a combination of fluvial and tidal flooding, without there being the presence of fluvial and tidal flood defences and a Barrage, completed in 1998.

Figure 2 shows the current flood map from lower resolutions. This was captured to identify more clearly the origin of flood risk.

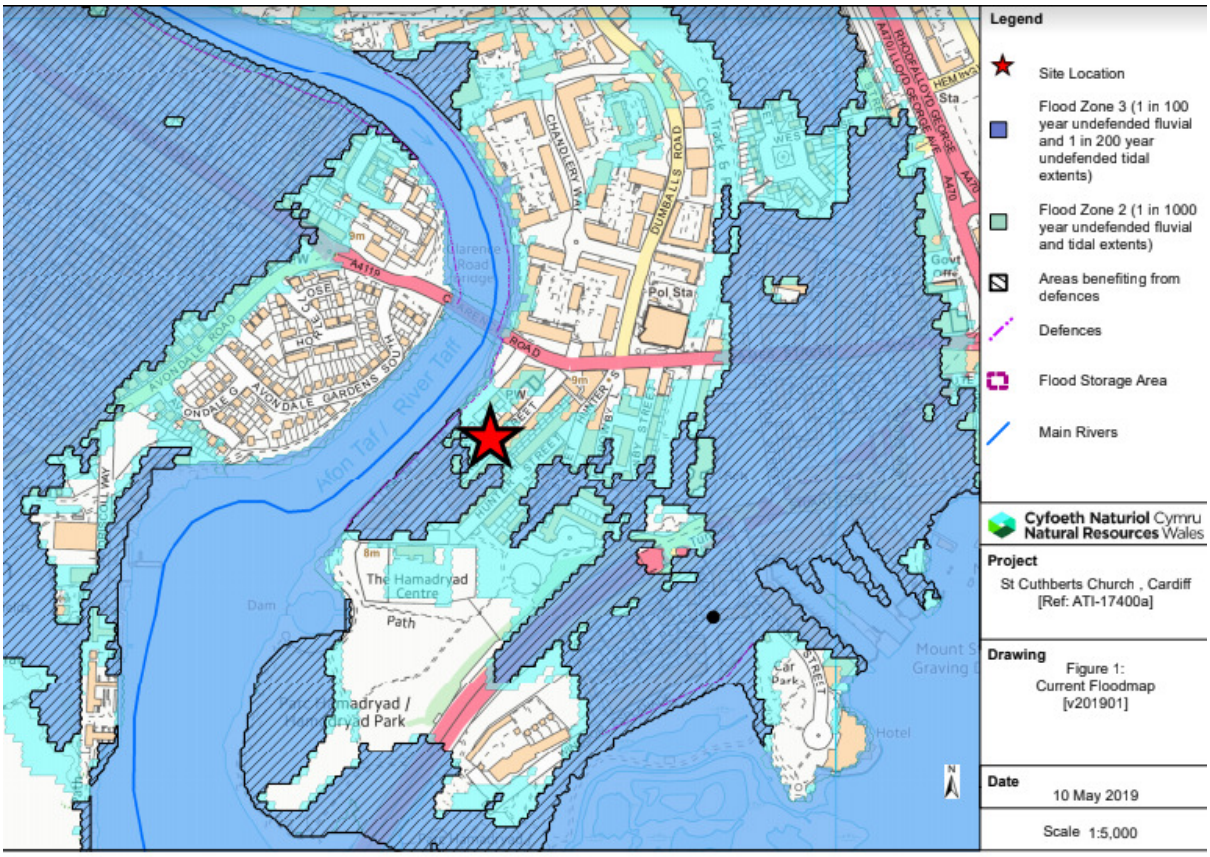

Figure 1: Generic Flood map provided by Natural Resources Wales

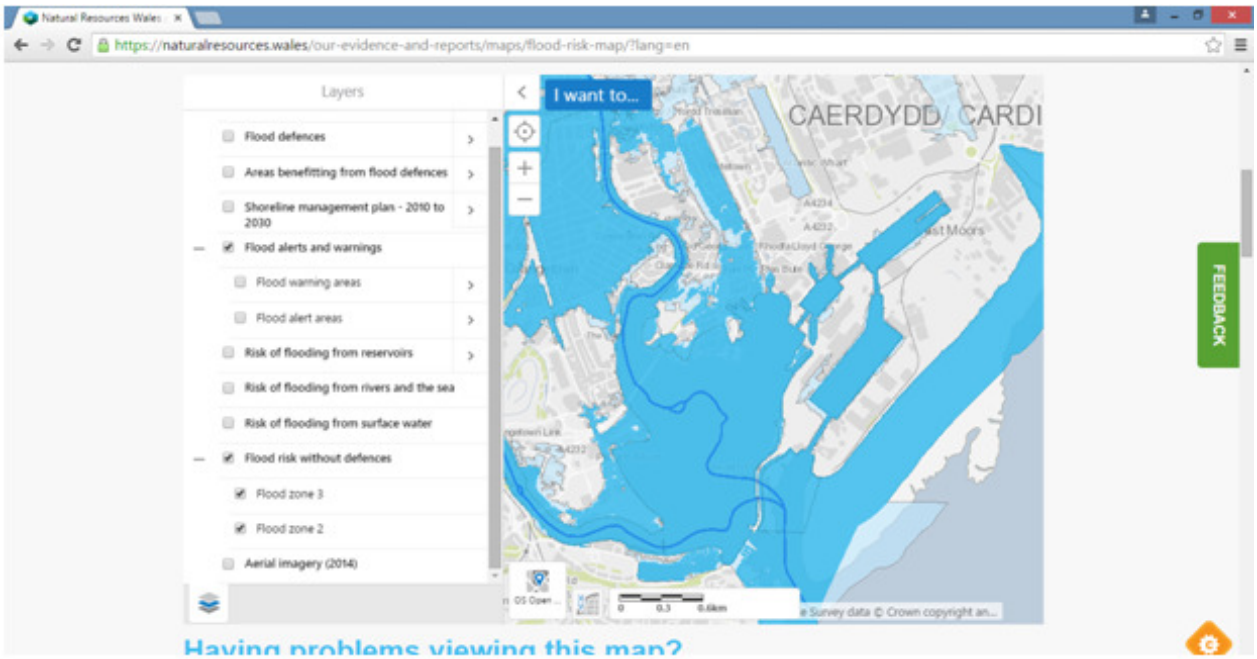

Figure 2. Screenshot from NRW website.

It can be seen from both maps that the site falls within the Natural Resources Wales flood outlines for the 1 in 1000 year (0.1 %) annual probability flood. However, the generalised flood mapping does not account for information produced as part of a detailed flood risk model undertaken for this area.

Figure 2 was specifically produced to look at the flood mapping on a broader scale. The map does not indicate a flow path directly from the Severn Estuary, east of Cardiff Barrage.

The closest major sources of flooding is the River Taff which has flood alleviation measures in place in the form of reinforced earth embankments and Rip Rap that were constructed following major flooding in December 1979. However, in the longer term, the risk of tidal flooding from beyond the barrage should be considered.

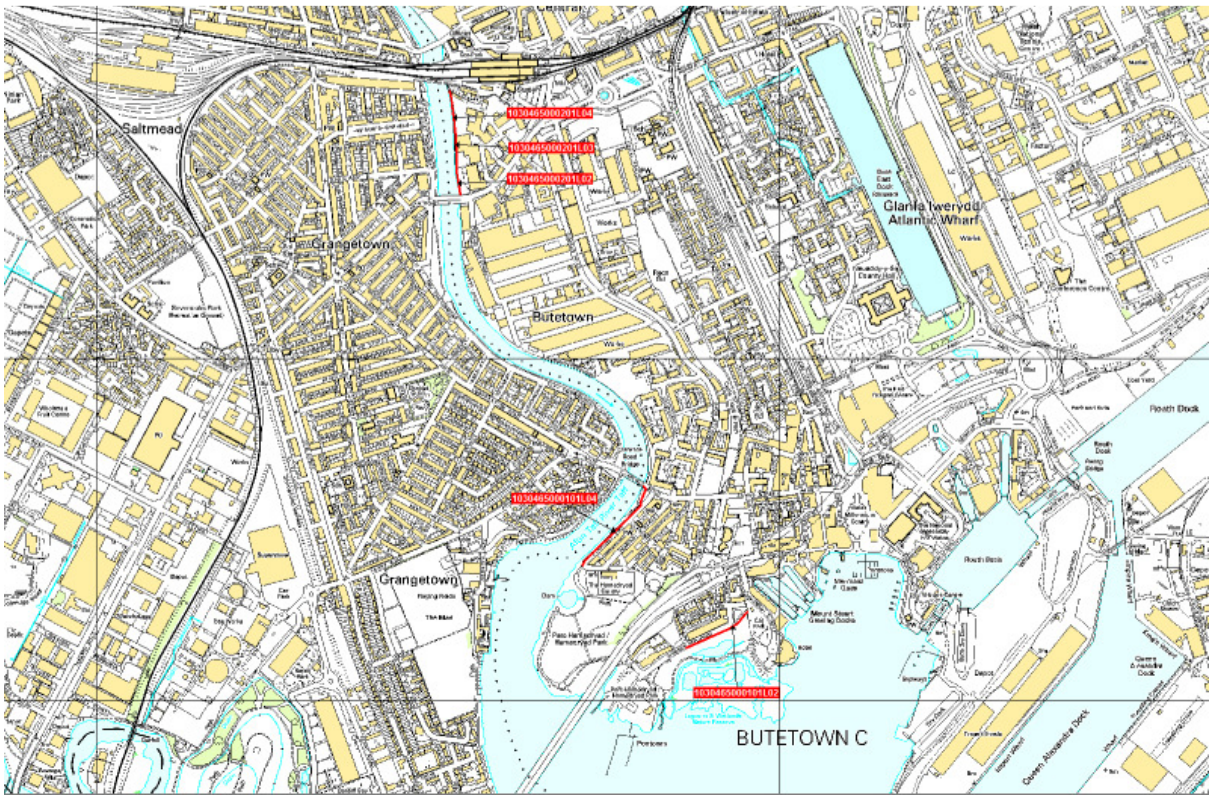

Figure 2 Natural Resources Wales maintained defences

The original flood defence scheme in this area was to protect against a fluvial and tidal source. The construction of the Cardiff Bay barrage further reduces the impact of tidal flooding and acts to retain flood flows. The standard of protection near the site is approximately 1 in 100 years.

The flood defences at the locations shown above are generally stone wall or steel Piles and brick wall. The defence crests vary between 8.40 m and 8.90 m AOD. There has been no evidence of fluvial or tidal flooding since this complex scheme was put in place.

8.0 Natural Resources Wales Detailed Hydraulic Analysis

Natural Resources Wales have completed a detailed hydraulic study of the two major river systems that pass through the general area of Cardiff. The purpose of the study is for flood risk mapping and is publically available to identify areas at potential risk of flooding. Whereas the Flood Maps are often used to provide a generalised broad indication of risk, the study completed for this area involves the use of a detailed two dimensional river modelling exercise that not only indicates areas at risk, but also provides an estimation of flood depths, routing and velocities of flood water that may occur in a flood of a given return period.

Importantly, this detailed river model takes into account the presence of flood defences within the vicinity.

Correspondence with Natural Resources Wales revealed that this site was not impacted from the River Taff, therefore no levels of predicted flood depths up to the 1 in 1000 (0.1%) flood were provided.

9.0 Tidal Projections

Natural Resources Wales have provided tidal projections with allowance for climate change that would not have been depicted in the generalised flood risk modelling.

Table 4: Design Scenario (excluding 95% Confidence Bound)

Year	Sea level rise(m)	Extreme Event Sea Level (mAOD)	
		T200	T1000
2019	0.039	8.1	8.5
2094	0.775	8.8	9.2
2119	1.138	9.2	9.6

Table 5: Sensitivity Scenario (including 95% Confidence Bound)

Year	Sea level rise(m)	Extreme Event Sea Level (mAOD)	
		T200	T1000
2019	0.039	8.5	9.1
2094	0.775	9.2	9.8
2119	1.138	9.6	10.2

Table 5 shows the figures when adopting a precautionary approach as advised by Agency guidance *(ref 4)*, these levels include the upper level 95% confidence bound.

These numbers are conservative and include a +/- confidence bound. Without the confidence bound the important levels would be:

T200 (100 Lifetime of development) - 9.20 m AOD

T1000 (100 Life time of development) - 9.6 0 m AOD

This represents in Estuary Water levels for extreme tides that include tidal surge. From inspect of OS Survey data, it is seen that the coastal frontage is between 10.0 m and 12.0 m AOD.

Based on the information for fluvial and tidal risk, it suggests that the only risk of flooding as mapped by NRW is the undefended scenario of flood risk mapping from the River Taff directly.

10.0 Flood Risk and Acceptance Criteria

TAN 15 requires that proposals for developments in Zone C1 should be supported by an assessment that considers particular "Acceptability Criteria" as outlined in Section 7 and Appendix 1.

The acceptability criteria for highly vulnerable development such as the proposed residential development are indicated in Appendix 1 of TAN15.

In terms of hazard identification the issue is addressed by considering the predicted flood levels and comparing them to site levels and proposed finished floor levels. A design level can then be interpreted using the table in Section A1.14 and A1.15 of TAN 15.

The acceptance of the criteria in Section 7 and Appendix 1 can been made using the output from the information provided alongside supplementary survey information. This data makes provision for the Flood Alleviation Scheme that affords a level of flood protection to this area of Cardiff.

A1.14 (TAN15) prescribes that development should be "flood free" in the 1 in 100 flood Event (Inc climate change). Design levels should be indicated to demonstrate this. There should also be dry access from the site in a flood event of this return period.

NRW confirm there is no direct risk from the River Taff based upon the detailed flood model. Due to the distance from the Estuary and the fact that the coastal fringes between Queen Alexander Dock and further East are all above 10 m AOD, there is a continue natural defence line. **No flooding is expected in this event from either a fluvial or Tidal source**

A1.15 (TAN15) provides indicative thresholds of flooding where development could be considered suitable for development subject to an assessment of the consequences of flooding. The Q1000 flood event is at a probability (1 in 1000 years), hence very unlikely although requires consideration for planning purposes.

The same conclusions can be drawn as A1.14. The site is outside the influence of both the River Taff and Coastal Estuary. Due the robust nature of the defences and the fact the barrage is now in place, breaching is highly unlikely.

Additional considerations also need to be given for other risks such as surface water flooding. There are no natural low points at this location which is supported by the flood map for surface water on the NRW website.

The additional criteria of TAN15 are addressed below:

A1.12 – A1.17

The developer must ensure that potential purchasers are aware of flood risk.

- ✓ This can be highlighted through Natural Resource Wales Flood maps that are picked up in Environmental Searches. The proposed properties would not be affected by flooding from the adjacent watercourse.

- ✓ *Effective Flood Warnings can be provided at the site*

  Natural resources Wales have provided information on flooding warning at this site

  A flood warning system is in place for this area. Natural Resources Wales (NRW) provide a staged warning service along the River Taff. The service encompasses the threat of flooding from both tidal and river flows.

  Escape and Evacuation routes must be show to be operational under all conditions

- ✓ The access routes immediately adjoin the public highway and leads to an area that is outside any flooding influence.

  No flooding Elsewhere

- ✓ As the site is not at risk there will be no additional footprint within the floodplain, and neither will there be any additional surface water runoff. However, a more comprehensive drainage strategy will be produced to incorporate, where possible, sustainable drainage systems to reduce the amount of the surface water runoff that goes into the existing network.

10.0 Conclusions.

Flood Risk has been considered from various sources and it is apparent that the area is very low risk. The detailed flood risk modelling indicates that once defences are taking into account the site is not impacted.

A comprehensive drainage strategy will be required to ensure that surface water runoff from the site is appropriately managed.

Appendix A

Site Location

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Site Plan

Site Location Plan