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BRADLEY MILL, WREXHAM
FLOOD CONSEQUENCES ASSESSMENT
Final Report v1.0

September 2011



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Flood Consequences Assessment
Final Report v1.0

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CONTENTS

	Page
Signature Sheet	i
Contents	ii
List of Tables, Figures & Appendices	iii
1 INTRODUCTION	1
1.1 SITE LOCATION	1
1.2 EXISTING AND PROPOSED DEVELOPMENT	1
1.3 SITE LEVELS	1
1.4 ACCESS AND EGRESS.....	2
2 TECHNICAL ADVICE NOTE 15 (TAN15)	3
2.1 DEVELOPMENT ADVICE MAP	3
2.2 ENVIRONMENT AGENCY WALES FLOOD MAP	3
3 FLOOD RISK	5
3.1 RIVER ALYN	5
4 MITIGATION MEASURES	7
4.1 FLOOD MITIGATION	7
4.2 ACCESS AND EGRESS.....	7
5 SURFACE WATER.....	8
6 CONCLUSIONS.....	9
7 RECOMMENDATIONS	10

LIST OF TABLES

Table 1: Modelled Flood Levels on Site	5
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LIST OF FIGURES

Figure 1: Site Location.....	1
Figure 2: Development Advice Map	3
Figure 3: Environment Agency Wales Flood Map	4
Figure 4: River Alyn	5

LIST OF APPENDICES

Appendix A:	Topographic Survey
Appendix B:	Weetwood <i>River Alyn Modelling Study</i> (September 2011)

1 INTRODUCTION

Weetwood has been instructed by JMC Construction & Groundworks to undertake a Flood Consequences Assessment (FCA) for the proposed redevelopment of the former Bradley Mill, Wrexham, in accordance with the requirements of Technical Advice Note 15 (TAN15): Development and Flood Risk.

1.1 SITE LOCATION

The site is located at Ordnance Survey National Grid Reference SJ 326 544, as shown in **Figure 1**.

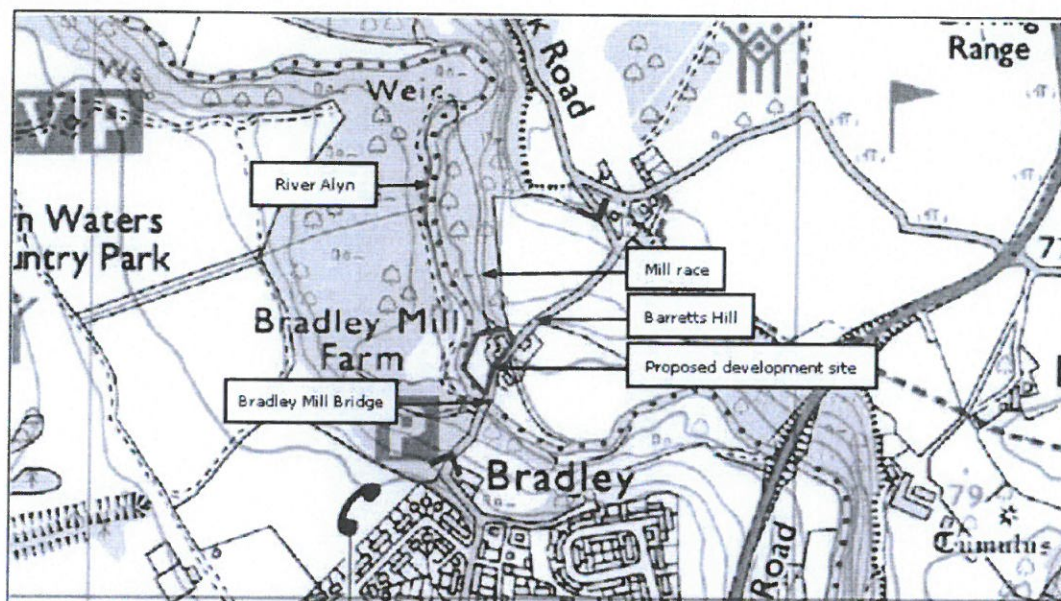


Image reproduced with permission of Ordnance Survey and Ordnance Survey of Northern Ireland

Figure 1: Site Location

1.2 EXISTING AND PROPOSED DEVELOPMENT

The site is currently occupied by a barn, a number of outbuildings and part of the old stone mill building.

Proposals are for the conversion of the existing barn to one residential dwelling.

Residential development is classified as '*highly vulnerable development*' under TAN15.

1.3 SITE LEVELS

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

Site levels are shown to fall from 53.00 metres Above Ordnance Datum (m AOD) in the north-east to 50.00m AOD towards the River Alyn.

Finished floor levels of the existing barn are currently at a level of 51.42m AOD.

1.4 ACCESS AND EGRESS

Access and egress to the site is provided via Barretts Hill, which borders the south-eastern boundary of the site.

Levels along this route are shown to rise in a north-easterly direction from a level of 51.74m AOD at Bradley Mill Bridge to over 52.00m AOD.

2 TECHNICAL ADVICE NOTE 15 (TAN15)

2.1 DEVELOPMENT ADVICE MAP

The Development Advice Maps are used for planning purposes associated with the use of TAN15. According to the latest Development Advice Map, the site is located partially within Zone C2 and Zone B (**Figure 2**).

Zone C is based on Environment Agency Wales's (EAW) extreme flood outline, equal to or greater than 0.1%, assuming that no defences exist. Zone C2 is an area of the floodplain without significant flood defence infrastructure.

Zone B is defined as areas known to have flooded in the past evidenced by sedimentary deposits.

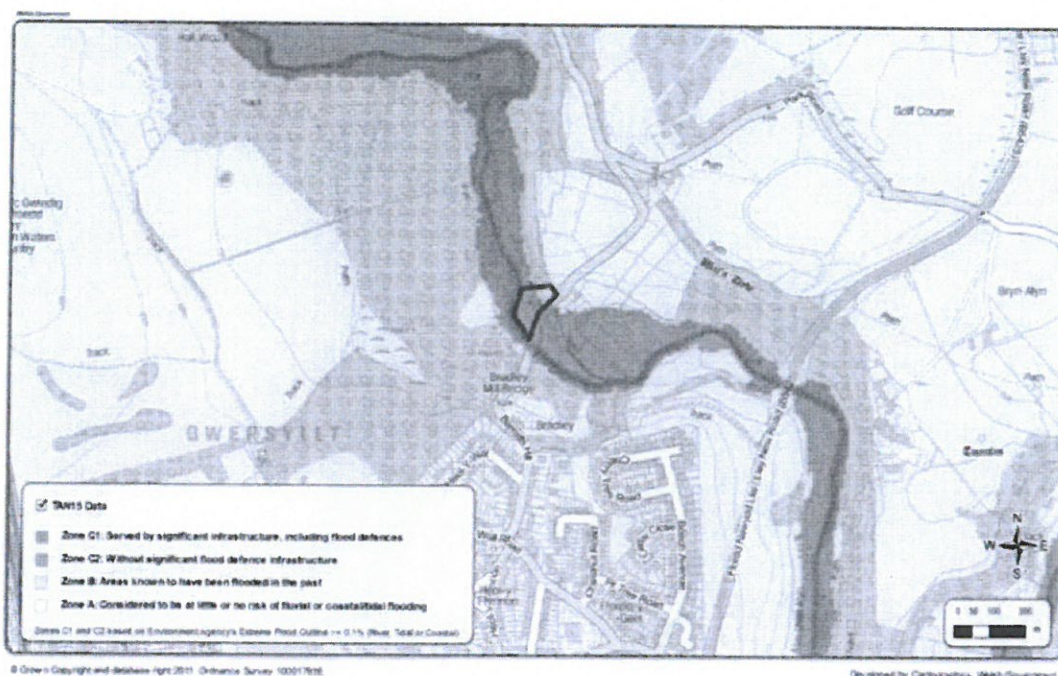
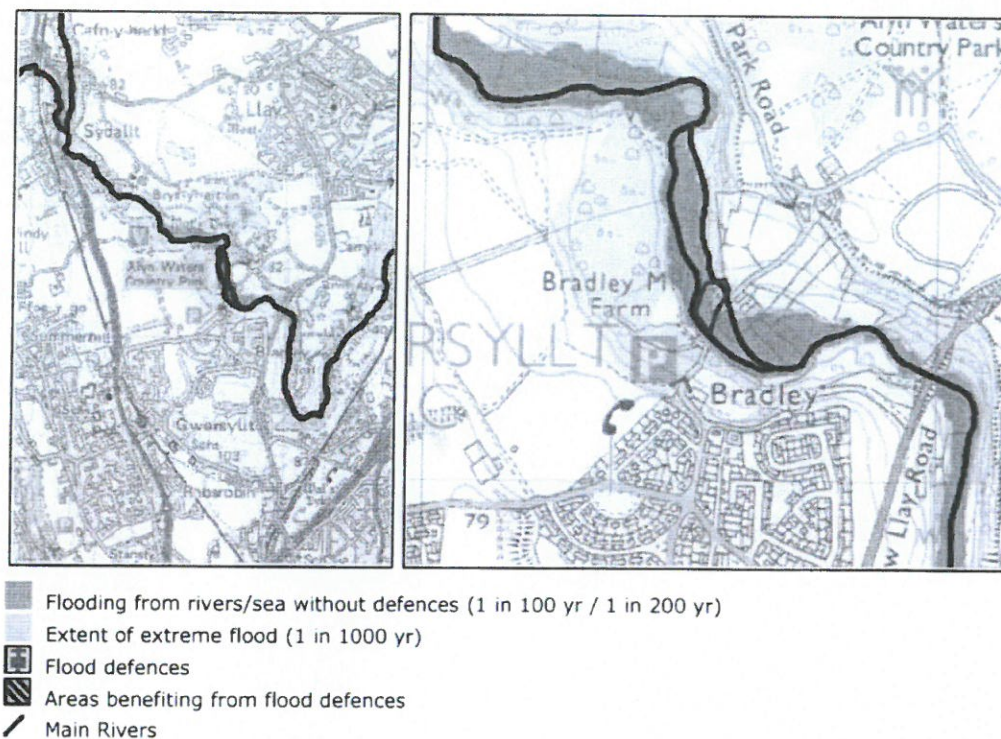


Figure 2: Development Advice Map

2.2 ENVIRONMENT AGENCY WALES FLOOD MAP

According to EAW's flood map (**Figure 3**), the site is located within the 1 in 100 year fluvial flood outline.



Environment Agency Wales, 100026380, 2010

Figure 3: Environment Agency Wales Flood Map

3 FLOOD RISK

3.1 RIVER ALYN

The River Alyn (**Figure 4**) flows in a southerly direction along the western boundary of the proposed development site. A weir is located upstream of the site. Historically, this controlled flow within the River Alyn and the adjoining mill race, which fed the old mill buildings on site. However, the in-channel section of the weir has now been demolished, with the mill race subsequently becoming inactive.

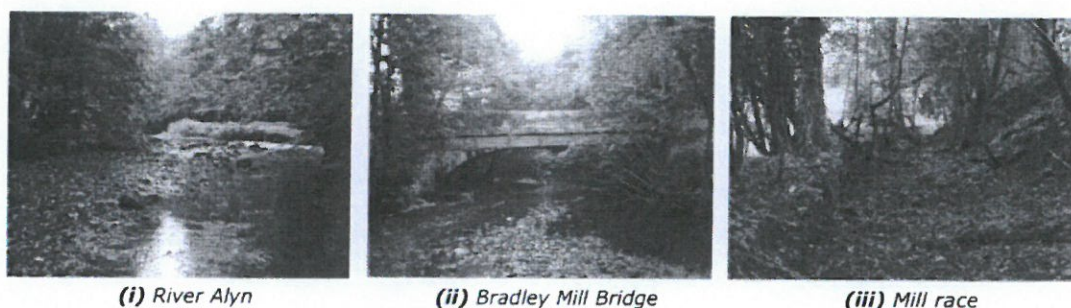


Figure 4: River Alyn

EAW does not hold any model data for this reach of the River Alyn. In order to identify and assess the level of flood risk from this source a 1D-2D, ISIS-TUFLOW model has been developed by Weetwood as detailed within the *River Alyn Modelling Study* report (**Appendix B**). The model outputs are discussed in further detail in the following section.

3.1.1 Modelled Flood Levels & Extents

The 1 in 100 year, 1 in 100 year plus climate change and 1 in 1000 year events have been modelled.

The model outputs (**Annex D** of the Weetwood *River Alyn Modelling Study*) indicate that only the lower lying area of the site immediately adjacent to the River Alyn, is expected to flood in up to a 1 in 100 year plus climate change event. The existing developed area of the site is shown to remain flood free.

In a 1 in 1000 year event, floodwaters are shown to encroach slightly onto the western boundary of the existing developed area of the site. However, the majority of the site continues to remain flood free.

Table 1 summarises the maximum flood levels on site.

Table 1: Modelled Flood Levels on Site

	1 in 100 yr	1 in 100 yr + cc	1 in 1000 yr
Peak flood level (m AOD)	50.67	50.96	51.40

Given that the floor level of the existing barn is at 51.42m AOD, no inundation would be expected in up to a 1 in 1000 year event.

The residual risk of flooding from this source will be mitigated through implementation of the measures proposed in **Section 4** of this report.

3.1.2 Flood Map Challenge - Weetwood Flood Zone Designation

The 1 in 100 year and 1 in 1000 year flood outlines provided within Annex D of the *Weetwood River Alyn Modelling Study* should be utilised in order to update EAW's existing flood map.

This will in turn result in a reclassification of the existing developed area of the site as Zone A (i.e. *land considered to be at little or no risk of fluvial flooding*)/Zone B (i.e. areas known to have flooded in the past evidenced by sedimentary deposits).

4 MITIGATION MEASURES

4.1 FLOOD MITIGATION

Model sensitivity was assessed as part of the *Weetwood River Alyn Modelling Study*. This included an assessment of the consequences associated with a partial blockage of the Bradley Mill Bridge and subsequent reduction in capacity by 50% during a 1 in 100 year plus climate change event. During such a scenario, peak flood levels were shown to be increased by approximately 0.14m, with a peak flood level of 51.10m AOD expected on site.

As detailed in **Section 1.3** the floor level of the existing barn building is at a level of 51.42m AOD. This provides a freeboard of 0.32m above the 1 in 100 year plus climate change flood level expected at the site when considering bridge blockage.

With a high level of confidence attributed to the *Weetwood River Alyn Modelling Study*, and recognising that the developable area of the site is situated outside the 1 in 100 year plus climate change flood outline, this is considered sufficient to mitigate against any residual risk of flooding from this source.

4.1.1 Main River

The River Alyn is classified as a 'Main River'. EAW therefore has discretionary powers, within the Water Resources Act 1991, to carry out works to the River for which access must be maintained. The Land Drainage Byelaws require the EA's prior written consent for *Works Affecting Watercourses* for any proposed works or structures in, over, under or within a distance of 8 metres from the top of the banks of the River. This shall not be unreasonably withheld.

No development is proposed within 8m of the watercourse.

4.2 ACCESS AND EGRESS

Access and egress to the site will continue to be provided via Barretts Hill following development.

This is shown to remain flood free in up to a 1 in 1000 year event and will therefore provide dry access and egress to the site.

5 SURFACE WATER

Proposals are for the conversion of an existing building. There will be no increase in impermeable areas at the site as a result of the development. Attenuation of surface water runoff is therefore not deemed to be necessary.

6 CONCLUSIONS

There are proposals for the redevelopment of the former Bradley Mill, Wrexham.

According to the TAN15 Development Advice Maps the proposed development site is located partially within Zone C2 and Zone B.

The River Alyn is located along the western boundary of the proposed development site. A weir is located upstream of the site. Historically, this controlled flow down the River Alyn and the adjoining mill race feeding the old mill buildings on site. However, the in-channel section of the weir has now been demolished, with the mill race subsequently becoming inactive.

In order to identify and assess the level of flood risk from the River Alyn, a 1D-2D, ISIS-TUFLOW model has been developed by Weetwood as detailed within the *River Alyn Modelling Study* report. The model outputs indicate that only the lower lying area of the site, immediately adjacent to the River Alyn, is expected to flood in up to a 1 in 100 year plus climate change event. In a 1 in 1000 year event, floodwaters are shown to encroach slightly onto the western boundary of the existing developed area of the site. However, the majority of the site continues to remain flood free. A peak flood level of 51.40m AOD is expected in a 1 in 1000 year event. With finished floor levels of the existing barn at a level of 51.42m AOD, no inundation would subsequently be expected.

The 1 in 100 year and 1 in 1000 year flood outlines provided within Annex D of the Weetwood *River Alyn Modelling Study* should be utilised in order to update EAW's existing flood map. This will in turn result in a reclassification of the existing developed area of the site as Zone A/Zone B.

Model sensitivity was assessed as part of the Weetwood study. A reduction in the capacity of the Bradley Mill Bridge by 50% during a 1 in 100 year plus climate change event was shown to result in a peak flood level of 51.10m AOD at the site. The floor level of the existing barn building is currently at 51.42m AOD. This provides a freeboard of 0.32m above the flood level expected during such a scenario and is considered sufficient to mitigate against any residual risk of flooding from this source.

Dry access and egress to the site can be provided via Barretts Hill in up to a 1 in 1000 year event.

There will be no increase in impermeable areas at the site as a result of the development. Attenuation of surface water runoff is therefore not deemed to be necessary.

7 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 level to be retained at a minimum of 51.42m AOD