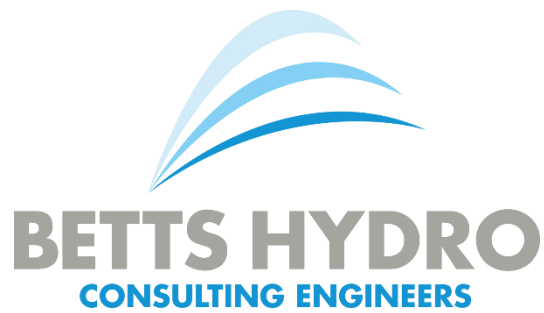




**LAND OFF ROSSETT ROAD
ROSSETT**

FLOOD CONSEQUENCE ASSESSMENT



For

Castle Green
Unit 20
St Asaph Business Park
St Asaph
Denbighshire
LL17 0LJ

The logo for Castle Green, featuring the text 'Castle' followed by four vertical bars of increasing height and then 'Green', all in white on a dark green rectangular background.

JANUARY 2021

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LAND OFF ROSSETT ROAD ROSSETT FLOOD CONSEQUENCE ASSESSMENT

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Prepared by:



Megan Berry BSc (Hons) MCIWEM
Graduate Flood Risk Analyst

Checked by:



Kirsty Williams BSc (Hons) MCIWEM
Associate

Authorised by:



Richard Nicholas BEng (Hons) MBA MCIWEM
Director

Revision History:

Rev.:	Date:	Status:	Prepared by:	Checked by:	Issued by:
0	27.01.2021	DRAFT	MB	KW	MB

Old Marsh Farm Barns
Welsh Road, Sealand
Flintshire CH5 2LY
Telephone: 01244 289 041



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EXECUTIVE SUMMARY

This Flood Consequence Assessment and Drainage Management Strategy was commissioned by Castle Green, referred to hereafter as 'the client'. This report has been prepared to support a planning application for residential development on land off Rossett Road in Rossett. The site is located mostly within Flood Zone A on the Development Advice Map, with a small slither of Flood Zone B shown to encroach into the northern development parcel. The proposals are residential in nature, which is classified as 'highly vulnerable' within Welsh Government Planning Policy and this nature of development is acceptable when located within Flood Zone A and B (in accordance with TAN15).

The Development Advice Map notes that most of site is located within Flood Zone A and means there is little or no fluvial flood risk. The small part of the site shown to be in Flood Zone B is an area which historically flooded, and this assessment has concluded that this historical flooding was likely to be associated with the existing land drainage system to the north of the site. It should be noted that no historical flooding has been identified through our various consultations as part of this assessment.

This Flood Consequence Assessment has reviewed all the potential sources of flood risk both to and resulting from the development proposals, including fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources. The nearest Main River to the site is the River Alyn which is located 180m to the south of site, the Alyn flows east and eventually outfalls into the River Dee. Although the potential direct flood risk from the south is low, discussion with NRW has identified that there is the potential for upstream exceedance and routing towards the site in the extreme 1 in 1000yr plus 30% Climate Change event and the residual 1 in 100yr plus 80% blockage event.

The National Resource Wales Mapping shows the site remains flood free in the 1 in 100yr, 1 in 1000yr and 1 in 100yr plus 30% Climate Change events. The NRW modelling outputs that flooding onsite occurs in the 1 in 1000yr plus 30% Climate Change event and in the 1 in 100yr event with 80% blockage applied to Chester Road Bridge. It is understood that those parts of site shown to be at risk are generally at risk of flood depths between 10mm to 80mm in these events based on the current onsite topographic survey. There is however a naturally low-lying area within the Northern Development Parcel which is at greater risk and has potential depths between 290mm and 350mm.

The National Resource Wales model provided however only includes data for simulating the 1 in 100yr and 1 in 1000yr events, with up to 30% allowance for Climate Change. The current guidelines for Climate Change on the River Dee catchment (in which the River Alyn falls under) is for an allowance of 25% for the Higher Central (70th percentile) estimate and 45% for the Upper (90th percentile) estimate on top of the 1 in 100yr return period event. To accurately assess the flood risk to the site both in the present and future, updated hydraulic modelling simulations being carried out to consider up to 45% allowance for Climate Change for both the 1 in 100yr and 1000yr return period event.

Consultations with Natural Resources Wales, Welsh Water and Flintshire County Council have been carried out as part of this assessment and they have not identified any historical flooding onsite. There are however reported incidents of flooding to the wider Rossett area in 2000, 2003

and 2019 due to an extreme and prolonged rainfall event that caused the River Alyn to burst its banks and flood the neighbouring highways and fields.

As part of the northern parcel is shown to be located in Flood Zone B, it has been assumed that this historical flooding must be associated with the and drainage system adjacent to the north. This system takes overland flow from the site and surrounding land drainage systems, along with some flows from the formal surface water infrastructure serving the residential development to the west of the site. Historically due to prolonged rainfall events, downstream blockages or inconsistent maintenance, this system is thought to have exceeded capacity and due to the existing low lying ground levels in the northern part of site some onsite flooding was assumed to have occurred.

Overall, the site is at 'low' flood risk from most of the flood sources reviewed including surface water flooding. There are some parts of the site more susceptible to flooding due to the existing topography and the existing land drainage ditch systems although the planning proposals show that those areas at greatest risk from surface water (or neighbouring the land drainage system) will consist of minimum development where practical. Residual flood risks can however be reduced and effectively managed as part of the proposals, through the implementation of mitigation measures proposed, along with ensuring space for water is incorporated into the development layout.

This Flood Consequence Assessment is commensurate with the site and in summary, the development can be considered appropriate in accordance with TAN15, providing the mitigation measures proposed within are included within the development proposals.

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Specialist Software

-  Flood Estimation Handbook FEH– Determination of Catchment Descriptors and depths of rainfall.

- MicroDrainage WinDES (v.14.1) – Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
BGS	British Geological Survey
CC	Climate Change
CFMP	Catchment Flood Management Plan
DAM	Development Advice Map
FCA	Flood Consequence Assessment
FEH	Flood Estimation Handbook
Ha	Hectare
LDP	Local Development Plan
LFRDP	Local Flood Risk Development Plan
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	metres Above Ordnance Datum
NGR	National Grid Reference
NRW	National Resources Wales
NSRI	National Soil Resource Institute
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPW	Planning Policy Wales
QSE	Quick Storage Estimate
SFCA	Strategic Flood Consequence Assessment
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
TAN15	Technical Advice Note 15

UKCIP	United Kingdom Climate Impacts Programme
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WW	Welsh Water
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WCBC	Wrexham County Borough Council
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1.0 INTRODUCTION

1.1 Planning Policy Context

- 1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. Planning Policy Wales (PPW) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the PPW, Technical Advice Note 15, (TAN15) 'Development and Flood Risk' issued in July 2004.

Technical Advice Note 15

- 1.1.2 TAN15 provides technical guidance to supplement the policy's set out in PPW with regards to 'development and flood risk', a framework is provided to enable new development to be considered appropriately with regards to risks from fluvial and tidal flooding along with risks associated with additional run-off from development in all locations (see **Appendix A**).

Sustainable Drainage Approving Body (SAB) Requirements

- 1.1.3 From January 2019, all new developments of at least 2 properties or over 100m² in Wales will be required to have Sustainable Drainage Systems (SuDS) to manage surface water run-off generated by the proposals. These SuDS must be designed and constructed in accordance with the Welsh Government standards for sustainable drainage. Schedule 3 of the Flood and Water Management Act 2010 (FWMA) establishes Wrexham County Borough Council as a SuDS Approving Body (SAB).
- 1.1.4 The SAB have statutory responsibility for approving and where appropriate adopting the proposed drainage systems on new developments. The SAB application is undertaken separately to the planning permissions and developers are required to obtain both planning approval and SAB approval prior to commencement of any proposed construction works.
- 1.1.5 This Flood Consequence Assessment and Drainage Management Strategy is to support the proposed planning application and full SAB approval will need to be sought separately by the developer once more details are available for the drainage proposals. As part of the proposals initial pre-application SAB discussion is underway to identify their preferences for the surface water management regime and those SuDS features being proposed.

1.2 Site Context

- 1.2.1 This Flood Consequence Assessment (FCA) has been prepared to support an outline planning application for residential development on land off Rossett Road in Rossett. The site is shown to be located within Flood Zone A and partly within Flood Zone B on the Development Advice Map (DAM).
- 1.2.2 A FCA is required to justify that the development is appropriate with reference to TAN15, this report will provide justification that;

- The consequences of flooding to the development (and elsewhere) have been fully considered and mitigated for during the lifetime of the development.
- No increase in flooding will occur to the development site or surrounding area due to the proposals including flooding from surface water and sewers.

1.3 Consultation

- 1.3.1 The report has been prepared in consultation with Natural Resources Wales (NRW), Welsh Water (WW) and Wrexham County Borough Council (WCBC). The consultations responses (where received) have been appended and can be seen in **Appendix B, C and D** respectively.
- 1.3.2 The Local Planning Authority (LPA), Wrexham County Borough Council, will make the final decision with regards to any planning permissions. The LPA should however consult with NRW who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications. WCBC also acts as the Lead Local Flood Authority and will be a key statutory consultee on the application in terms of flood risk and drainage.

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2.0 EXISTING SITE BACKGROUND

2.1 Location

- 2.1.1 The site is accessed off Rossett Road in Rossett. The Ordnance Survey National Grid Reference (OS NGR) for the site is E: 337284, N: 357242 and the nearest postcode is LL12 0DZ (full location plan is included in **Appendix E**). The total site covers 6.27ha and is divided into two separate parcels by Rossett Road. The Northern Development Parcel covers 2.83ha and the Southern Development Parcel covers 3.44ha. The parcels are edged in red in **Figure 1**. The site is bounded to the north, east and south by undeveloped agricultural land. To the west of site however is the main village of Rossett with both residential and commercial development.



2.2 Existing and Historical Land Use

- 2.2.1 The site is undeveloped at present and comprises of low-density vegetation with some taller shrubs along the site boundaries. The site is currently used for agricultural purposes, and no other historical uses have been identified as part of this assessment. Review of the online historic mapping identified a historic land drain to be located within the

boundary of the Northern Development Parcel. The land drain flows north into a pond which is understood to be fed by overland run-off from the site and the surrounding undeveloped agricultural land.

2.3 Topography

- 2.3.1 TAN15 requires all sources of flood risk to be considered and analysed with reference to the current levels of the site, a full topographical survey has been carried out and is included in **Appendix F**. The survey identified the Northern Development Parcel falls from the south-western boundary at a level of 13.5mAOD, down towards the northern corner at a level of 11.25mAOD. The Southern Development Parcel also falls from the south-west at a level of 14.30mAOD down to a level of 12.85mAOD adjacent to the north-eastern corner (adjacent to Rossett Road and Lane Farm).

2.4 Site Walkover

- 2.4.1 A site walkover was undertaken by Betts Hydro in January 2021 after the region experience heavy rainfall. During the site walkover there was some areas of standing water and saturated ground in existing low-lying areas identified by the topographic survey, as shown in **Figure 2 (Appendix G)**.



Figure 2: Existing Site Features Plan Extract (Betts Hydro, 2021)

2.5 Justification for Development

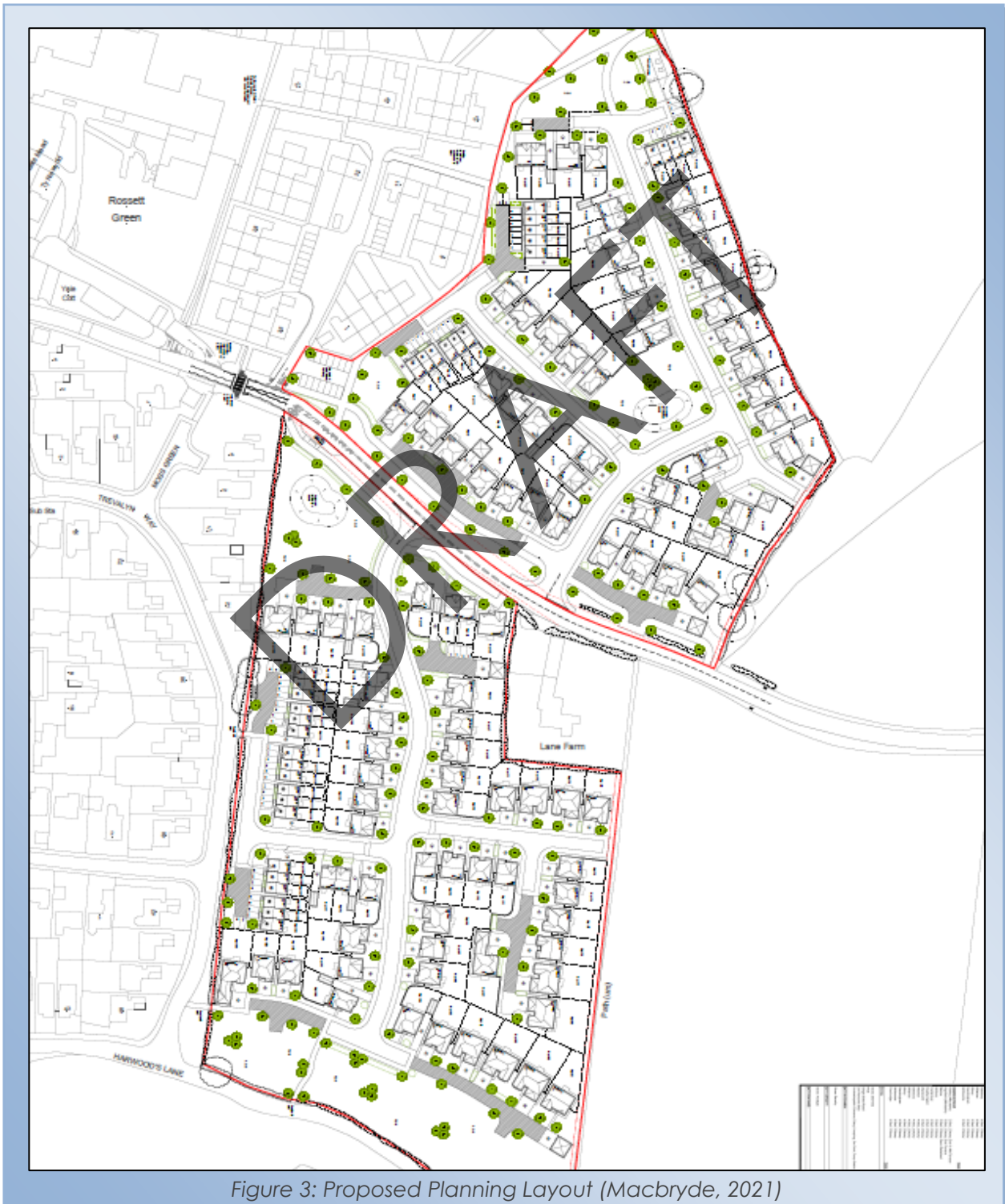
- 2.5.1 Planning Policy Wales (5th Ed. – November 2012) states that the Welsh Government is committed to promoting 'sustainable development' by providing for homes, infrastructure, investment and jobs in a way which is consistent with sustainable development principles PPW Sec. 2.2).
- 2.5.2 The FCA will be considerate to the nature and scale of the proposals and will review flood risk to and from the development along with considering any appropriate mitigation measures based on the identified risks.
- 2.5.3 The development proposals are of a Highly Vulnerable nature and will be located mostly within Flood Zone A with a small section of the Northern Development Parcel being located within Flood Zone B. Mitigation measures have been proposed to safeguard the development against any potential residential flood risks identified and it is considered that the proposals can be justified in accordance with TAN15 Guidance.

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3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

- 3.1.1 This FCA has been prepared to support a planning application for residential development, on land to the north and south of Rossett Road in Rossett. Based on the planning layout (below), the proposals will be complete with access, footpaths, car parking, external works, landscaping, external services, and drainage (**Figure 3**).

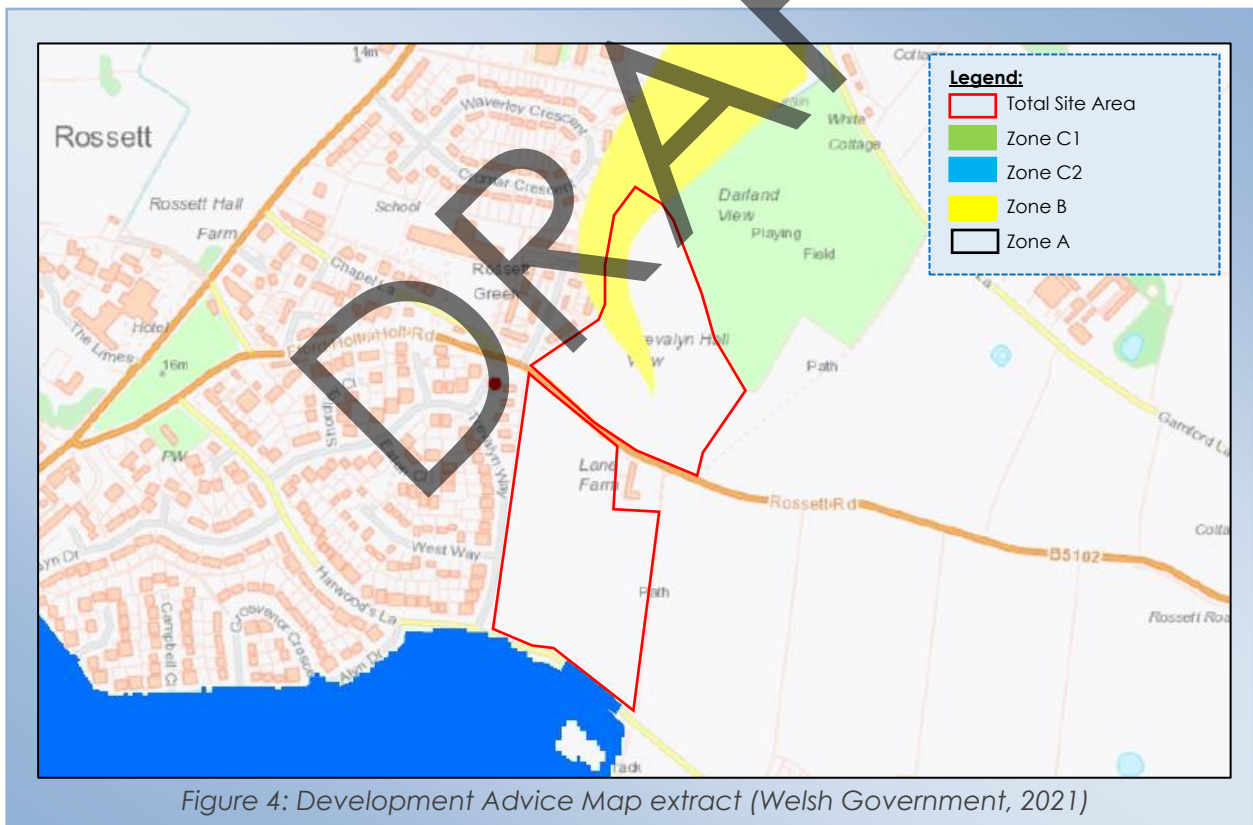


4.0 TECHNICAL ADVICE NOTE 15 (TAN15)

4.1 Flood Zone Classification

4.1.1 The Welsh Government Development Advice Map (DAM) is to be utilised when considering and determining flood risk associated with planning developments within Wales, these maps are based on extreme flood events outlined by the Natural Resources Wales (NRW) and British Geological Survey (BGS) data (TAN15). The DAM (**Appendix B**) identifies three keys 'Flood Zones' for consideration, which are:

-  **Flood Zone A:** Areas considered to be at little or no risk of fluvial/tidal flooding.
-  **Flood Zone B:** Areas known to have historically flooded based on sedimentary evidence deposits.
-  **Flood Zone C:** Areas considered to be located on floodplain based on EA extreme flood outline data (equal to or greater than 0.1% fluvial/tidal flooding). This zone is subdivided into:
 - Zone C1** - Areas considered to be developed and served by significant infrastructure (flood defences).
 - Zone C2** - Areas considered to be located within natural floodplain without significant flood defences.



4.1.2 The overall site is mostly located within Flood Zone A on the DAM, as illustrated in **Figure 4**. Flood Zone A is an area considered to be at little/no fluvial and/or tidal flood risk. The Northern Development Parcel is however shown to be partially located within Flood Zone B. Flood Zone B is an area known to have historically flooded based on sedimentary evidence deposits.

- 4.1.3 Further investigation with regards to the Flood Zone B area has identified that this part of the site suffered from exceedance flooding associated with the historic land drain during extreme and prolonged rainfall events. Overland flows from the site and the surrounding undeveloped agricultural land enters the land drainage ditch located within the northern corner of the Northern Development Parcel during these extreme and prolonged rainfall events and when the land onsite is saturated, the natural drainage ditch reaches capacity downstream, so the flows exceed the channel onto the low-lying land around. This is understood to be why a small part of the site is shown to be in Flood Zone B.

4.2 Category of Development

- 4.2.1 TAN15 states that some development types may not be considered 'acceptable' based on their vulnerability to the consequences of flooding, identified on the DAM. The vulnerability of different land uses is described in detail in TAN15 however there are three key categories as summarised in **Table 1**. The development proposals are 'highly vulnerable' in nature, based on the planning proposals and TAN15 guidance above.

DEVELOPMENT CATEGORY	DESCRIPTION	TYPES
Emergency Services	Facilities which need to remain operational and accessible at all times.	❖ Hospitals & Ambulance Stations, ❖ Fire & Police Stations, ❖ Coastguard Stations.
Highly Vulnerable	Development where the ability of occupants to decide on whether they wish to accept the risk and manage the consequences associated with flooding is limited.	❖ Residential Developments, Hotels, Caravan Parks, Public Buildings. ❖ Power Stations, Chemical Plants, Waste Disposal.
Less Vulnerable	Development where the ability of occupants to decide on whether they wish to accept the risks associated with flooding is greater than 'highly vulnerable category'.	❖ General Industrial, ❖ Commercial Developments, ❖ Utilities Infrastructure, ❖ Transport.

Table 1: Development Categories of Vulnerability (Source: TAN15: Section 5)

4.3 Acceptability Criteria

- 4.3.1 Various criteria are identified within TAN15 (Section 7), these are used to determine whether residential development is 'acceptable' based on the nature and scale of proposals. Appropriate management should be considered with any proposed consequences of potential flooding.
- 4.3.2 The proposals are classified as 'highly vulnerable' in accordance with TAN15 and are located within Flood Zone A and B, therefore the proposals are not at risk from fluvial/tidal flooding. In accordance with TAN15 highly vulnerable development is considered acceptable within Flood Zone A, providing surface water is appropriately managed. Section 5.0 of this report assesses flood risk and the consequences of flooding in accordance with the above.

5.0 SOURCES OF FLOOD RISK

5.1 Fluvial Flood Risk

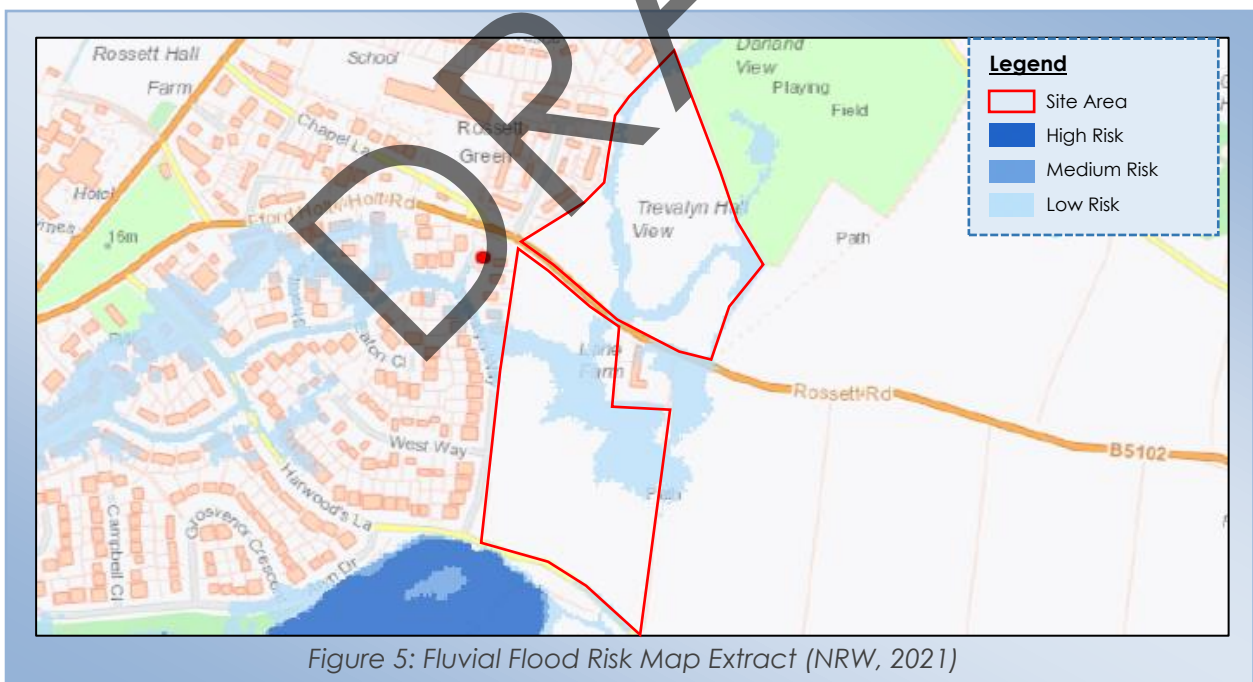
5.1.1 Information relating to the flood risk at the site has been obtained from the Welsh Government's DAM and the Natural Resources Wales (NRW) online Flood Mapping (see **Appendix B** for full details). Based on the online flood mapping the site is at low risk from flooding associated with fluvial/tidal sources.

5.1.2 The DAM notes the site is located mostly within Flood Zone A (with a small portion in Flood Zone B. This section of the report will however refer to the potential flood risk in terms of the more accurate NRW identified Flood Zones (Flood Zones 1, 2 and 3). NRW more accurately identifies the Flood Zones as:

- Flood Zone 1 as little or no flood risk.
- Flood Zone 2 is the extent of the 1 in 1000yr return period.
- Flood Zone 3 is the extent of the 1 in 100yr return period.

Based on this mapping (**Appendix B**), the site is shown to be located wholly within Flood Zone 1 and would therefore be considered at little or no fluvial flood risk.

5.1.3 The long-term flood risk mapping data (also provided by NRW) has however identified some parts of the site to be at low risk from fluvial flood risk as shown in **Figure 5**. The mapping classifies areas at low risk as being at risk of flooding between the 1 in 100 year and 1 in 1000 year return period event.



Main River(s)

5.1.4 The nearest Main River to the site is the River Alyn which is located 180m to the south of the Southern Development Parcel. The River Alyn flows east and eventually outfalls into the River Dee located 2.8km east of site. The flood risk associated with these sources is mostly very low to low given their location in relation to site and the wider catchment topography (see mapping in **Appendix B**).

- 5.1.5 Based on the mapping (**Figure 5**), it is understood that the exceedance in the upstream River Alyn channel, has the potential to direct naturally with ground levels towards the site via the adjacent residential development (Trevalyn Way). Flows would potentially enter the site on the western boundary in some events and convey through the site, from the southern parcel to the northern parcel, with the natural low-lying levels before exiting the site into the land drainage network to the north (as shown within **Figure 5**).
- 5.1.6 When the existing topographic levels onsite in those areas shown to be at low risk from fluvial flooding are considered these low-risk areas coincide with the natural conveyance routes (low-lying corridors) present through the site. It should also be noted that this online flood mapping data only considers the existing ground levels (LiDAR) and direct rainfall within the catchment to identify potential flood extents. There are other elements which would potentially influence the level of flooding that are not considered by this type of mapping including the existing ground conditions, formal or land drainage in place or any engineering changes which would result as part of future development.
- 5.1.7 NRW have been consulted to ascertain the potential flood risk to the site from the River Alyn in these potential exceedance events (see Rossett Road Flood Risk Study within **Appendix B**). They have provided additional information on the flood risk. The modelling outputs provided by NRW identify Top Water Levels (TWL) onsite during key flood events.
- 5.1.8 The information provided identifies that the site remains flood free during the defended and undefended 1 in 100yr, 1 in 1000yr and 1 in 100yr plus 30% Climate Change (CC) events (see mapping outputs included within **Appendix B**). The site is however identified to be at low risk of flooding during the more extreme defended 1 in 1000yr plus 30% CC event and in the residual 1 in 100yr plus 80% blockage (Chester Road Bridge) event.
- 1 in 1000yr plus 30% Climate Change Event**
- 5.1.9 During the extreme 1 in 1000yr plus 30%CC event, flows are shown to exceed the River Alyn upstream and convey towards the site through the residential development to the west. It is also understood that flows enter the site from the south via Hardwood's Lane. The TWL's identified by NRW's dataset (illustrated in **Figure 6**) during the 1 in 1000yr plus 30%CC event have been compared against the existing ground levels identified by the topographic survey.
- 5.1.10 **Table 2** shows the existing levels against the potential TWL's in the 1 in 1000yr plus 30%CC event and has identified that the site is generally at risk of flood depths between 10mm to 80mm. There is however a naturally low-lying area within the Northern Development Parcel (**Node D**) which based on the TWLs compared to existing ground potentially has flood depths up to 290mm.
- 5.1.11 The NRW model provided however only includes data for simulating the 1 in 100yr and 1 in 1000yr events, with up to 30% allowance for CC. The current guidelines for CC on the River Dee catchment (in which the River Alyn falls under) is for an allowance of 25% for the Higher Central (70th percentile) estimate and 45% for the Upper (90th percentile) estimate on top of the 1 in 100yr return period event. To accurately assess the flood risk

to the site both in the present and future, simulations are required in the 1 in 100yr and 1000yr event with up to 45% allowance for CC. In order to accurately understand the flood risk posed by the River Alyn, a hydraulic modelling assessment is currently being undertaken.



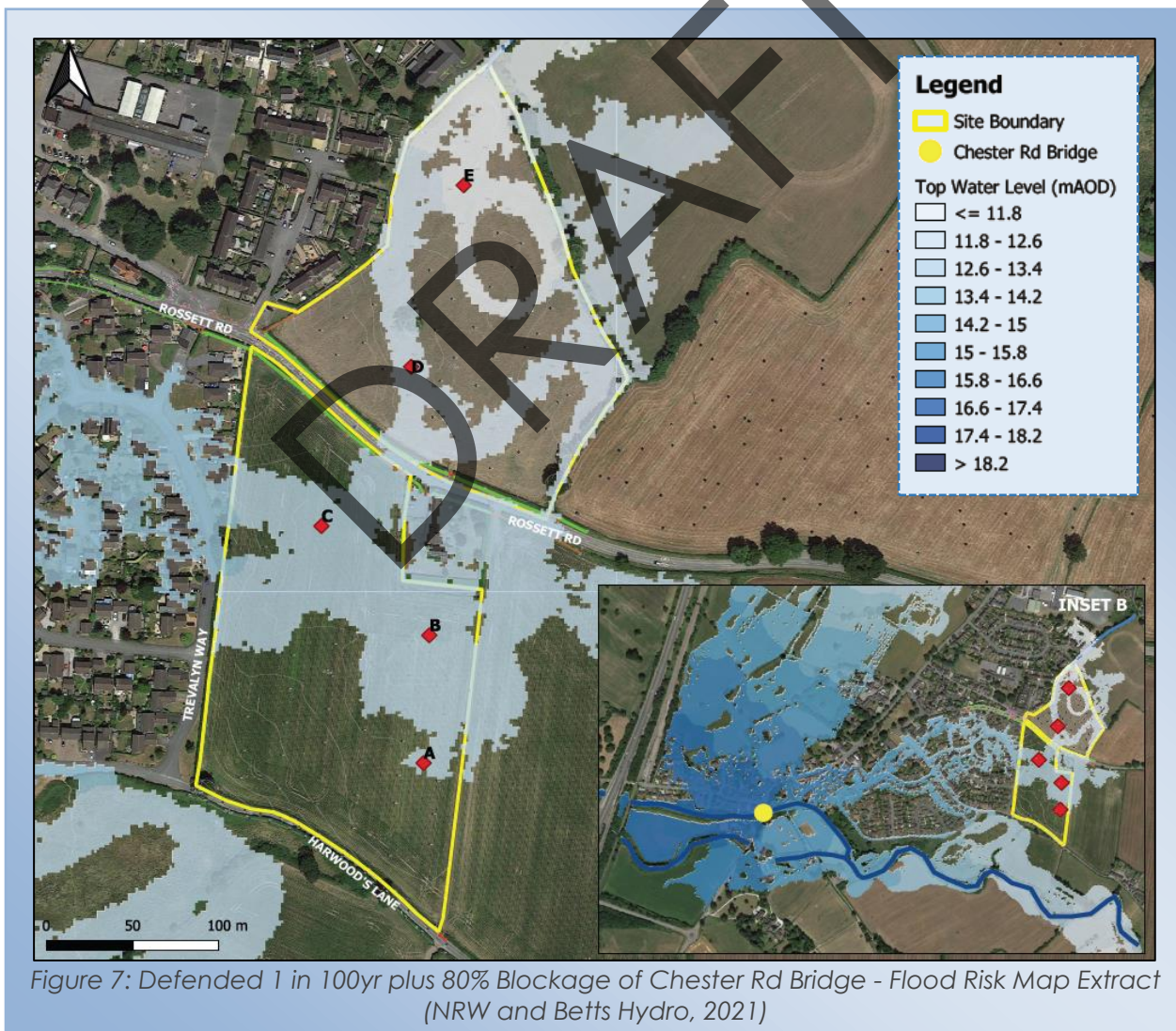
Figure 6: Defended 1 in 1000yr plus 30%CC Flood Risk Map Extract (NRW and Betts Hydro, 2021)

Node	Flood Risk based on the Nodes in Figure 5 in the 1 in 1000yr plus 30% CC event				
	A	B	C	D	E
TWL (mAOD)	12.94	12.85	12.94	12.14	11.70
Existing Ground Level (mAOD)	12.89	12.80	12.86	11.85	11.69
Flood Depth (mm)	50mm	50mm	80mm	290mm	10mm

Table 2: Proposed Flood Risk to the Development Site in the 1 in 1000yr plus 30% CC (Betts Hydro, 2021)

1 in 100yr plus 80% Blockage Event

- 5.1.12 During the residual 1 in 100yr event plus 80% blockage of Chester Road Bridge, both the Northern and Southern Development Parcel are shown to be impacted by low levels of flooding, as shown within **Figure 7**. Exceedance in the upstream channel of the River Alyn, has the potential to direct naturally towards the site area via the adjacent residential development Trevalyn Way. Flows would potentially enter the site on the western boundary and convey through the site, from the Southern parcel to the Northern parcel with the natural levels before exiting into the land drainage network. This is however considered to be a residual risk event.
- 5.1.13 During this residual flood risk event the development site would be generally at risk of flood depths between 10mm to 150mm, when compared to the existing ground levels (see **Table 3**). There is however a naturally low-lying area within the Northern Development Parcel that is identified to be at risk of flood depths up to 350mm, however this is an isolated area of site and the risk to the rest of site is understood to be significantly lower.



Node	Flood Risk based on Nodes in Figure 6 in the 1 in 100yr plus 80% Blockage of Chester Road Bridge				
	A	B	C	D	E
TWL (mAOD)	12.86	12.86	13.01	12.20	11.79
Existing Ground Level (mAOD)	12.89	12.80	12.86	11.85	11.69
Flood Depth (mm)	-	60mm	150mm	350mm	10mm

Table 3: Proposed Flood Risk to the Development Site in the 1 in 100yr plus 80% Blockage of Chester Rd Bridge. (Betts Hydro, 2021)

- 5.1.14 As noted previously this flood risk mapping is based on a pre-development scenario and uses the existing ground levels to ascertain flow routes and risk. For sites such as this (undeveloped) the mapping does not consider factors such as levels changes and incorporation of formal surface water management infrastructure. These factors will often provide improvement and reduce the level of potential flood risk identified.

Proposed Mitigation Measures

- 5.1.15 For 'highly vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of residential dwellings to a minimum of 150mm above the external ground levels. Based on the potential fluvial flood water levels in the extreme scenario events discussed above, it is however proposed that the FFL of the residential dwelling are raised between 300 to 350mm above the external ground levels to ensure the dwelling remain flood free in all events including the 1 in 1000yr plus 30%CC event. By ensuring the FFLs are raised sufficiently above the proposed external levels (following any re-grade) should provide additional resilience against the risk of overland flows associated with a variety of sources, including groundwater and surface water.

- 5.1.16 Along with raising the FFL's, some developers look to incorporate other flood resilience measures to reduce the vulnerability of the proposed residential dwellings, to future residual flooding. Flood resilience measures can assist the future occupants in preparing for future flooding and the dwelling in recovering after a possible flood event. Ground floor rooms can easily be designed with robust and easily cleanable materials and anti-flood/back surge valves and critical services (for example electrical socks etc) can be raised an additional 300mm above the proposed FFL. These measures can be considered as flood resilience techniques and others could also be included in the design in due course.

Land Drainage Ditch

- 5.1.17 The online mapping has also identified a land drainage ditch to be located within the northern corner of the Northern Development Parcel. The currently available flood risk mapping is based predominantly on the Main River networks or watercourses with catchments greater than 2km². The now ephemeral watercourse/land drain located within the Northern Development Parcel has a catchment of less than 1km², is not likely to have been included in the national flood modelling. It is not therefore possible to provide a quantitative assessment of potential flood risk associated with this feature, without more hydraulic modelling. A qualitative assessment of the potential flood risks can still however be provided, as below.

- 5.1.18 Further investigation into this land drainage ditch has identified this area of site is also located within Flood Zone B based on the DAM mapping. This area of site is therefore known to have historically suffered from flooding which is assumed to be linked to the land drainage system present in this location. It is understood that overland flows from the site and the surrounding undeveloped agricultural land enters the land drainage ditch and during extreme and prolonged rainfall events when the land drainage ditch reaches capacity, the flows have the potential to exit the channel and spill into the Northern Development Parcel given the naturally low levels in this northern corner.
- 5.1.19 The existing ground levels within the main development areas onsite have however been identified to be at least 300mm higher than the top of bank of the adjacent land drains channel. With the main development area being elevated in comparison to the natural land drain, the potential risk to the proposals from natural exceedance of the main channel would be minimal given development is offset from the northern corner. The risk will be further reduced post-development once a formal sustainable drainage management scheme is implemented onsite.
- 5.1.20 Generally, ground levels within the site area fall from the south-western boundary down to the northern corner, therefore any residual flood risks associated with exceedance would direct naturally with the existing falls towards the main channel located beyond the northern boundary. Appropriate levels design as part of the proposal can ensure external levels fall away from the proposed dwellings towards the maintained conveyance route(s) through site to mitigate for any residual flood risks associated.
- 5.1.20 Furthermore, when the ground levels within the wider area are considered, levels are shown to naturally fall away from the sites northern boundaries heading in a northerly direction with the watercourse catchment. Should exceedance from the land drain occur during extreme or prolonged rainfall then the natural ground levels would convey exceedance towards the north, in the natural direction of flow.
- 5.1.21 Consultation with the key statutory bodies including the Lead Local Flood Authority and the Local Planning Authorities has not identified any historical flooding at the site because of this Ordinary Watercourse/land drainage system or the requirement to undertake a more detailed assessment of flood risk at this site at this moment in time.

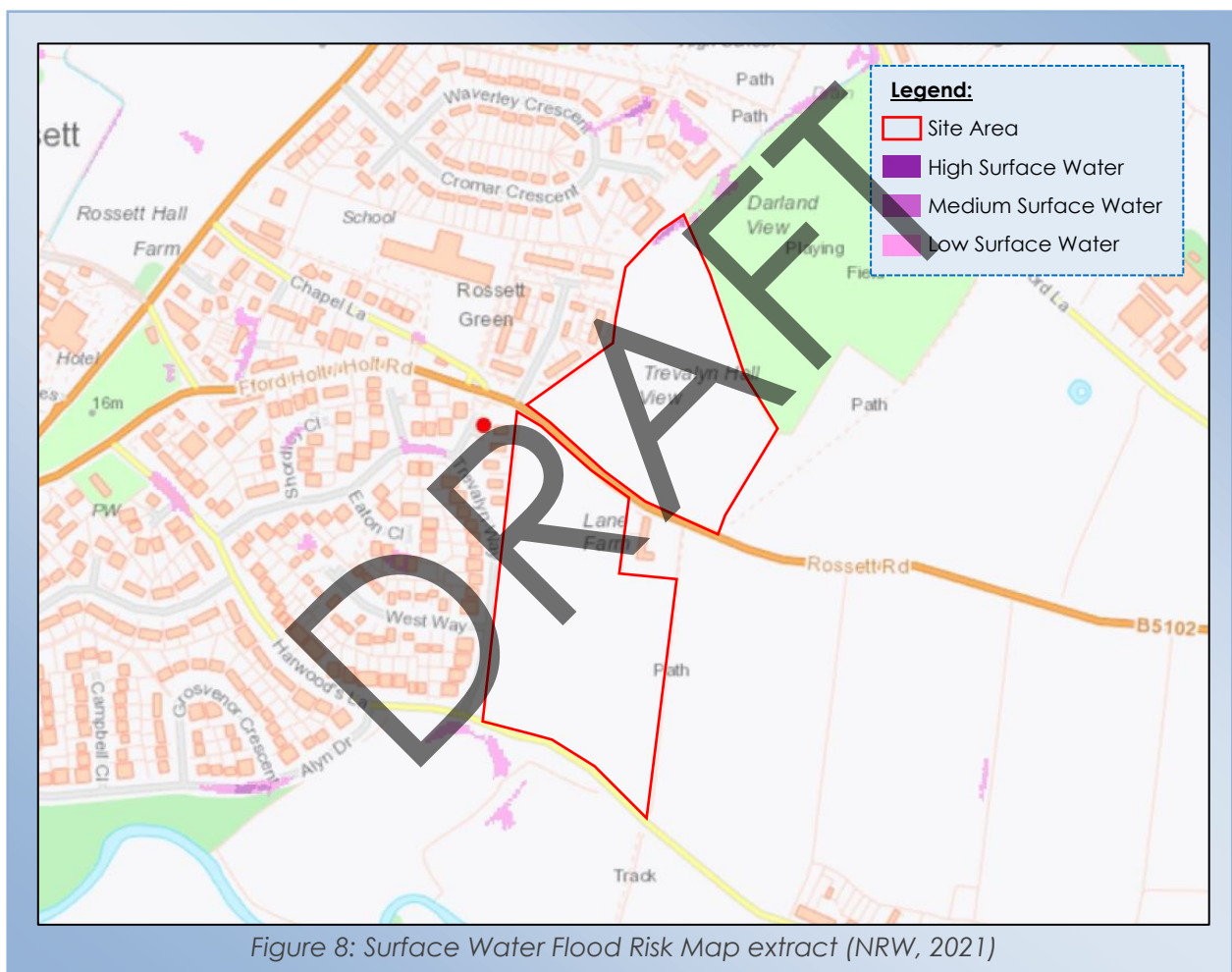
5.2 Tidal Flood Risk

- 5.2.1 The River Dee Estuary is located over 20km to the north of site. Due to the distance from the coast and estuarine waterways the risk of flooding from tidal sources is very low.

5.3 Surface Water Flood Risk

- 5.3.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. An increase in impermeable areas through development can reduce percolation rates at source, therefore increasing surface water run-off. If this run-off is not controlled effectively it can increase the frequency and extent of localised flooding in neighbouring areas of the catchment.

- 5.3.2 TAN15 states therefore that 'the aim should be for new development not to create additional run-off when compared with the undeveloped situation and re-development to reduce the overall run-off where possible' (Section 8.3).
- 5.3.3 The site is shown to be predominantly at 'very low' risk from surface water flooding based on the NRW online mapping (**Figure 8**). There is a small area within the Northern Development Parcels northern corner which is shown to be at higher risk from surface water flooding, but this is due to this area being naturally low-lying next to the land drainage ditch. This increases the likelihood of pluvial/surface water ponding in the extreme storm events when run-off is unable to convey away from the low-lying areas.



- 5.3.4 The proposals are 'highly vulnerable' in nature and not located in those parts of the wider site shown to be at some flood risk from surface water. Any residual risk associated with surface water will need to be catered for through the implementation of a sustainable surface water management regime as part of the proposals. Furthermore, the Finished Floor Levels of proposed dwellings will be elevated above external levels to allow for safe external overland flow routes in the event of exceedance from the main drainage systems (above that which they have been designed for). Any exceedance will be directed through appropriate levels design within the wider site to areas of POS and landscaping to prevent any increased risk to others.

5.4 Pluvial Flood Risk

- 5.4.1 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land use can have a strong influence on the direction and depth of flow. The volume and rate of overland flow from land can be exacerbated if development increases the percentage of impermeable area.
- 5.4.2 Given the neighboring topography and that of the development, there is likelihood of significant pluvial flows impacting on the potential development or on adjacent land/property because of the proposals. Any pluvial flows generated by the site will need to be catered for within the proposals through appropriate management and surface water infrastructure. Any overland flows generated by the potential development must be carefully controlled; safe avenues directing overland flow away from the proposed or existing adjacent buildings are advised.

5.5 Artificial Sources of Flood Risk

- 5.5.1 TAN15 suggests that for development to be 'justified' then all sources of flood risk must be considered both to the development site and arising from the proposals.
- 5.5.2 NRW identify reservoirs as those holding over 25,000cu.m of water; an extract of NRW's online reservoir flood map is included in **Appendix B**. The NRW mapping illustrates that the site is not located within the predicted extents of flooding associated with any local reservoirs. There are also no canals within the immediate vicinity of the development site considered to present a flood risk to the site.

5.6 Groundwater Flood Risk

- 5.6.1 Groundwater flooding is caused by unusually high groundwater levels, it occurs as excess water emerges at the ground surface (or within manmade underground structures). Groundwater flooding tends to be more persistent typically lasting for weeks or months and it can result in significant damage to property.
- 5.6.2 In general terms groundwater flooding can occur from three main sources:
- If groundwater levels are naturally close to the surface, then this can present a flood risk during times of intense rainfall.
 - Seepage and percolation occur where embankments above ground level hold water. In these cases, water travels through the embankment material and emerges on the opposite side of the embankment.
 - Groundwater recovery/rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.

- 5.6.3 No groundwater flood risk has been identified during onsite investigations however shallow groundwater was identified during soakaway testing undertaken by Betts Geo in October 2020. The likelihood of flooding from this source is therefore considered to be low. Should groundwater be encountered during any future construction phase(s) then suitable land-drainage will need to be installed to intercept groundwater flows.

5.7 Sewer Flood Risk

- 5.7.1 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away. It can also occur when the sewer becomes blocked or is of inadequate capacity, this could lead to there being a high risk of internal property flooding with contaminated water.
- 5.7.2 Welsh Water (WW) sewer records have identified public sewer networks to the west in the residential areas and within Rossett Road (refer to sewer records extract in **Appendix C**). Consultation with Welsh Water did not identify any existing sewer flood risk issues or historical flooding of the site, refer to **Appendix C**.

5.8 Historical and Anecdotal Flooding Information

- 5.8.1 An internet-based search for flooding identified that parts of the Northern Development Parcel have been known to have historically flooded, where exceedance encroached on site the northern part of the site due to upstream capacity constraints in land drainage system during prolonged rainfall events. There are also online reports of incidents of flooding to the wider Rossett area in 2000, 2003 and 2019 due to an extreme and prolonged rainfall event that caused the River Alyn to burst its banks and flood the neighbouring highways and fields.
- 5.8.2 Consultation with the various interested parties including WCBC, WW and NRW however failed, to highlight any recorded historical flooding in the immediate vicinity of the site. Review of WCBC's Preliminary Flood Risk Assessment (PFRA) and the Strategic Flood Risk Assessment (SFRA) also did not highlight any historic flooding at or near to the site (some general mapping data is included in **Appendix I**).

5.9 Mitigation Measures and Residual Risks

- 5.9.1 As the site is located within Flood Zone A and partially within Flood Zone 1 on the NRW detailed mapping, the site is at little or no risk from fluvial/tidal flooding. Some mitigation measures have however been discussed below to consider the residual risks associated with other flood sources in compliance with TAN 15.

Mitigation Measures

- 5.9.2 For 'highly vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of residential dwellings to a minimum of 150mm above the external ground levels. Based on the potential fluvial flood water levels in the extreme scenario events discussed above, it is however proposed that the FFL of the residential

dwelling are raised between 300 to 350mm above the external ground levels to ensure the dwelling remain flood free in all events including the 1 in 1000yr plus 30%CC event. By ensuring the FFLs are raised sufficiently above the proposed external levels (following any re-grade) should provide additional resilience against the risk of overland flows associated with a variety of sources, including groundwater and surface water.

- 5.9.3 Any overland flows generated by the development must be carefully controlled and safe avenues directing overland flows away from any proposed properties is advised. Any natural conveyance routes should be maintained through the site, where practical. Where this is not practical then provision will need to be made to intercept and convey flows safely through the proposals to outfall as they would naturally.
- 5.9.4 The Northern Development Parcel is located partially within Flood Zone B. Flood Zone B is an area known to have historically flooded based on sedimentary evidence deposits. Although consultations with various parties have not identified any historical flooding records for the site itself, it is understood that those parts of site shown to be within Flood Zone B are potentially susceptible to exceedance flooding associated with the upstream land drainage system when there are capacity issues during prolonged rainfall events or other scenarios (blockages or poor maintenance). It is therefore advised that this northern-most corner of site remain free from highly vulnerable development to cater for the potential residual risks of future exceedance events.
- 5.9.5 The National Resource Wales model provided however only includes data for simulating the 1 in 100yr and 1 in 1000yr events, with up to 30% allowance for Climate Change. The current guidelines for Climate Change on the River Dee catchment (in which the River Alyn falls under) is for an allowance of 25% for the Higher Central (70th percentile) estimate and 45% for the Upper (90th percentile) estimate on top of the 1 in 100yr return period event. To accurately assess the flood risk to the site both in the present and future, updated hydraulic modelling simulations are being carried out to consider up to 45% allowance for Climate Change for both the 1 in 100yr and 1000yr return period event.
- 5.9.6 To minimise the flood risk to the neighbouring properties and conform to the guidance set out in TAN15, it is proposed that surface water run-off be managed effectively and sustainably in accordance with best practice and standard guidance. It is recommended that the peak rates of surface water run-off generated by the proposals be restricted to the equivalent of the pre-development greenfield situation.
- 5.9.7 A separate Drainage Management Report will be prepared based on the detailed initial drainage discussions carried out with the Local Planning Authority and the sub. The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

6.0 SUMMARY AND CONCLUSIONS

- 6.1 This report has been prepared to support a planning application for residential development on land off Rossett Road in Rossett. The site is located mostly within Flood Zone A on the Development Advice Map, with a small slither of Flood Zone B shown to encroach into the northern development parcel. The proposals are residential in nature, which is classified as 'highly vulnerable' within Welsh Government Planning Policy and this nature of development is acceptable when located within Flood Zone A and B (in accordance with TAN15).
- 6.2 The Development Advice Map notes that most of site is located within Flood Zone A and means there is little or no fluvial flood risk. The small part of the site shown to be in Flood Zone B is an area which historically flooded, and this assessment has concluded that this historical flooding was likely to be associated with the existing land drainage system to the north of the site. It should be noted that no historical flooding has been identified through our various consultations as part of this assessment.
- 6.3 This Flood Consequence Assessment has reviewed all the potential sources of flood risk both to and resulting from the development proposals, including fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources. The nearest Main River to the site is the River Alyn which is located 180m to the south of site, the Alyn flows east and eventually outfalls into the River Dee. Although the potential direct flood risk from the south is low, discussion with NRW has identified that there is the potential for upstream exceedance and routing towards the site in the extreme 1 in 1000yr plus 30% Climate Change event and the residual 1 in 100yr plus 80% blockage event.
- 6.4 The National Resource Wales Mapping shows the site remains flood free in the 1 in 100yr, 1 in 1000yr and 1 in 100yr plus 30% Climate Change events. The NRW modelling outputs that flooding onsite occurs in the 1 in 1000yr plus 30% Climate Change event and in the 1 in 100yr event with 80% blockage applied to Chester Road Bridge. It is understood that those parts of site shown to be at risk are generally at risk of flood depths between 10mm to 80mm in these events based on the current onsite topographic survey. There is however a naturally low-lying area within the Northern Development Parcel which is at greater risk and has potential depths between 290mm and 350mm.
- 6.5 The National Resource Wales model provided however only includes data for simulating the 1 in 100yr and 1 in 1000yr events, with up to 30% allowance for Climate Change. The current guidelines for Climate Change on the River Dee catchment (in which the River Alyn falls under) is for an allowance of 25% for the Higher Central (70th percentile) estimate and 45% for the Upper (90th percentile) estimate on top of the 1 in 100yr return period event. To accurately assess the flood risk to the site both in the present and future, updated hydraulic modelling simulations are being carried out to consider up to 45% allowance for Climate Change for both the 1 in 100yr and 1000yr return period event.
- 6.6 It should be noted that the online long-term flood mapping data is based on existing levels and the direct rainfall on the existing catchment area. The mapping does not consider other factors which would potentially reduce the potential flood risks such as

underlying ground conditions, which in this case are highly permeable so would likely reduce the amount of run-off leaving the site after it enters from the western boundary. Furthermore, this mapping is based on a pre-development scenario and does not account for any proposed engineering levels changes which will result from the development or the incorporation of a formal surface water drainage regime which can be designed to intercept and convey potential incoming flows safely.

- 6.7 Consultations with Natural Resources Wales, Welsh Water and Flintshire County Council have been carried out as part of this assessment and they have not identified any historical flooding onsite. There are however reported incidents of flooding to the wider Rossett area in 2000, 2003 and 2019 due to an extreme and prolonged rainfall event that caused the River Alyn to burst its banks and flood the neighbouring highways and fields.
- 6.8 Furthermore, as part of the northern parcel is shown to be located in Flood Zone B, it has been assumed that this historical flooding must be associated with the and drainage system adjacent to the north. This system takes overland flow from the site and surrounding land drainage systems, along with some flows from the formal surface water infrastructure serving the residential development to the west of the site. Historically due to prolonged rainfall events, downstream blockages or inconsistent maintenance, this system is thought to have exceeded capacity and due to the existing low lying ground levels in the northern part of site some onsite flooding was assumed to have occurred.
- 6.9 Overall, the site is at 'low' flood risk from most of the flood sources reviewed including surface water flooding. There are some parts of the site more susceptible to flooding due to the existing topography and the existing land drainage ditch systems although the planning proposals show that those areas at greatest risk from surface water (or neighbouring the land drainage system) will consist of minimum development where practical. Residual flood risks can however be reduced and effectively managed as part of the proposals, through the implementation of mitigation measures proposed, along with ensuring space for water is incorporated into the development layout.
- 6.10 This Flood Consequence Assessment is commensurate with the site and in summary, the development can be considered appropriate in accordance with TAN15, providing the mitigation measures proposed within are included within the development proposals.

7.0 RECOMMENDATIONS

- 7.1 For 'highly vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of residential dwellings to a minimum of 150mm above the external ground levels. Based on the potential fluvial flood water levels in the extreme scenario events discussed above, it is however proposed that the FFL of the residential dwelling are raised between 300 to 350mm above the external ground levels to ensure the dwelling remain flood free in all events including the 1 in 1000yr plus 30%CC event. By ensuring the FFLs are raised sufficiently above the proposed external levels (following any re-grade) should provide additional resilience against the risk of overland flows associated with a variety of sources, including groundwater and surface water.
- 7.2 Any overland flows generated by the development must be carefully controlled and safe avenues directing overland flows away from any proposed properties is advised. Any natural conveyance routes should be maintained through the site, where practical. Where this is not practical then provision will need to be made to intercept and convey flows safely through the proposals to outfall as they would naturally.
- 7.3 The Northern Development Parcel is located partially within Flood Zone B. Flood Zone B is an area known to have historically flooded based on sedimentary evidence deposits. Although consultations with various parties have not identified any historical flooding records for the site itself, it is understood that those parts of site shown to be within Flood Zone B are potentially susceptible to exceedance flooding associated with the upstream land drainage system when there are capacity issues during prolonged rainfall events or other scenarios (blockages or poor maintenance). It is therefore advised that this northern-most corner of site remain free from highly vulnerable development to cater for the potential residual risks of future exceedance events.
- 7.4 The current guidelines for Climate Change on the River Dee catchment (in which the River Alyn falls under) is for an allowance of 25% for the Higher Central (70th percentile) estimate and 45% for the Upper (90th percentile) estimate on top of the 1 in 100yr return period event. To accurately assess the flood risk to the site both in the present and future, updated hydraulic modelling simulations are being carried out to consider up to 45% allowance for Climate Change for both the 1 in 100yr and 1000yr return period event.
- 7.5 To minimise the flood risk to the neighbouring properties and conform to the guidance set out in TAN15, it is proposed that surface water run-off be managed effectively and sustainably in accordance with best practice and standard guidance. It is recommended that the peak rates of surface water run-off generated by the proposals be restricted to the equivalent of the pre-development greenfield situation.
- 7.6 A separate Drainage Management Report will be prepared based on the detailed initial drainage discussions carried out with the Local Planning Authority and the sub. The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with a 40% allowance for climate change being contained onsite.

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Welsh Water – <http://www.dwrcymru.com/>

APPENDIX A: TAN15 EXTRACTS

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Figure 1

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a 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.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	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.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	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.

Figure 2

Development category	Types
Emergency services	hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood
Highly vulnerable development	all residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites
Less vulnerable development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites

Summary of Policy Requirements

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
A	Emergency services Highly vulnerable development Less vulnerable development Other	- Justification test not applicable - Refer to surface water requirements	No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere.
B	Emergency services	- 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. - Refer to surface water requirements	- Acceptable consequences for nature of use - Occupiers aware of flood risk - Escape/evacuation routes present - Effective flood warning provided - Flood emergency plans and procedures - Flood resistant design - No increase in flooding elsewhere	Generally suitable for most forms of development. Assessments, where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Highly vulnerable development		- Acceptable consequences for nature of use - Occupiers aware of flood risk - Escape/evacuation routes present - Effective flood warning provided - Flood emergency plans and procedures - No increase in flooding elsewhere - Occupiers aware of flood risk - No increase in flooding elsewhere	
	Less vulnerable development		No increase in flooding elsewhere	
	Other	Refer to surface water requirements	No increase in flooding elsewhere	
C1	Emergency services Highly vulnerable development Less vulnerable development	- Application of justification test (section 6), including acceptability of consequences (section 7 and appendix 1) - Refer to surface water requirements	- Acceptable consequences for nature of use - Flood defences adequate - Agreement for construction and maintenance costs secured - Occupiers aware of flood risk - Escape/evacuation routes present - Effective flood warning provided - Flood emergency plans and procedures - Flood resistant design - No increase in flooding elsewhere	Plan allocations and applications for all development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	- Application of acceptability of consequences (section 7 and appendix 1) - Refer to surface water requirements	- Acceptable consequences for nature of use - Occupiers aware of flood risk - Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal - No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1.

DAM	Development Type (Section 5)	Planning Requirements (Section 4)	Acceptability Criteria (Section 7 & Appendix 1)	Development Advice (Section 5, 6, 7 & Appendix 1)
C2	Emergency services Highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable development are not considered to be acceptable. Plan allocations should not be made for such development and planning applications not proposed.		
	Less vulnerable development	▪ Application of justification test (section 6) , including acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements	▪ Acceptable consequences for nature of use ▪ Flood defences adequate ▪ Agreement for construction and maintenance costs secured ▪ Occupiers aware of flood risk ▪ Escape/evacuation routes present ▪ Effective flood warning provided ▪ Flood emergency plans and procedures	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 and acceptability of consequences in accordance with section 7 and Appendix 1.
	Other	▪ Application of acceptability of consequences (section 7 and appendix 1) ▪ Refer to surface water requirements	▪ Flood resistant design ▪ No increase in flooding elsewhere ▪ Acceptable consequences for nature of use ▪ Occupiers aware of flood risk ▪ Effective flood warning provided ▪ No increase in flooding elsewhere	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix

APPENDIX B: NRW INFORMATION & CORRESPONDENCE

DRAFT

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Megan Berry

From: Megan Berry
Sent: 14 December 2020 09:08
To: 'datadistribution@cyfoethnaturiolcymru.gov.uk'
Subject: Product 5 & 6
Attachments: LOCATION PLAN.pdf

To whom it may concern,

Rossett Rd, Rossett

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and Specific Drainage Requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) MCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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DAM

Allwedd / Map Key

Zone C1

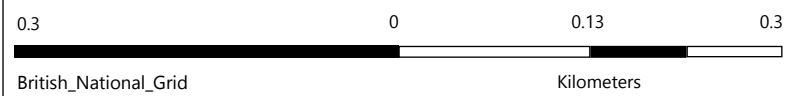
Zone C2

Zone B

Zone A

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
18/12/2020





Flood Risk Map from Rivers

Allwedd / Map Key

Flood Risk from Rivers - Extent

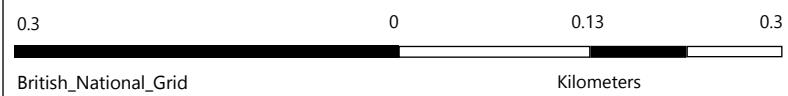
High

Medium

Low

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
07/01/2021





FLOOD RISK FROM RESERVOIR

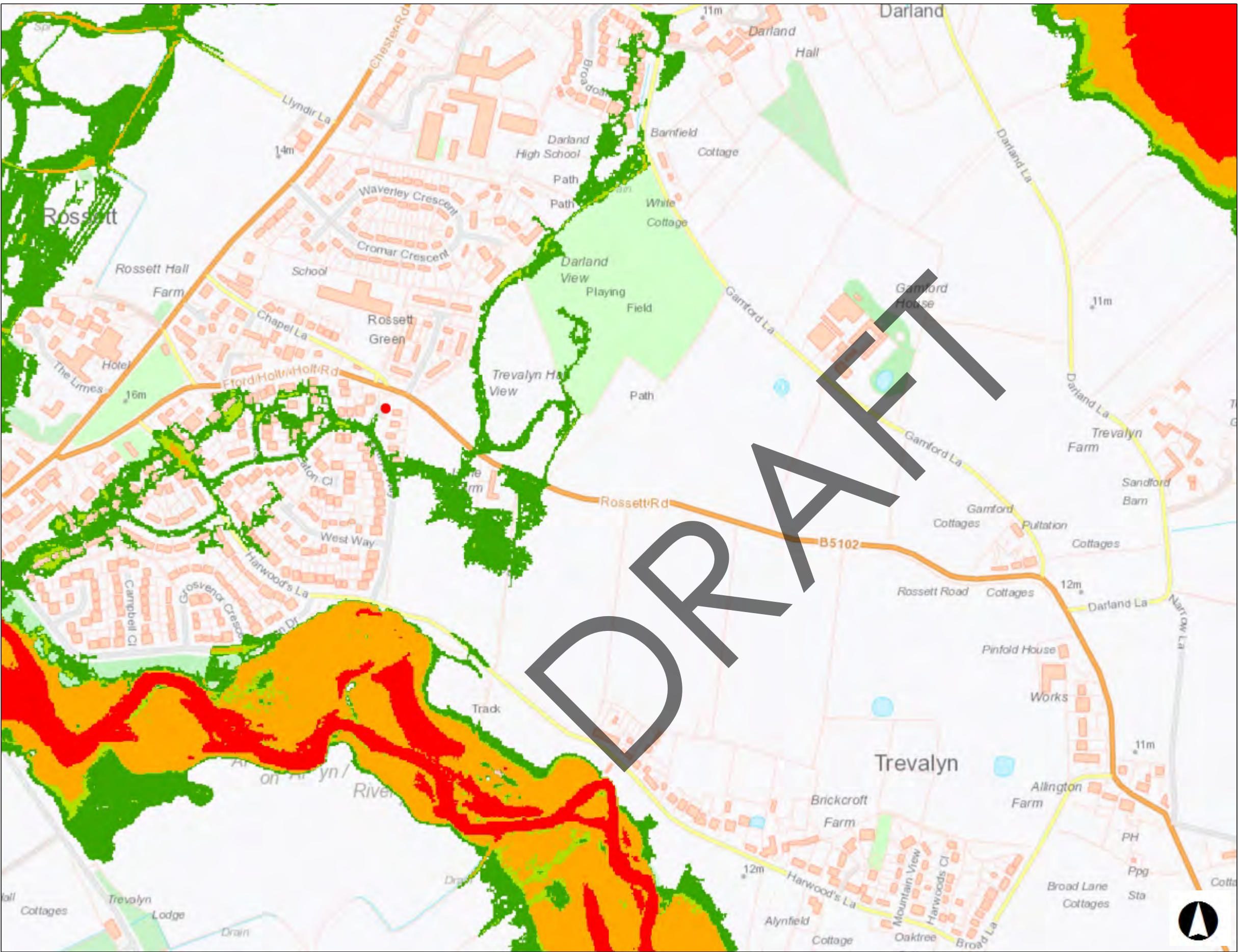
Allwedd / Map Key

Flood Risk from Reservoirs

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
18/12/2020





National Flood Risk Map from Rivers - Hazard

Allwedd / Map Key

Rivers Hazard - Low Risk

Low

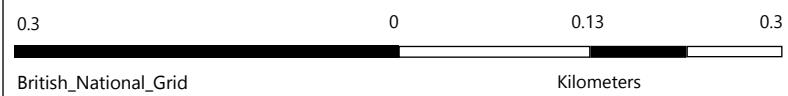
Danger for Some

Danger for Most

Danger for All

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
07/01/2021





National Flood Risk Map from Rivers - Depth

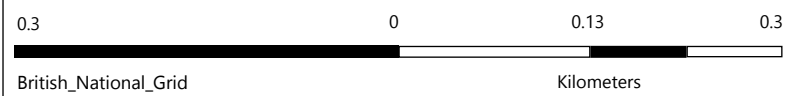
Allwedd / Map Key

Rivers Depth - Low Risk

- Less than 0.15m
- 0.15 - 0.30m
- 0.30 - 0.90m
- Greater than 0.9m

Graddfa / Scale at A3 1: 5,000

Dyddiad / Date
07/01/2021





FLOOD RISK FROM SURFACE WATER

Allwedd / Map Key

Flood Risk from Surface Water & Small Watercourses - Extent

High

Medium

Low





DO NOT SCALE

Legend

- Site Boundary
- Chester Rd Bridge
- Main River
- Land Drain

Top Water Levels (mAOD)

- <= 11.8
- 11.8 - 12.6
- 12.6 - 13.4
- 13.4 - 14.2
- 14.2 - 15
- 15 - 15.8
- 15.8 - 16.6
- 16.6 - 17.4
- 17.4 - 18.2
- > 18.2

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:
**ROSSETT ROAD
ROSSETT**

TITLE:
**RIVER ALYN DEFENDED
1 IN 100YR WITH 80% BLOCKAGE:
CHESTER RD BRIDGE**

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 108	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

Top Water Levels (mAOD)

- <= 11.5
- 11.5 - 12
- 12 - 12.5
- 12.5 - 13
- 13 - 13.5
- 13.5 - 14
- 14 - 14.5
- 14.5 - 15

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



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CONSULTING ENGINEERS

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Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT: ROSSETT ROAD ROSSETT			
TITLE: RIVER ALYN DEFENDED 1 IN 1000YR PLUS 30% CLIMATE CHANGE RETURN PERIOD EVENT			
DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 107	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data

Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

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Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:

ROSSETT ROAD
ROSSETT

TITLE:

RIVER ALYN DEFENDED
1 IN 100YR
RETURN PERIOD EVENT

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 106	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data

Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

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Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:

ROSSETT ROAD
ROSSETT

TITLE:

RIVER ALYN DEFENDED
1 IN 100YR PLUS 30% CLIMATE CHANGE
RETURN PERIOD EVENT

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 105	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data
Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

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Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT: ROSSETT ROAD ROSSETT			
TITLE: RIVER ALYN DEFENDED 1 IN 100YR RETURN PERIOD EVENT			
DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 104	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data

Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



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CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:
**ROSSETT ROAD
ROSSETT**

TITLE:
**RIVER ALYN UNDEFENDED
1 IN 1000YR PLUS 30% CLIMATE CHANGE
RETURN PERIOD EVENT**

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 103	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data

Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



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Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:
**ROSSETT ROAD
ROSSETT**

TITLE:
**RIVER ALYN UNDEFENDED
1 IN 100YR
RETURN PERIOD EVENT**

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 102	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data

Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



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CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT:
**ROSSETT ROAD
ROSSETT**

TITLE:
**RIVER ALYN UNDEFENDED
1 IN 100YR PLUS 30% CLIMATE CHANGE
RETURN PERIOD EVENT**

DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 101	REV: A	



DO NOT SCALE

Legend

- Site Boundary
- Main River
- Land Drain

NRW Flood Data
Top Water Level (mAOD)

- 8.1886
- 9.635253
- 11.081906
- 12.528559
- 13.975212
- 15.421865
- 16.868518
- 18.20389
- 19.3167

A	07/01/21	MB	PRELIMINARY FOR ISSUE	KW
REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS:



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 enquiries@betts-associates.co.uk



PROJECT: ROSSETT ROAD ROSSETT			
TITLE: RIVER ALYN UNDEFENDED 1 IN 100YR RETURN PERIOD EVENT			
DATE: 07/01/21	SCALE @ SIZE: 2000@A3	DRAWN: MB	CHECKED: RDN
PROJECT No: HYD554	DRAWING No: 100	REV: A	

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APPENDIX C: WW SEWER RECORDS & CORRESPONDENCE

DRAFT

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Megan Berry

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 04 January 2021 15:35
To: Megan Berry
Subject: Request for Information - Sewer Flood Risk
Attachments: LOCATION PLAN.pdf

Our Reference: EIR/646/2020

Dear Ms Berry,

Request for information

We write further to your request for information dated 14th December 2020, which we have been considering under the Environmental Information Regulations 2004.

We can confirm that we have reviewed our flooding database and have no flood risks reported to us on our sewerage network in this postcode or in the vicinity of the development site.

Turning to your query on specific drainage requirements, we have a dedicated Planning Team within our Developer Services function that can provide advice on the capacity in our infrastructure to accommodate new development.

Our pre-planning service will review the capacity available in our sewerage network, wastewater treatment works and clean water network to accommodate the flows/demand from a proposed development. It will also raise awareness of any of our assets crossing the site which will need to be factored into the layout of your development and provide general advice on surface water drainage.

An application for pre-planning advice can be submitted online via the following address <https://developers.dwrcymru.com/en/applications/planning/pre-planning>. If you wish to discuss in more detail our Planning Team are contactable on 08009172652 or alternatively by email developer.services@dwrcymru.com.

We hope that this response is clear. Should you have any questions, please contact us by email at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Pentwyn Road, Nelson, Treharris, Mid Glamorgan, CF46 6LY.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

Yours sincerely,

R.Stevens

Dŵr Cymru Welsh Water

Dwr Cymru Welsh Water is firmly committed to water conservation and promoting water efficiency. Please log on to our website www.dwrcymru.com/waterefficiency to find out how you can become water wise. Mae Dwr Cymru Welsh Water wedi ymrwymo i warchod adnoddau dwr a hyrwyddo defnydd dwr effeithiol. Mae cyngor i' ch helpu i ddefnyddio dwr yn ddoeth yn www.dwrcymru.com/waterefficiency

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DRAFT





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APPENDIX D: LLFA CORRESPONDENCE

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Megan Berry

From: Megan Berry
Sent: 14 December 2020 09:09
To: 'planning@wrexham.gov.uk,'
Subject: Flood Risk and SAB Information
Attachments: LOCATION PLAN.pdf

To whom it may concern,

Rossett Rd, Rossett

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and Specific Drainage Requirements; this would be greatly appreciated. If there are any other specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) MCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

CIVIL | STRUCTURAL | GEO-ENVIRONMENTAL | HYDROLOGY | FLOOD RISK MANAGEMENT
SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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APPENDIX E: LOCATION PLAN

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LOCATION PLAN

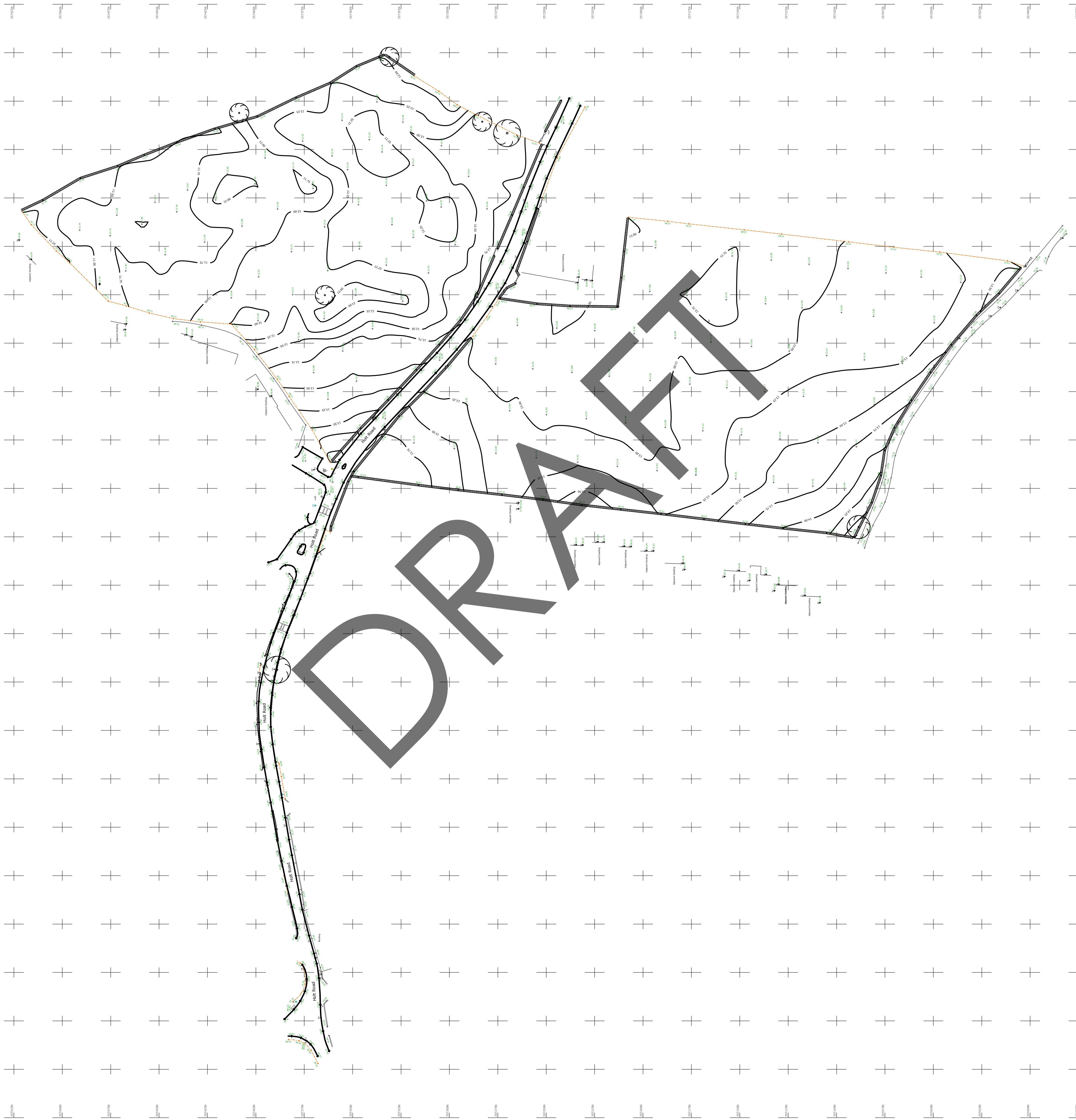
ROSSETT ROAD, WREXHAM



OS X (Eastings)	337284
OS Y (Northings)	357242
Nearest Post Code	LL12 0DZ
Lat (WGS84)	N53:06:31 (53.108663)
Long (WGS84)	W2:56:18 (-2.938311)
Lat, Long	53.108663, -2.938311
Nat Grid	SJ372572 / SJ3728457242
mX	-327091
mY	6968925

APPENDIX F: TOPOGRAPHIC SURVEY

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APPENDIX G: SITE WALKOVER PHOTOGRAPHS AND PLANS

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APPENDIX H: PLANNING LAYOUT

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APPENDIX I: PFRA/SPRA INFORMATION

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Volume Pumps (HVP's) pumps were brought in to extract the excess surface water in to the river system.

In Wrexham County Borough there were no areas identified as significant risk threshold with an affected population, greater than 5,000 people. Within the Wrexham County Borough Council Preliminary Flood Risk Assessment (PFRA) 2011⁶, 20 1km square areas of 200 properties, 20 businesses or 1 critical infrastructure have been identified. These are areas which do not meet the statutory flood risk areas of 5,000 people but areas which are locally significant. These areas are concentrated around Wrexham, Llay Industrial Estate, Wrexham Industrial Estate and urban villages of Gwersyllt, Rhosllanerchrugog, Ruabon, Coedpoeth, Cefn Mawr, Acrefair, Chirk and Glyn Ceiriog, Ceiriog Valley. This local threshold will continue to form the basis of the LFRMS supported by continuing collection of information on local flood events.

The PFRA (2011) 1km² squares show that local flood risk could potentially affect 20,696 properties. The Environment Agency maps on surface water show a total number of 451 properties within areas susceptible to surface water flooding. The Environment Agency Flood map for surface water shows that 1922 properties could potentially be affected by 1 in 30 flood event, and 5312 properties are shown at risk from the 1 in 200 flood map for surface water. To date, the County Borough has received 383 flooding incidents.

The flooding events that have occurred this year 2012-2013 within the County Borough I have varied in size and caused different patterns of events. In April prolonged and heavy rainfall caused problems associated with surface water run off and river flooding alerts in Acrefair and Rossett. The events in July and August were associated with surface water flooding and flash flooding in urban villages of Gwersyllt, Gresford, Marford, Llay and Burton Green. In September, flooding events covered the borough causing surface water and river flooding to the Alyn and surrounding farmland around Holt, Farndon and Rossett.

The flood risk areas for Wrexham are listed in Figure 1.8 shows the PFRA squares in relation to the community council areas and shows how many properties, business or infrastructure could be affected. The table compares this information in relation to the EA Areas Susceptible to Surface Water Flooding and Flood Map for Surface Water, groundwater flooding areas, the historic flood outline and flood zones, canal flooding from Civic Canal and River Trust and sewer flooding from Welsh Water and the historical flooding data captured by the LLFA. The table also shows how these areas relate to the policy areas of the River Dee Catchment Plan and River Dee Basin Management Plan. Figure 1.9 will help identify the highest risk areas for the implementation of measures (L1-11) and forthcoming flood risk maps and flood risk management plans.

Environment Agency River Dee Catchment Flood Management Plan (2010)

Flood risk is the combination of the likelihood (or probability) of a particular flood event occurring and the consequence (or impact) of the flood event if it occurred. within a one year period. This is known as an Annual Exceedance Probability which is expressed as a % AEP and is the probability of a particular flood event (or size) occurring in one year. Flood risk is likely to be exacerbated by climate

⁶ WCBC (2011) Preliminary Flood Risk Assessment
April 2013 Version 3.1

change, and UKC09 projections indicate that rainfall will change significant with 90% probability, wetter winters causing higher river flow, especially when combined with sea level rise and more frequent and intense extreme rainfall events. The main sources of flood risk in Wrexham County Borough include river flooding, surface water flooding, some sewer, ground water and ordinary watercourse flooding.

Flooding has occurred at many locations throughout the River Dee Catchment Flood Management (CFMP) area, mostly from the main River Dee and its major tributaries but also from several small watercourses. Significant floods were recorded in 1890, 1946, and 2000.

The River Dee CFMP ⁷ identifies a number of populated areas which are affected include Rossett, Holt, Wrexham, Coedpoeth and Rhosllanerchrugog. In 2000, flooding was widespread across the catchment to places which have never flooded before

In the River Dee catchment area, a 1% AEP event could affect approximately 4,200 properties. In the County Borough of Wrexham there are considered to be 100-500 number of properties within Wrexham and Bangor on Dee and between 50-100 properties in Cefn Mawr at risk from flooding. This would equate to a flood risk to 0.5% of the population in 2010 and is because large amounts of area that are at risk of flooding from fluvial sources forms agricultural low land areas. There are limitations to this data given the lack of historic records associated with surface water flooding.

The CFMP (2010) has six policy areas cross the catchment area. These policy areas are incorporated into sub area action plans. The key policy options 2, 3 and 4 for Wrexham are listed in Figure 1.7 below.

Figure 1.7 River Dee Catchment Management Policies for Wrexham

Policy 2: Middle Dee, Bangor on Dee and East of the Borough

Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk

Policy 3: Lower Dee (Rossett, Holt Farndon and Main Alyn West of Wrexham)

Areas of low to moderate flood risk where we are generally managing existing flood risk effectively;

This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood

⁷ EA (2010) The River Dee Catchment Management Plan
April 2013 Version 3.1

risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.

Policy 4: Wrexham (Rossett to Erddig and Rhostyllen)

Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change;

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

The sub areas relevant to Wrexham County Borough include, Sub area 1: Upper Dee, Sub Area 2: Main Alyn, Sub Area 3: Middle Dee , Sub Area 4 Wrexham and Sub Area 5: Lower Dee. For each of these sub areas there are a list of partners, an outline of the issues, and outline of the policy approach required and actions required to implement them.

Environment Agency River Dee Basin Management Plan (2009)

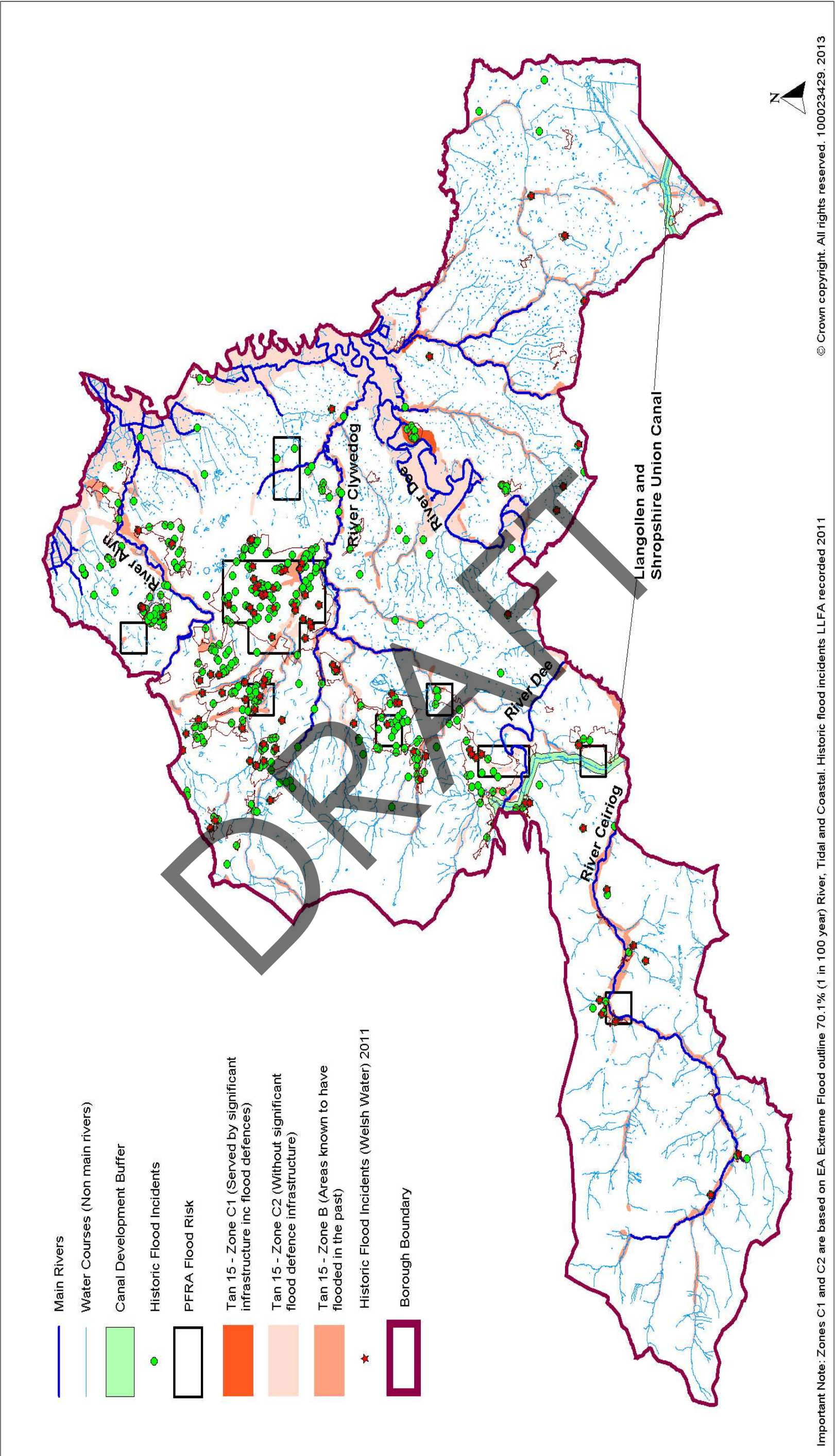
The River Dee is considered as part of a wider river basin including the river, its tributaries and estuary. The source of the Dee is near Bala and the whole basin includes Llyn Tegid Special Area of Conservation (SAC) through to the Dee Estuary (SPA) including reservoirs at Llyn Tegid, Celyn and Brenig. The Dee is of high biodiversity value due to its originally low nutrient status and high quality riparian habitats. Its interest includes a number of species that are typical of high quality rivers with low nutrient levels in the water. Of particular note is the use of the River Dee as a migration route by Atlantic salmon, up to spawning grounds in the river, some of which are within Wrexham County Borough.

The River Basin Management Plan current status of the water environment states that 28% of the surface waters are at good or better ecological/potential status now. 51% of the assessed surface waters are at a good or better ecological status now. 108 surface water bodies have been assessed for ecology and 72 have been assessed for biology. The River Dee and Bala lake is a SAC, is vulnerable to specific flood risk management measures and pressures in relating to canalised stretches altering habitats, collapsing embankments, nutrient levels, provision of water resource locally and to parts of the West Midlands and North West of England, recreational disturbance, siltation from construction and invasive species.

Limitations

There are limitations to the data provided with each source of information varying in format and level of detail. Improvements in the recording system have been identified and are included as a measure of the LFRMS. Once adopted and monitored improvements in flood risk information held by the Lead Local Flood Authority will inform local flood risk management approach and ongoing review of the strategy.

Figure 1.8 Flood Risk Assessment across Wrexham County Borough (Local Flood Risk Management Strategy 2012)



and mapping them against green spaces, initiatives for investment and improvements can be identified. It provides evidence of existing initiatives within the regional area which includes Stamford Brook and Northern Gateway which demonstrate the principles of this policy approach to Lower River Dee and actions required. This action plan forms one of two areas that have been prioritised for green infrastructure investment under the Green Infrastructure Framework.

Natural approaches to flood risk management is more sustainable and cost effective than hard engineering defences and can bring added benefits to wildlife and amenity to regenerated areas and urban spaces. The Environment Agency has conducted research and there evidence to demonstrate the benefits of this approach. Natural approaches can include techniques which use land to temporarily store water away from high risk areas, reconnect rivers to floodplains, lengthening watercourses to a more natural alignment, restoring peat bogs, blocking artificial drainage channels, reforesting floodplains, green roofs, permeable paving, and surface water attenuation ponds

Improvements to the collection of data onto a single mapping system for the local authority ensures that different functions take account or have regard to local flood risk and their interrelatedness. That will facilitate the analysis and monitoring of flood event patterns in relation to existing assets and infrastructure. Highlighting repeat issues or issues in regards to maintenance. The development of an annual asset maintenance schedule will ensure that the required ordinary watercourse consents will be scheduled and pre-application discussions can limit the issues in regards to design, ecology or proposed methods involved. The investigation process and asset register can reduce costs associated with flood damage from flood events and reduce the costs from repetitive actions which do not resolve the issues associated with the source of the flooding. Small measures, that could save long term higher costs associated with the continued flood risk we can anticipate from Climate Changes.

The Lead Local Flood Authority has permissive power to designate structures which affect flood risk so the owners can not alter or remove the structures. This designation procedure is assessed and has to satisfy four conditions for the consideration of formal designation. These four conditions are;

- Condition 1: that the designating authority thinks the existence or location of the structure or feature affects a flood risk or coastal erosion risk;
- Condition 2: that the designating authority has flood or coastal erosion risk management functions in respect of the risk which is affected;
- Condition 3: that the structure or feature is not already designated by another authority;
- Condition 4: that the owner of the structure or feature is not a designating authority;

Designation and asset maintenance can reduce the consequences and improve the approaches of flood risk management within the Borough. The flooding events that have occurred this year 2012-2013 within the Borough Council have varied in size and caused different patterns of events. In April prolonged and heavy rainfall caused problems associated with surface water run off and river flooding alerts in Acrefair and Rossett. The events in July and August were associated with surface water flooding and flash flooding in urban villages of Gwersyllt, Gresford, Marford, Llay and Burton Green. In September, flooding events covered the borough

The identification of communities at risk and vulnerable people can be assessed through the careful use of datasets across the Authority. Using the principles of the Community Flood Plans in Rossett and Bangor on Dee, and utilising the databases held on the private rented sector, council owned assets.

Wrexham County Borough Council in partnership with Environment Agency is committed to ensuring that everyone in the County Borough of Wrexham is informed or aware of the risks of local flooding. This awareness and information sharing is important to enable households and businesses to adopt suitable resistance and resilience measures.

In Wales, six pilot studies have been completed, two of these areas include Prestatyn and Pwllheli and provide important lessons in regards to the importance of awareness rising and adaptation to climate change. Climate change and adaptation forms an important role within all flood risk management measures.

The Multi-agency Flood Plan (MAFP) (2010) provides the framework produced by North Wales Resilience Forum and Multi Agency Response Plan for Major Emergencies (2010) for Emergency responses within the Borough. There are flood warning systems in place for Alyn Catchment, Rossett, Lower Dee Valley Llangollen to Chester, Lower Dee and Bangor on Dee.

The Area Flood Partnership includes representatives from the Council's Emergency Management Response Teams, Lead Local Flood Authority, Flood Risk Management Authorities and communities of Bangor on Dee, Rossett. This group hold meetings throughout the year and exercises every three years.

The Local Authority has an Emergency Planning Team (EP) and out of hours service with contact numbers, information and advice available on the website. During working hours flood event calls are dealt with by the Contact Centre through the Pride in Your Streets and passed to; Emergency Planning, Environment, Housing, or Public Protection. Most of the calls received are directed to Environment Street Scene section because of their responsibilities in regards to highways and land drainage.

In an Emergency flooding event, an established emergency response will be initiated. Flooding events are monitored carefully and co-ordination of information and updates across the various departments, external organisations and emergency responders are very important

The LFRMS has the potential to adversely affect such features, especially aquatic features as a result of any flood management measures that are implemented. Construction, land use change, changes in flood regime and frequency or changes in water levels that have the potential to adversely affect nature conservation and biodiversity features. Conversely, such changes present opportunities to enhance the condition of existing habitats and create new habitats. Trees form important character and functions within areas for biodiversity and drainage and flood risk alleviation. Trees within urban areas and Green Networks are important to flood risk management approach of quality, quantity and amenity.

APPENDIX J: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

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