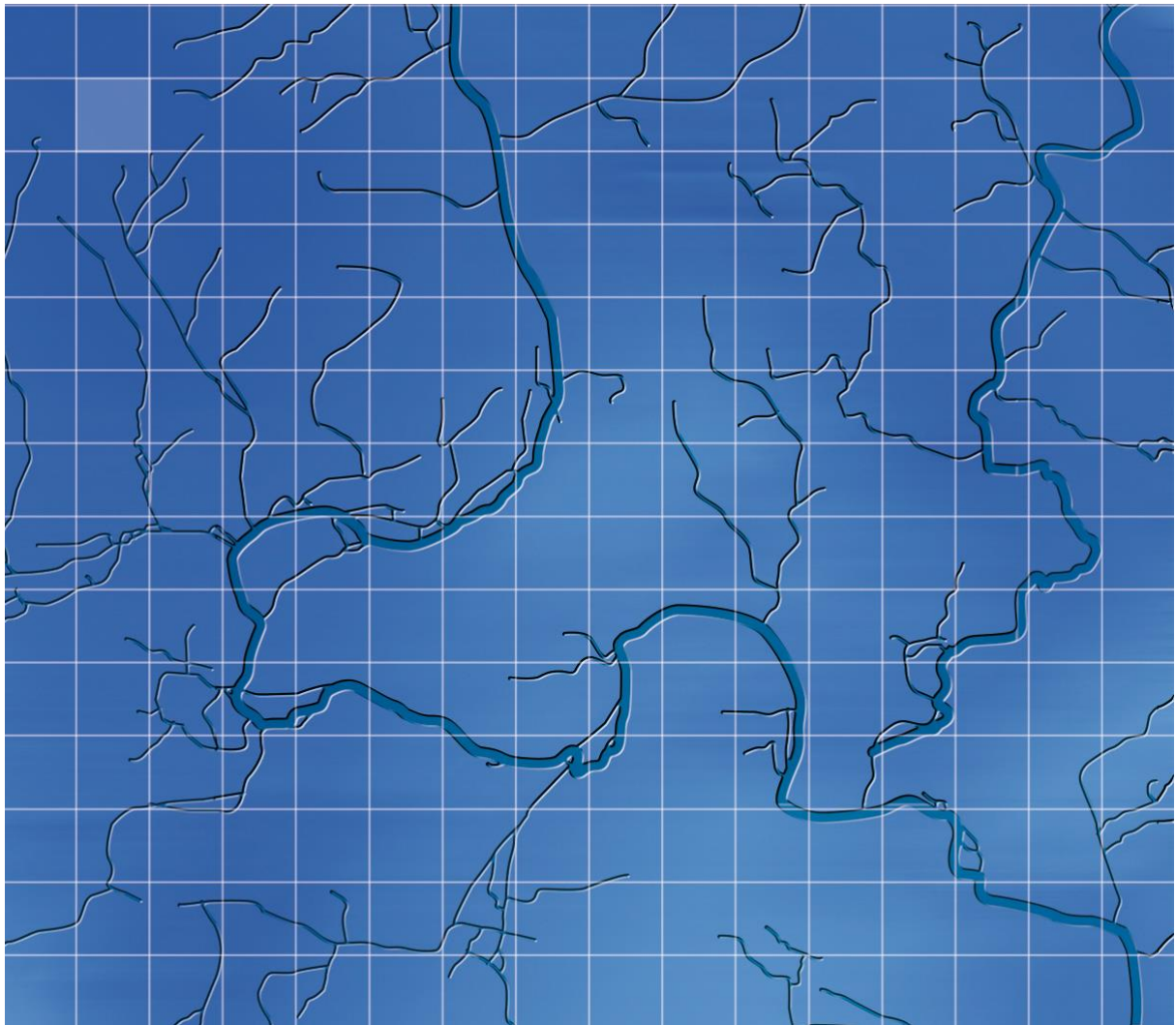


**Blaenau Gwent County Borough Council**

June 2023

# **Blaenau Gwent Strategic Flood Consequence Assessment**



**WHS**

# Blaenau Gwent County Borough Council

## Blaenau Gwent Strategic Flood Consequence Assessment

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For and on behalf of Wallingford HydroSolutions Ltd.

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# Contents

<b>1</b>	<b>Introduction</b>	<b>6</b>
1.1	Scope of Assessment	6
1.2	SFCA Objectives	6
1.3	Overview of National Planning Policy	8
1.4	Overview of Local Guidance and Past Studies	11
<b>2</b>	<b>Methodology</b>	<b>13</b>
2.1	Data Sources	13
2.2	Consultation with statutory bodies	14
2.3	Sequential Test	14
<b>3</b>	<b>Summary of Flood Risk in Blaenau Gwent</b>	<b>15</b>
3.1	Review of Flooding Sources	15
3.2	Review of Historic Flood Events	20
3.3	Review of Flood Defences	21
3.4	Review of Flood Warning	22
3.5	Climate Change	24
<b>4</b>	<b>Flood Risk at Candidate Sites</b>	<b>25</b>
4.1	Candidate Sites	25
4.2	Fluvial Flood Risk (Main Rivers)	25
4.3	Other Sources of Flooding	32
4.4	Baseline Flood Risk Review	35
<b>5</b>	<b>Flood Risk Management</b>	<b>39</b>
5.1	High level review of flood risk management opportunities	40
5.2	Flood Resilience	48
<b>6</b>	<b>Conclusions and Recommendations</b>	<b>49</b>
6.1	Conclusions	49
6.2	Recommendations	50
Appendix 1	– Fluvial (Main Rivers) Flood Maps	
Appendix 2	– Surface Water and Small Watercourses Flood Maps	
Appendix 3	– LLFA flood incidents	
Appendix 4	– Geological and Soils Mapping	
Appendix 5	– DCWW sewer flood incidents	

# 1 Introduction

## 1.1 Scope of Assessment

Wallingford HydroSolutions (WHS) has been commissioned by Blaenau Gwent County Borough Council (BGCBC) to undertake a Strategic Flood Consequence Assessment (SFCA) to inform policies and site selection processes for BGCBC's Replacement Local Development Plan (RLDP).

The study will identify key flood risk constraints within the development plan area to enable BGCBC to assess the suitability of future development and inform land use policy with regards to flood risk.

## 1.2 SFCA Objectives

SFCAs are overarching technical studies that are used to guide development and inform the selection of sites in relation to flood risk.

A major part of this study will be to assess flood risk from all sources which will first involve the collation of available model data and historical information on flooding. Flood risk will be assessed for the baseline and the future scenario, which will consider the latest climate change guidance.

In this context, flood management options will be reviewed including i). opportunities to develop natural flood and water management (NFM) schemes, ii). the likely applicability of Sustainable Drainage Systems (SuDS), iii). flood resilience measures and iv). emergency provision in flood risk areas.

Another key requirement of the SFCA is to enable BGCBC to make informed decisions on allocating sites for development in the RLDP. The first stage of this will involve a candidate site assessment of the 122 sites earmarked for consideration. This initial assessment will rule out sites where flood risk is unacceptable. The sequential test will then be applied to the remaining sites, and they will be ranked from those least at risk of flooding to those at highest risk, with those at higher risk reviewed in more detail.

The list of objectives for this SFCA are summarised below:

### **Baseline & Future Flood Risk**

- Attain an understanding of flood risk from all sources, including the risks associated with fluvial, surface water, groundwater, sewer and reservoir flooding, recognising the implications of these risks on a whole catchment basis.
- The consideration of evidence from a range of sources, including flood maps, hydraulic models, historical flood data, the Flood Risk Assessment for Wales and the latest climate change guidance.

### **Flood Risk Management**

- The potential suitability and contribution of SuDS
- The identification of opportunities to develop natural flood and water management schemes for inclusion in the RLDP to help protect communities inside and outside the plan area
- The provision of general advice on which measures offer the best and most appropriate protection from flooding in terms of resilient design.
- The provision of general advice on how emergency plans should address access and escape issues.
- Advice on what emergency provision is needed in flood risk areas, where relevant.
- Advice on how residual risks should be managed.

### Sequential Test and Site-Specific Assessment

- Implement national policy to direct development away from areas of flood risk through assessing all Candidate Sites to determine flood risk (approximately 122 sites) and help inform strategic decisions on the spatial strategy and settlement hierarchy.
- Where sites are identified at risk of flooding and have been assessed as suitable for development through the candidate site assessment process, undertake further assessment to apply the sequential test by identifying sites that have the least risk of flooding and:
  - Establish whether sites are capable of meeting TAN15 requirements without increasing flood risk elsewhere.
  - Set out site specific recommendations on development allocation and access and egress

Figure 1 shows the candidate site locations and main watercourses within the Blaenau Gwent administrative boundary.

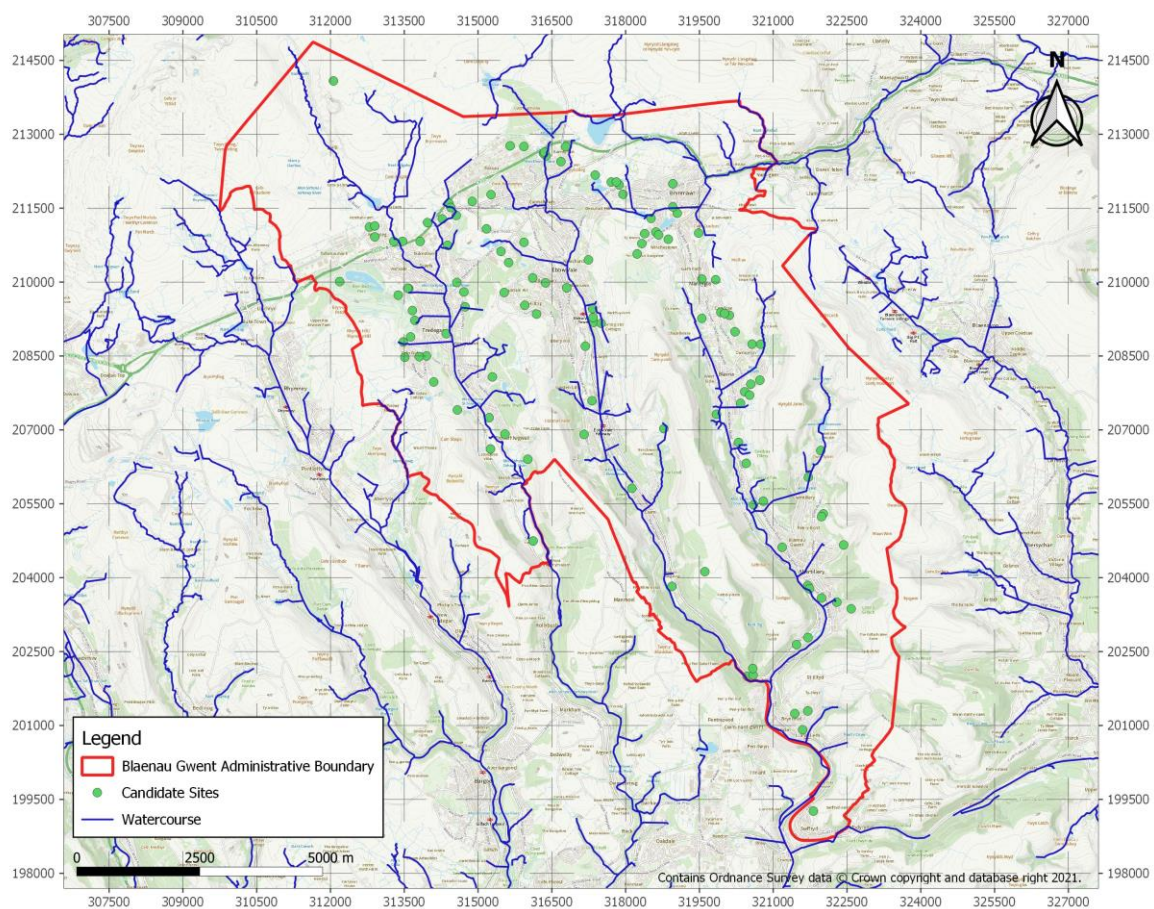


Figure 1- Overview of Study Area and Candidate site locations

## 1.3 Overview of National Planning Policy

### 1.3.1 Planning Policy Wales

Planning Policy Wales (PPW)<sup>1</sup> sets out the land use planning policies employed by the Welsh Government and forms a framework for the preparation of Local Development Plans (LDP's). Chapter 6 of the document focuses on constraints to land use planning caused by environmental risks, such as flooding and climate change.

PPW states that a sequential approach to development in flood hazard areas should be adopted whereby locating development away from flood hazard areas is prioritised, over locating development in higher risk areas and seeking to mitigate against the consequences of flooding thereafter.

Additionally, climate change will intensify rainfall and increase river flows leading to greater flood risk. This will also reduce the service levels provided by existing surface water drainage structure. Based on PPW, planning authorities are required to take climate change into account in their local development plans.

The Welsh Government advises that planning authorities consult with NRW to ensure that development proposals do not increase flood risk elsewhere, and where possible, reduce flood risk overall. It is recommended that the latest edition of PPW (currently 11<sup>th</sup>) is referred to when undertaking any future site specific FCAs, to ensure compliance with Welsh Government.

### 1.3.2 National Strategy for Flood and Coastal Erosion Risk Management in Wales

The Flood and Water Management Act 2010 sets out how Welsh Ministers must develop, maintain and apply a National Strategy for Flood and Coastal Erosion Risk Management (FCERM) in Wales.

This Strategy sets out how the Welsh Government will manage the risks from flooding and coastal erosion across Wales over the next 10 years. It clarifies roles and responsibilities before setting out the policies and direction for all Welsh Flood Risk Management Authorities to follow, with measures to explain how targets will be achieved. The strategy highlights how FCERM is a priority area for the government and is supported by a Programme for Government commitments.

### 1.3.3 Technical Advice Note 15

PPW is supplemented by a series of Technical Advice Notes (TAN's). The most relevant in terms of flood risk is TAN15. The updated version of TAN15<sup>2</sup> first published in December 2021 was initially paused until June 2023. During this 18 month pause period, the existing policy framework of Planning Policy Wales, the current TAN 15<sup>3</sup> and the Development Advice Map (DAM) remained in place for planning applications.

The coming into force of the new TAN15 and the associated Flood Map for Planning has since been suspended further due to additional consultation on the TAN, therefore the existing framework remains in place until at least late 2023.

However, the new TAN15 should be taken into account by planning authorities in Wales in the preparation of Development Plans. When plans are reviewed, the flood risk considerations that feed

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<sup>1</sup> Planning Policy Wales 11<sup>th</sup> Edition. Welsh Assembly Government. February 2021.

<sup>2</sup> Technical Advice Note 15: Development and Flood Risk. Welsh Assembly Government. December 2021.

<sup>3</sup> Technical Advice Note 15: Development and Flood Risk. Welsh Assembly Government. July 2004

into the settlement strategy and site allocations must be in accordance with the new TAN 15 and the new Flood Map for Planning. The SFCA will be the principal source of evidence to inform those elements of the plan and locally specific flood risk policies, therefore the new TAN15 published in December 2021 is used in the development of this SFCA.

The new TAN15 focuses on Welsh Government Policy Guidelines regarding development and flood risk and provides a framework to assess this to meet the requirements of the PPW. The TAN also reflects the core principles of the National Strategy for Flood and Coastal Erosion Risk management in Wales<sup>4</sup>, to adopt a risk-based approach in respect to new development in areas at risk of flooding and coastal erosion.

As a priority, new development should be located in areas at minimal risk of flooding. However, with increasing pressures on development and regeneration, TAN15 sets out requirements should development need to be considered in high flood risk areas.

To help determine at risk areas, the latest version of TAN15 was developed in tandem with the new Flood Map for Planning which is hosted by Natural Resources Wales (NRW) and will replace the current Development Advice Map (DAM). The DAM zone categories have been replaced by Flood Zones which are based on annual exceedance probabilities (AEPs). The new flood zones also consider climate change with inclusion of a climate change allowance for the delineation of Zones 2 and 3. A defended zone is also added.

The definition of each zone for fluvial, tidal and surface water flooding is provided in Table 1, which is based on Section 5 of TAN15. The latest version of the Flood Map for Planning at time of publication (June 2023) has been used in the development of this SFCA.

Table 1 - Flood Zones

Zone	Fluvial Flooding	Tidal Flooding	Flooding from surface water and small watercourses*
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.
TAN 15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

<sup>4</sup> <https://gov.wales/national-strategy-flood-and-coastal-erosion-risk-management-wales>

*\* The term 'small watercourses' is specific to the names of flood zones in the Flood Map for Planning. 'Ordinary watercourses' is the term used in the National Strategy for Flood and Coastal Erosion Risk Management and refers to watercourses smaller than 'main rivers'. The Map differentiates between rivers and other watercourses on the basis of catchment size (above and below 3km<sup>2</sup>), not on the status or definition of the watercourse. Most, but not all, small watercourses are also ordinary watercourses.*

The overarching aim of TAN15 when considering new development is to prevent exposure to risk, by making locational choices in the following order of preference:

- Direct new development to areas at minimal risk of flooding – areas in Zone 1
- Enable resilient development in areas served by formal flood risk management defences that reduce the risk and consequences of flooding over the lifetime of development – areas in the TAN 15 Defended Zones
- Allow resilient development in undefended areas of relatively low risk – areas in Zone 2
- Only permit water compatible development, essential infrastructure, and less vulnerable developments by exception in areas of higher risk – areas in Zone 3

TAN15 sets out several other circumstances where development may be permissible in flood zones 2 and 3; with the exception of highly vulnerable development in zone 3. These include the following:

- Acceptable consequences for type of use
- Agreement for construction and maintenance costs secured
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures
- Flood resistant and resilient design
- No increase in flooding elsewhere

TAN15 categorises development in respect to its vulnerability to flood risk, subsequently providing a basis for flood zone compatibility for different types of development. Some key examples include highly vulnerable new development (e.g. residential) not being permissible in Zone 3 under any circumstances. Less vulnerable development (e.g. commercial) are permissible in Zone 3 where it meets certain criteria and the potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable. Further examples and details are provided in Section 6 and Section 10 of TAN15.

TAN15 also requires that due consideration is given to surface water runoff, as the increase in hard standing area on greenfield land will in turn increase the rate of runoff discharging from a new development. It is a requirement that SuDS are implemented to reduce surface water runoff; with site discharge rates being agreed with the Sustainable Drainage Approval Body (SAB) within the relevant Lead Local Flood Authority (LLFA). Liaison with the relevant Internal Drainage Board (IDB) and Sewerage Undertaker may also be required to ensure there is agreement to a proposed surface water drainage strategy. Further guidance and information is provided in Section 8 of TAN15.

Section 7 of TAN15 details the requirements of an SFCA. In summary it is required to present evidence on flood risk to inform the policies behind Local Development Plans (LDPs) and should help the planning authority consider flood risk issues in a way that is compatible with placemaking. To achieve this, SFCAs should provide planning authorities with information on current and future flood risk, using best available information about climate change and projected changes to the nature of flood risk. This includes flood maps, modelling, the Flood Risk Assessment for Wales (FRAW), Flood Risk Management Plans, Shoreline Management Plans and Area Statements. The final document can then be used to identify which areas comply with national policies and where local or specific approaches may be required. Water management schemes and other such opportunities should also be considered and identified in a SFCA.

### 1.3.4 Flood and Water Management Act 2010

The Flood and Water Management Act (FWMA) (2010), sets out legislation on the management of risks in connection with flooding and coastal erosion for the United Kingdom. It highlights the need for an effective flood risk strategy, which must be developed, maintained, applied, and monitored regularly to adequately manage flood risk. The Act was released in 2010, of which Schedule 3 came into effect in Wales in 2019.

Where development does take place, Schedule 3 of the FWMA highlights the need for it to be sustainable. A key facet of this is the requirement for sustainable drainage, which is designed to reduce the impact of new and existing development with respect to surface water discharges. In Wales it is mandatory to use SuDS on any development larger than 100m<sup>2</sup>. Local authorities are required to act as a SuDS Approval Body (SAB). This requires them to approve drainage schemes in addition to being responsible for adopting and maintaining them.

As SuDS are an important aspect of flood risk management this SFCA will provide advice on the requirements of SuDS and outline the guidance available to help planners.

## 1.4 Overview of Local Guidance and Past Studies

A wide range of local planning documents developed by BGCBC exist related to development policy, flood risk, environmental standards, and surface water management.

BGCBC offers guidance<sup>5</sup> on drainage requirements within the region which makes reference to Schedule 3 of the FWMA. Developments with Blaenau Gwent must meet these requirements whereby a surface water drainage scheme must be accepted by the SAB and must be done so for any development greater than 100 m<sup>2</sup>. BGCBC works in partnership with Caerphilly County Borough Council (CCBC) and any development requiring SAB approval does so through CCBC.

As the Lead Local Flood Authority (LLFA), BGCBC developed a Local Flood Risk Management Strategy<sup>6</sup>. The LLFA is responsible for flooding from surface water, groundwater and small watercourses. The strategy determined which areas of Blaenau Gwent were at the greatest risk of flooding with an emphasis on the surface water flooding map. Flooding from groundwater was considered less of a risk but was based on limited data. The report also proposes a variety of flood risk mitigations, structural and non-structural, to meet the LLFA's aims. SuDS is a key theme again under natural drainage solutions in addition to emergency planning.

It is the LLFA's responsibility to decide when to review their local strategies but the Welsh Government<sup>7</sup> recommended this is done continually taking note of the National Strategy, which is reviewed every six years.

Following this BGCBC have produced a Flood Risk Management Plan<sup>8</sup> upon which this SFCA will develop upon. This document breaks down the flood risk in sixteen community areas and describes the flood risk management plans currently undertaken by the council. An area at the north of the region, the Ebbw Vale and Tredegar area, was identified as a 'Flood Risk Area' by BGCBC and NRW.

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<sup>5</sup> Permission for Drainage. BGCBC. 2019. Available from: <https://www.blaenau-gwent.gov.uk/en/resident/planning/how-to-apply-for-planning-permission/permission-for-drainage/>

<sup>6</sup> Local Flood Risk Management Strategy. BGCBC. 2013 Available from: [https://www.blaenau-gwent.gov.uk/fileadmin/documents/Resident/Planning/Flood\\_Risk\\_Strategy.pdf](https://www.blaenau-gwent.gov.uk/fileadmin/documents/Resident/Planning/Flood_Risk_Strategy.pdf)

<sup>7</sup> Local Flood Risk Management Strategies. Welsh Government. November 2011. Available from: <https://gov.wales/sites/default/files/publications/2019-06/local-flood-risk-management-strategies.pdf>

<sup>8</sup> Flood Risk Management Plan. BGCBC. 2015. Available from: [https://www.blaenau-gwent.gov.uk/fileadmin/documents/Resident/Planning/Floods\\_FRMP\\_complete.pdf](https://www.blaenau-gwent.gov.uk/fileadmin/documents/Resident/Planning/Floods_FRMP_complete.pdf)

It is a main area of concern containing eight communities. Flood risk for the remaining eight communities is dealt with separately.

Measures to manage flood risk are divided into Borough and local measures. For each of the sixteen communities, local measures include carrying out risk assessments and ensuring awareness of the risk of flooding to individuals.

The Blaenau Gwent region is included in NRW's South East Wales Area Statement<sup>9</sup> which focuses upon ecosystems and community resilience. The 'Climate Ready' theme is of particular relevance to the climate response for flooding with a focus on sustainable and natural flood mitigations. Some of the key aims include increasing the use of SuDS and restoring and enhancing existing floodplains and hydrological systems.

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<sup>9</sup> South East Wales Area Statement. NRW. 2021. Available at: <https://naturalresources.wales/about-us/area-statements/south-east-wales-area-statement/?lang=en>

## 2 Methodology

### 2.1 Data Sources

To inform the assessment of flood risk, existing information and model data have been identified and collated for different sources of flooding. Any recent and relevant studies on flood risk within the study area have also been incorporated into the SFCA, along with details on flood defences and flood management schemes. This information and the available model data have been used to assess flood risk across the study area as well as at each of the candidate sites. Detailed flood maps utilising the latest GIS software have been created. The main sources of data to inform this SFCA include.

- NRW Flood Map for Planning<sup>10</sup>
  - Rivers Flood Zones– to quantify fluvial flood risk from rivers (catchment size >3 km<sup>2</sup>)
  - Surface Water and Small Watercourses Zones – to quantify the pluvial flood risk and flood risk from small watercourses (catchment size <3 km<sup>2</sup>) where appropriate
  - TAN15 Defended Zones- to identify any areas that benefit from flood defences with a minimum standard of protection (SOP) of 100-year (present-day)
  - Recorded Flood Outlines – to review historical flood events
  - Flood risk from reservoirs – to quantify the risk of reservoir flooding
- Hydraulic modelling data from the Ebbw hydraulic model (2018)<sup>11</sup>
- Hydraulic modelling data for the Ebbw Fach hydraulic model (2013)<sup>12</sup>
- Dwr Cymru Welsh Water (DCWW) sewer data<sup>13</sup> – to determine risk of sewer flooding based on incidences of nearby sewer flooding
- Flooding incident data provided by BGCBC<sup>14</sup> – to provide information on local and historical flooding from surface water flooding across the study area
- British Geological Survey (BGS) geoviewer<sup>15</sup> – To determine local bedrock and its expected permeability informing assessment of groundwater flood risk
- Soilsmap<sup>16</sup> – To determine local soil and its expected permeability informing assessment of groundwater flood risk
- Spatial defence data<sup>17</sup> – To assess existing formal and informal flood defences
- Various previous flood risk studies previously completed for BGCBC (see section 1.4)

NRW regularly review and update the flood map for planning, with any amendments to the Flood Zone mapping being informed by more detailed information as and when it becomes available. This can either be as a result of more detailed hydraulic modelling carried out by NRW and/or external parties; or recorded flood extents following a flood event. Furthermore, real-world upgrades to flood defence infrastructure will also alter the degree of flood risk in a particular area. In this regard, this SFCA is a snapshot of flood risk based on data available at the time of publication, with the conclusions on flood risk presented subject to change in accordance with any updates to the NRW Flood for Planning and existing flood defence infrastructure.

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<sup>10</sup> NRW (2023) *Flood Map for Planning* <https://flood-map-for-planning.naturalresources.wales/> accessed June 2023

<sup>11</sup> NRW (2018) *Ebbw ICM\_5\_v1.0\_2018\_Product6*

<sup>12</sup> NRW, (2013) *Abertillery\_5\_V2.0\_2013 FMP-Tuflow hydraulic model*.

<sup>13</sup> DCWW (2021) *Blaenau Gwent Sewer Flood Risk 28.06.21*

<sup>14</sup> BGCBC (2021) *All flood incidents records*

<sup>15</sup> BGS (2021) *Geology of Britain viewer (classic)*, <https://mapapps.bgs.ac.uk/geologyofbritain/home.html>

<sup>16</sup> Cranfield Soil and Agrifood Institute (2021) *Soilsmap*, <http://www.landis.org.uk/soilsmap/>

<sup>17</sup> NRW (2019) *Spatial Flood Defences with Standardised Attributes*, <https://lle.gov.wales/catalogue/item/SpatialFloodDefencesWithStandardisedAttributes/?lang=en>

The level of flood risk associated with each source of flooding has been classified further at each of the candidate sites. These classifications are based on a pragmatic and conservative approach which accounts for the flood source being considered and the nature of the data available. The criteria used to classify risk for each source is detailed in their respective subsections in section 4.

## **2.2 Consultation with statutory bodies**

The PPW and associated guidance require that a SFCA be prepared by the local planning authorities in consultation with NRW and Lead Local Flood Authorities (LLFAs), as well as the local sewerage undertaker and Internal Drainage Boards where relevant.

In order to inform this SFCA, NRW and BGCBC were contacted to confirm the most up to date information available including modelling data and historical information. This was followed up by proactive engagement to agree the methodology and mapping required for this SFCA. In addition, consultation with DCWW established what information/data were available on sewer flooding to inform the SFCA.

## **2.3 Sequential Test**

TAN15 advocates a sequential approach that will guide the planning decision and the allocation of potential development sites. Development in Zone 1 is acceptable in principle in relation to flood risk, providing it does not cause any increase in flood risk elsewhere. Where development is proposed in a flood risk area facing risk from rivers and the sea, the planning authority will need to be satisfied that its location is justified. It is important that areas in Zone 3 are used only as a last resort, and not at all for new highly vulnerable development. More flexibility is permitted in Zone 2 and the TAN 15 Defended Zones, where formal defence infrastructure provides a good standard of protection against flooding.

Planners should first seek to direct new development to areas at minimal risk of flooding- areas in Zone 1. Only if it can be demonstrated that there are no suitable sites within these areas, should alternative sites at greater risk of flooding be considered.

Following the application of this sequential test, TAN15 stipulates permissible development types within each flood zone. This considers both the probability of flooding within a site, and the likely vulnerability of the proposed development to damage, as well as the risk of life to occupants should a flood event occur.

This SFCA provides the information required to carry out the Sequential Test. It identifies flood risk zones, and accounts for the impact of climate change on fluvial flooding. It also includes a summary of other sources of flood risk to the candidate sites.

## 3 Summary of Flood Risk in Blaenau Gwent

### 3.1 Review of Flooding Sources

#### 3.1.1 Fluvial Flood Risk (Main Rivers)

The risk of fluvial flooding from main rivers (catchment area >3km<sup>2</sup>) has been assessed using the mapped flood extents through the Blaenau Gwent area, as shown by existing hydraulic modelling data and NRW's Flood Map for Planning Rivers Flood Zones. Flood extents for the River Ebbw are based on a 1D/2D model developed as a part of the Ebbw 2018 NRW study. This model includes the Ebbw Fach downstream of Six Bells and the River Sirhowy downstream of Ynysddu, Caerphilly. Additionally, the Ebbw Fach is informed by a separate 1D/2D model developed by JBA as a part of the Abertillery Flood Risk and Hazard Mapping 2013 study<sup>18</sup>.

#### **River Ebbw**

The River Ebbw is the largest river running through Blaenau Gwent. It flows from north to south, starting at the Carno Reservoir and passing through the communities of the Ebbw Vale. It converges with the Ebbw Fach at Aberbeeg and passes through Llanhilleth before entering Caerphilly. The floodplain is constrained due to the steep topography. The floodplain opens up in the flatter urban areas and culverted sections in Cwm, Carmeltown and Ebbw Vale. A number of properties in these areas are within Flood Zone 2 and Flood Zone 3.

#### **River Sirhowy**

In the west side of Blaenau Gwent, the River Sirhowy is the main river. It runs from north to south starting upstream of an unnamed reservoir at NGR: 312863, 211626 before passing through Waundeg and Tredegar. The floodplain is again constrained by the local topography. Several properties in Tredegar, where the A4047 meets the A4048 (NGR: 314251, 209867), are located in Flood Zone 3 with several more to the south located in Flood Zone 2.

#### **Ebbw Fach**

The Ebbw Fach also flows from north to south, starting at Blaina before passing through Abertillery and meeting the River Ebbw at Aberbeeg. The floodplains are again narrow, however tend to widen in flatter urban areas. Notably large areas of Abertillery and Duffryn park sit within Flood Zone 3. The main flood risk to properties is in Abertillery, specifically upstream of a culverted section passing by the A467 where several properties lie within Flood Zones 2 and 3. Similarly to the Ebbw there are a number of culverted sections, upstream of which the flood zones widen.

The Afon Tyleri is included in the 2013 Abertillery model which starts at the Cwmtillery Reservoir and converges in Abertillery. A large portion of it is culverted as it passes through the community therefore flood risk is restricted to the northern area where there are no properties mapped.

#### **Other Watercourses**

There are several other main rivers in the Blaenau Gwent administrative boundary. These are largely tributaries of the Ebbw and Sirhowy. They are not included in the detailed hydraulic models available for these watercourses, therefore the flood extents for these watercourses are likely to be based on JFLOW mapping. JFLOW is appropriate for a strategic assessment of flood risk, however it is generally not advised for site-specific purposes.

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<sup>18</sup> NRW, 2013. Abertillery\_5\_V2.0\_2013 FMP-Tuflow hydraulic model.

The Nant Melyn and Nant Trefil are both tributaries of the Sirhowy. The Nant Melyn runs through the Crown Industrial Estate and joins the Sirhowy by the Glanhwy Primary School (NGR: 314158, 210152). A large portion of the industrial estate is located within Flood Zone 3. The Nant Trefil joins the Sirhowy upstream of the unnamed reservoir and passes through the small settlement of Trefil (NGR: 312018, 212719) where a number of properties are located in Flood Zone 3.

Another watercourse is the River Clydach which runs from west to east in the most northern area of Blaenau Gwent. It starts at the Blaen-y-Cwm Reservoir (NGR: 317380, 213110) and runs alongside the A465 on the edge of Brynmawr. In Brynmawr Flood Zone 3 remains largely in channel whilst Flood Zone 2 opens up near the King's Street roundabout (NGR: 319592, 212091) putting a number of properties at risk.

Maps showing the extent of the flood outlines for the main rivers in Blaenau Gwent are provided in Appendix 1.

### 3.1.2 Small Watercourses

Small watercourses with catchments less than 3km<sup>2</sup> are not represented in the fluvial flood maps provided by NRW. The risk of flooding from small watercourses has therefore been assessed by reviewing NRW's Flood Map for Planning surface water and small watercourses flood zones.

The maps, accounting for local rainfall patterns and topography, show the majority of small watercourses. It should be noted that not all the conveyance area of small watercourses is explicitly modelled nor structures such as culverts in most cases. Therefore, they usually provide a conservative assessment of the flood risk from small watercourses and should not be used as definitive mapping, however, are a valuable tool when combined and validated against local experience and knowledge.

There are a number of small watercourses in Blaenau Gwent which are not included in NRW's fluvial flood maps and are summarised below. These have been identified using the surface water and small watercourses flood zones combined with OS mapping.

- Nant Big: A stream located between the River Ebbw and Ebbw Fach. It joins the River Ebbw at NGR: 320581, 201902 just before it meets the Ebbw Fach. No properties are located nearby therefore it is not considered to pose a significant flood risk, however the flood map does show flooding across the Ebbw Vale railway line in the lower reaches.
- Cwm Nantmelyn (Rasa Brook): A stream that passes through the Rassau Industrial Estate conveyed through several culverts and bridges before joining the Rasa Brook by Rassau Road at NGR: 315708, 211499. Several properties adjacent to the stream lie within the zone 2 and 3 extents. There also appears to be a significant surface water flood risk to the wider estate.
- Nant Cwmllywdrew: A small stream that runs east to west alongside Graig Rd and joins the Ebbw Fach at Six Bells at NGR: 322014, 202926. It is largely culverted through Six Bells. Several properties adjacent to the stream lie within the zone 2 and 3 extents, these lie mainly upstream of the culvert at NGR: 322300, 202872.
- Nant y Groes: A stream located immediately above the Nant Cwmllywdrew that also meets the Ebbw Fach in Six Bells at NGR: 322062, 203078. It appears to be fully culverted in Six Bells based on OS mapping, however several properties appear to be at risk along its apparent course upstream of Bridge Street (NGR: 322177, 203072), potentially as a result of out of bank flows from further upstream.
- Nant Ystruth: A stream that joins the Ebbw Fach at Blaina. The watercourse is assumed to enter a culvert at NGR: 320715, 208441 adjacent to the Cwmcelyn Nature Reserve as it disappears on OS maps. The flood maps suggest that out of bank flows upstream of the culvert could pose a

risk to several properties lying downstream as the flows combine with surface water flooding in east Blaina.

- Cwm Nantmelyn (River Clydach): This stream joins the River Clydach at NGR: 320227, 212250 from the north adjacent to the A465. The flood maps show it may pose a low flood risk (to the adjacent waste processing facility).

Maps showing the extent of the flood outlines for the surface water flood maps in Blaenau Gwent are provided in Appendix 2 with the small watercourses marked.

### 3.1.3 Surface Water Flooding

Surface water flooding is often the result of high peak rainfall intensities, and/or insufficient capacity in the sewer network. Surface water flooding is a significant flood risk in urban areas due to the high proportion of impermeable surfaces, which cause a significant increase in runoff rates and consequently the volume of water that flows into the sewer network.

The risk of flooding from surface water has been assessed by reviewing NRW's Flood Map for Planning surface water and small watercourses flood zones. This mapping is intended to be the best single source of information on surface water flooding incorporating the latest NRW modelling techniques.

The maps are currently based on several assumptions but do indicate where surface water flooding would occur as a result of local rainfall. Assumptions include using a 90% runoff factor for urban surfaces and incorporating a loss rate of 12 mm/hr to account for urban drainage. Caution should be exercised when reviewing the map as it may show an over or under-estimation of the surface water flood risk in certain areas.

Due to the modelling techniques used, the mapping picks out depressions in the ground surface and simulates some flow along natural drainage channels, rivers, low areas in floodplains and flow paths between buildings. In areas where the surface water flood maps show flooding near rivers, the dominant flooding mechanism is often fluvial. Therefore, these areas are included in the assessment of fluvial rather than surface water flooding.

In addition to the strategic level flood maps, flooding incidents recorded by BGCBC dating back to 1990 have been used to assess surface water risk. It should be noted that some of these records are anecdotal evidence from residents and tend not to give details on the extent and severity of flooding encountered. Therefore, the records should be treated with caution, some records may be for very minor events (eg groundwater ingress into a yard) which do not mean an area is necessarily prone to flooding.

In this regard, the analysis has sought to combine both data sources to identify areas at significant risk of surface water flooding; particularly where historical incidents corroborate flooding shown by the mapping. These at-risk areas are summarised below:

- **Cwm** – There is a risk of surface water flooding along several roads in Cwm including Marine Street, Graig Terrace, York Terrace, Aubrey Terrace, Stanfield Street, Crosscombe Terrace, Railway Terrace, Curre Street, Canning Street and Oak Street. This risk generally borders the properties however there are numerous properties at risk particularly when the 1000-year event plus climate change event (Flood Zone 2) is considered. These include properties on York Terrace, Aubrey Terrace, Crosscombe Terrace and Canning Street. Flooding incidents were also recorded along Curre Street, Oak Street, and Falcon Terrace during the Storm Dennis event.
- **Ebbw Vale** – Areas at risk include the roads and parking associated with the Tesco superstore, Beaufort Road, Gwaun Helyg Road, Bethcar Street, the Ebbw Vale Learning Community Campus' and the industrial buildings to the south. Some properties on Eureka Place and Clos Trehelyg are

also shown to be at risk of flooding. Flooding incidents have been recorded at Eureka place and Bethcar Street in 2009 and 2010 respectively.

- **Tredegar** – Surface water flood risk is prominent in Tredegar, Sirhowy and Georgetown with several roads and industrial estates at risk. Prominent roads and areas at risk including the Tafarnaubach Industrial Estate, Merthyr Road, Crown Industrial Estate, Charles Street, Beaufort Road, Church Street, Stockton Way, Queen Victoria Street, and the roads around Bedwellty Park. Some properties including those on Charles Street, Church Street and Queen Victoria Street are also shown to be at risk. The surface water flood map is partly corroborated by recorded flooding incidents on Charles St (2016), Beaufont Rd (2009), Church Street (2008 & 2009), Stockton Way (2009) and Queen Victoria Street (2009).
- **Rassau** – Rassau Industrial Estate and Rassau Road and School Road are at risk from surface water flooding. Many properties on the southern side of Rassau Road are also at risk. Flooding incidents were recorded at Rassau Rd in 2010.

Maps showing the extent of the flood outlines for the surface water flood maps in Blaenau Gwent are provided in Appendix 2. Maps showing the location of flooding incidents recorded by BG CBC are provided in Appendix 3.

### 3.1.4 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at ground level. There are limited local data with respect to groundwater flooding. However, for a strategic level assessment of the potential for groundwater flooding the BGS UK Geoviewer has been used to determine the bedrock and superficial deposits across the study area, with the Landis Soilsmap map used to determine the soils present.

The BGS mapping shows that the southern Blaenau Gwent area is underlain by the South Wales Upper Coal Measure Formation. This is a sedimentary bedrock of mudstone, siltstone and sandstone in the valleys with the dividing hills consisting of sandstone. The general permeability of the bedrock in this region is expected to be moderate.

The soils on the southern side of Blaenau Gwent are largely freely draining acid loamy soils over rock whilst those in the hills have a wet peaty surface. The freely draining nature of the soils should limit the potential for impeded drainage and waterlogging, however the mobile water table may present a groundwater flood risk in low lying areas particularly near watercourses.

Further north the county is underlain by the Middle and Lower South Wales Formations. This largely consists again of mudstone, siltstone and sandstone. In the north-west corner of the region the area is underlain by various formations consisting largely of sandstone and conglomerate. Once more these formations are expected to permit moderate permeability.

In the north the soils are predominantly slowly permeable soils with a peaty surface. These soils are likely to exhibit impeded drainage which may limit groundwater flood risk but may form a separate surface water flood risk to urban areas including Ebbw Vale and Rassau. Several areas are designated as restored soils as a result of quarry works or similar activities, drainage in these areas is expected to be variable. Maps showing the bedrock and soils in Blaenau Gwent are provided in Appendix 4.

It should also be noted that given its coal mining heritage, Blaenau Gwent has a broad network of disused pits and collieries which could pose a further groundwater flood risk. Disused mine shafts often contain water as they lay below local groundwater levels. In periods of intense rainfall, water levels within the mine have the potential to rise to the surface, known as groundwater rebound. As

mine water reaches the surface, flash floods as a result of the pressure build up within the shaft can occur via disused mine entry points.

The Coal Authority is responsible for monitoring mining works. However, the vast number of mine shafts across the South Wales coalfield mean that it is not possible to effectively monitor all sites. Therefore, predicting where mine flooding may occur can be difficult and results in certain areas being potentially vulnerable to this type of flooding in future.

### 3.1.5 Sewer Flooding

Sewer flooding often occurs because an existing drainage system having insufficient capacity to drain rainfall, consequently causing the release of water at manholes. Sewer flooding can also occur should there be a fault/failure at an existing drainage system.

The responsible authority for sewer flooding across the study area is Dwr Cymru Welsh Water (DCWW), the Sewerage Undertaker. DCWW was contacted to gather available data on sewer flooding. A total of 95 historic records of sewer flooding with active risk and a further 67 historic incidents with resolved risk were recorded by DCWW for the study area between 1990-2021. Resolved risk refers to incidents where a scheme has been introduced since to address risk. Measures may include upsizing sewers, creating off-line storage tanks and/or enhancing natural drainage.

It should be noted as for surface water flooding incidents, that the records are somewhat dependent on reporting and are given for a point location. In this regard, caution should be exercised when ascribing a sewer flood risk to a particular area.

A summary of the spatial distribution of active risk and resolved risk incidents of sewer flooding by electoral ward is summarised in Table 2. These show the wards of Brynmawr and Rassau to have the most active risk incidents. Maps showing the location of sewer flooding incidents in Blaenau Gwent are provided in Appendix 5.

Table 2 - Sewer Flooding Incidents by Electoral Ward

Electoral Ward	Number of Active Risk Incidents	Number of Resolved Risk Incidents
Abertillery	5	4
Badminton	4	0
Beaufort	5	0
Blaina	8	8
Brynmawr	10	14
Cwm	2	15
Cwmtillery	2	4
Ebbw Vale North	5	4
Ebbw Vale South	3	0
Georgetown	4	1
Llanhilleth	7	14
Nantyglo	3	0
Rassau	14	0
Sirhowy	7	0
Six Bells	7	0
Tredegar Central and West	8	3

### 3.1.6 Reservoir Flooding

In 2010 the EA published maps showing the flood risk associated with reservoirs. Dam breach and flood modelling techniques were used to produce a national set of reservoir flood maps for both England and Wales. The maps were created showing how far flood water would spread from a reservoir in a worst-case scenario so that emergency services and councils have all the information they need to put plans in place to protect people. These include the following reservoirs:

- Ebbw- Carno Reservoir, Llangyndir Reservoir, Unnamed Reservoir at NGR: 317325, 213092
- Ebbw Fach- Unnamed Reservoir at NGR: 318860, 211194
- Sirhowy- Unnamed Reservoir at NGR: 312865, 211627, Bryn Bach Park Reservoir
- Afon Tyleri- Cwmtillery Reservoir

The areas affected lie along these watercourses and include parts of Tredegar, Ebbw Vale, Brynmawr, Nantyglo, Blaina, Abertillery and Aberbeeg. Whilst these areas are shown to be at risk, reservoir failure is a rare event with a very low probability of occurrence. Current reservoir regulation, which has been further enhanced by the Flood and Water Management Act, aims to make sure that all reservoirs are properly maintained and monitored in order to detect and repair any problem.

### 3.2 Review of Historic Flood Events

Historical flood events recorded by NRW, local newspaper reporting, previous studies for the River Ebbw catchment and local gauge data have been used to provide a summary of historic flood events for the Blaenau Gwent area. NRW's recorded flood extents and historic flood map layers were also reviewed for the area but show no recorded flood extents. The following table summarises the dates and anecdotal details for the major flood events identified.

Table 3- Recorded Flood Events in Blaenau Gwent Area

Date of Flood Event	Anecdotal Details
Winter 1925	Heavy rain affected South Wales. On the Ebbw catchment damage occurred at Cwm. The Duffryn Schools playground was flooded to a depth of several feet, whilst many houses in Cwm were isolated by the flood.
Winter 1929	Very serious and prolonged rainfall in November brought flooding to Cwm on the Ebbw, water was up to the doors of houses in Oak Street whilst allotments and football fields were under water. Many houses in Ebbw Vale were flooded, with people stranded in upstairs rooms. Duffryn School yard was flooded along with the boiler house but not the school itself. The Glyn Milwr Pond above Blaina overflowed along Henwain Street to the Abertillery Road; culvert capacity was insufficient and houses in Jubilee Terrace were flooded. At Aberbeeg, the recreation grounds were covered. The concrete bridge at Llanhilleth Colliery was under water for several hours.
Autumn 1933	Heavy rain fell on the 9 <sup>th</sup> and 10 <sup>th</sup> October. The River Ebbw overflowed in the Western valleys and caused much damage to property but principally water coming off the hillside was the main risk. At Llanhilleth the park and bowling green were underwater. Some houses in Meadow Street, Llanhilleth were flooded.
Winter 1960	Meadow Street and Railway Street, Llanhilleth were flooded to a depth of three feet with an estimated 87 homes affected. Homes were also flooded at New Woodland Terrace, Aberbeeg. The river rose above two of the bridges at River Row, flooding a warehouse.
Winter 1979	Six inches of rain fell in 12 hours. 5 major roads were affected including: Aberbeeg to Ebbw Vale; Blackwood to Tredegar; and the Ebbw Vale Steelworks Road.
Autumn 1998	Reports of flooding at Tredegar from the River Sirhowy.
Autumn 2016	Parts of Ebbw Vale and the Tredegar area were affected by flooding from the Ebbw and Sirhowy.
Winter 2020	Parts of Cwm and Aberbeeg were badly affected by flooding and several roads in the area were closed as a result. The railway line between Ebbw Vale and Cardiff was closed. Parts of Brynmawr and Llanhilleth also experienced flooding.

### 3.3 Review of Flood Defences

A number of NRW flood defences are present alongside the River Ebbw and Ebbw Fach in the form of embankments and walls. Table 4 provides a summary of the flood defences including their condition, extent, standard of protection and the locations benefitting.

The defences are primarily located in the south of the study area, no formal flood defences have been identified in Ebbw Vale, Tredegar, Rassau, Blaina, Nantyglo and Brynmawr. Most of the defences are in fair or good condition, safeguarding against a breach event. Where defence condition is poor or very poor this is flagged below.

Table 4- Recorded Flood Events in Blaenau Gwent Area

NRW Sub catchment	Defence Type	Length	Condition	Design SOP	Easting	Northing
Cwm	Wall	9.91	2 - Good	100	318292	205384
	Wall	102.14	3 - Fair	100	318337	205244
	Wall	123.48	3 - Fair	100	318116	205614
	Embankment	33.29	<b>4 - Poor</b>	100	318071	205689
	Embankment	87.68	3 - Fair	100	317983	205790
	Wall	63.57	2 - Good	100	318672	204629
	Wall	104.28	3 - Fair	100	318183	205512
	Embankment	135.77	3 - Fair	100	317983	205790
	Wall	128.16	3 - Fair	100	318633	204678
	Wall	58.76	3 - Fair	100	318075	205655
Llanhilleth and Aberbeeg	Wall	146.4	3 - Fair	100	321665	200660
	Embankment	179.32	3 - Fair	100	320964	201468
	Wall	94.9	3 - Fair	100	320913	201257.
	Wall	60.82	2 - Good	100	321185	202232
	Wall	340.22	3 - Fair	100	321331	200734.
	Wall	85.55	3 - Fair	100	321185	202232
	Embankment	95.63	3 - Fair	100	320961	201857
	Wall	31.88	3 - Fair	100	321136	202177
Six Bells & Abertillery	Wall	125.58	<b>4 - Poor</b>	100	322039	203343
	Wall	34.29	2 - Good	100	322049	203311
	Wall	52.15	3 - Fair	100	321324	204299
	Wall	57.28	3 - Fair	100	321451	204103
	Wall	36.1	3 - Fair	100	321266	204338
	Wall	185.42	3 - Fair	100	321107	204463
	Wall	24.71	3 - Fair	100	321243	204346
	Wall	127.82	3 - Fair	100	322070	203203
	Embankment	50.2	2 - Good	100	320994	204589
	Wall	34.85	3 - Fair	100	321298	204323
	Wall	36.46	3 - Fair	100	321377	204169
	Embankment	17.61	3 - Fair	100	322076	203118.
	Wall	109.7	3 - Fair	100	322070	203203
	Wall	24.77	<b>5-Very Poor</b>	100	321469	204049
	Wall	63.96	<b>4 - Poor</b>	100	321408	204150
	Wall	40.02	2 - Good	100	322068	203079
	Wall	69.46	2 - Good	100	321345	204214
Wall	22.49	3 - Fair	100	321349	204231	

### 3.4 Review of Flood Warning

Natural Resources Wales (NRW) is responsible for issuing flood warning in the Blaenau Gwent area. In regularly monitoring the river network they aim to give the public notice of any local main river overtopping its bank (flood alert) or flooding properties (flood warning).

Along the reaches within the study area there are four level gauges, one of which is also a flow gauge. These gauges are listed below and are used for flood alerts and warnings.

- Cwm (New)
- Cwm (Old)
- Abertillery
- Aberbeeg (Flow Gauge)

At these gauges the water levels are monitored, and this information is used to inform flood warnings at the five flood warning areas within the study area. Flood warning areas are geographical areas where NRW expect flooding to occur and where NRW provide a flood warning service. A flood warning is issued when there is a risk of property flooding. The flood warning areas in the study area are listed below:

- Ebbw Fawr at Cwm
- Ebbw Fach at Aberbeeg
- Ebbw Fach at Six Bells
- Ebbw Fach at Abertillery
- River Ebbw at Llanhilleth

The gauges are also used to issue flood alerts across the wider River Ebbw, Sirhowy and Lwyd flood alert area. Flood alert areas are geographical areas where it is possible for flooding to occur. A flood alert is issued to warn people of the possibility of flooding. Figure 2 shows the flood alert area relative to the five flooding warning areas.

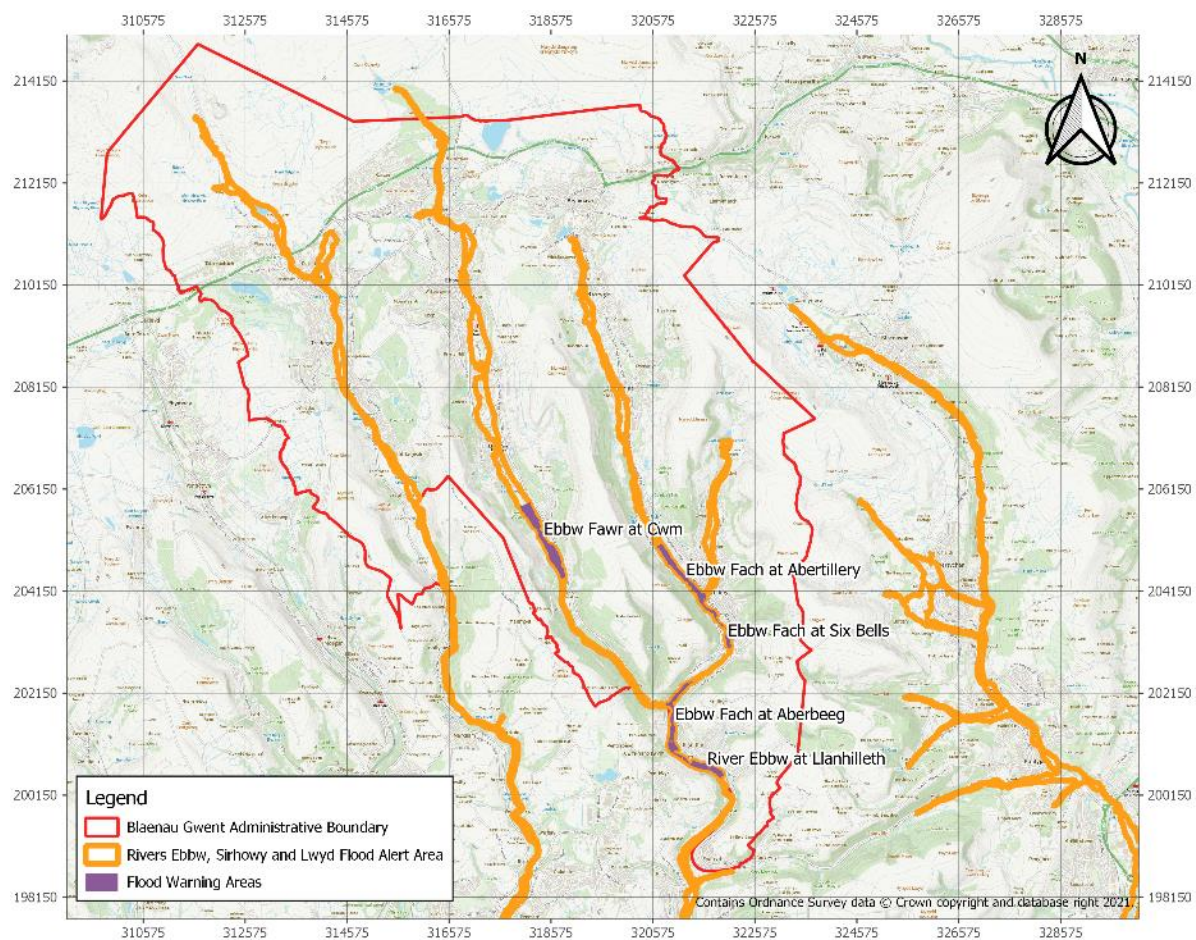


Figure 2 – Flood Warning Areas and Flood Alert Area

The timings of flood alerts and warning are typically determined by trigger levels at the gauges which relate to the following:

- **FAL – Flood Alert**  
The level where flood waters first come out of bank if there were no defences.
- **FW – Flood Warning**  
The level where flood waters flood 1 property.
- **SFW – Severe Flood Warning**  
The level where flood waters flood 50 properties.

The flood warning systems were reviewed and updated recently as part of the Ebbw hydraulic modelling study. In this regard they are robust and up to date.

Flood alerts and warnings are available from NRW by a preferred contact method e.g. by phone or email. It is recommended that landowners/property owners in flood risk areas sign up to this service. There is also a 5-day flood forecasting system available on the NRW website.

### 3.5 Climate Change

The impacts of climate change are likely to increase constraints on development within flood risk areas. This is due to a predicted increase in storm/rainfall intensity, subsequently increasing peak river flows. As of 1st December 2016, Welsh Government updated climate change allowances to reflect research into the effect of climate change on peak river flows and sea levels. Following this, updated guidance was released in December 2017 by Welsh Government. The latest available guidance note from September 2021<sup>20</sup> has been applied in this SFCA. It uses the UKCP18 climate projections.

Wales is split into a total of 3 river basin districts; Western Wales, Severn and Dee. The Blaenau Gwent area falls in the Severn River basin district. A range of percentage increases in river peak flow estimates are provided for each district; lower end (10th percentile), central estimate (50th percentile) and upper end estimate (90th percentile). The guidance note recommends that the central estimate is used for site specific FCA's, with the upper end allowance required for mitigation design, depending on the scale and nature of the proposed development. It is standard practice for commercial and residential development to use the allowance that represents 100 years of climate change relative to present day (i.e. the total change anticipated by the 2080's). The range of allowances for the Severn River basin district are shown in the Table 5.

Table 5- Peak River flow allowances for the Severn River basin district

NRW Sub catchment	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
<b>Severn</b>			
Upper end estimate	25%	40%	70%
Central estimate	10%	20%	25%
Lower end estimate	0%	5%	5%

<sup>20</sup> Flood Consequence Assessments: Climate Change Allowances. Welsh Government. 2021. Available at: [https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments\\_0.pdf](https://www.gov.wales/sites/default/files/publications/2021-09/climate-change-allowances-and-flood-consequence-assessments_0.pdf)

## 4 Flood Risk at Candidate Sites

### 4.1 Candidate Sites

A total of 122 candidate sites are being promoted for consideration in the Strategic Flood Consequence Assessment (SFCA). The SFCA will implement national policy to direct development away from areas of flood risk through assessing all candidate sites and helping inform strategic decisions on future development. Figure 1 shows the location of sites across the Blaenau Gwent administrative area. The majority of the sites are earmarked for residential development however a range of potential uses are proposed as summarised in Table 6.

Table 6 - Candidate Sites Proposed Uses

Proposed Use	Number of Sites	TAN15 Development Category
Residential	82	Highly vulnerable
Employment	11	Less vulnerable
Mixed Use	9	N/A
Settlement Boundary Change	7	N/A
Tourism and Leisure	3	Less vulnerable
Renewable Energy	3	Less vulnerable
Gypsy and Travellers site	1	Highly vulnerable
Nursery	1	Highly vulnerable
Garden Extension	1	Highly vulnerable
Quarry	1	Less vulnerable
Railhead and Associated Transport Links	1	Less vulnerable
No proposed use	1	N/A

Note, some of the sites relate to changes in a settlement boundary rather than an earmarked development. If these changes are successful, then the land will be within a settlement boundary making it potentially easier to secure planning permission for future development.

### 4.2 Fluvial Flood Risk (Main Rivers)

Fluvial flood risk from main rivers (catchment area >3km<sup>2</sup>) at the candidate sites has been assessed using NRW's Flood Map for Planning fluvial flood zones with the proportion of each site falling in respective flood zones estimated using GIS software. The level of fluvial flood risk has been assessed at each of the candidate sites based on the criteria listed below.

Table 7- Classification of Fluvial Flood Risk


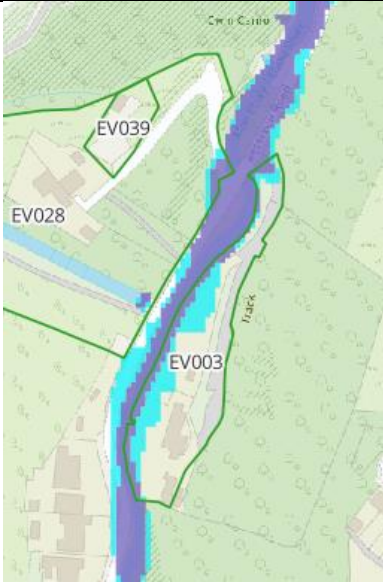
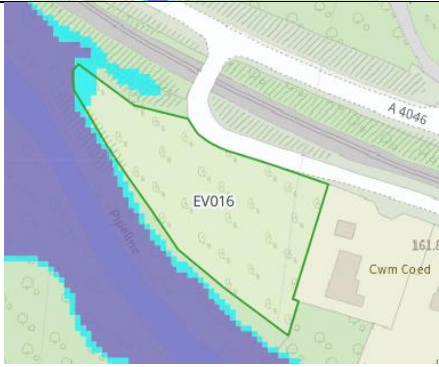
Fluvial Flood Risk Classification	Criteria
High	<ul style="list-style-type: none"> <li>Over 20% of site area located in Flood Zone 3</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>More than 10% of site area located in Flood Zone 2</li> </ul>
Low	<ul style="list-style-type: none"> <li>Site area within Flood Zone 2 extent</li> </ul>



In total 112 sites out of 122 are not at risk of fluvial flooding from a main river, being situated entirely within Flood Zone 1. For the remaining 10 sites, parts of each site lie either within Flood Zone 2 or Flood Zone 3. Four of these sites are classed as low risk, five of the sites are classed as moderate risk and one of the sites is classed as high risk

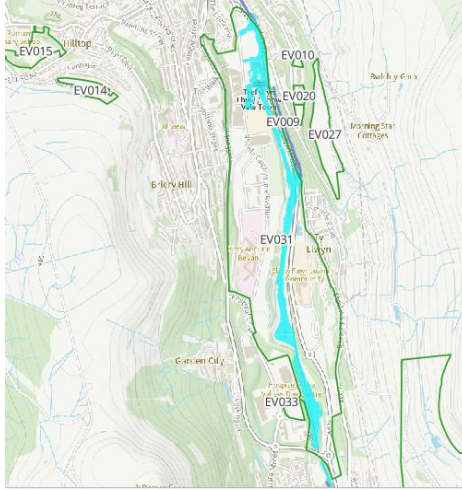

For these sites a further sequential test has been undertaken to establish whether the sites are capable of meeting TAN15 requirements based on flood risk and their proposed development categorisation. Recommendations are also made with regard to layout, access/egress issues and freeboard requirements. The freeboard in this case, refers to an allowance for setting finished floor levels in new development, it provides the designer with a degree of confidence that the project will perform as designed. In most cases it is 300mm above the design flood level (100-year plus climate change event).

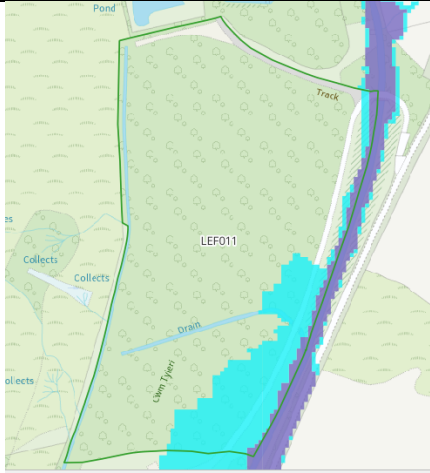
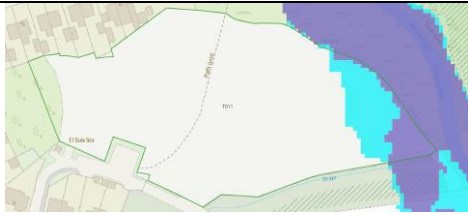
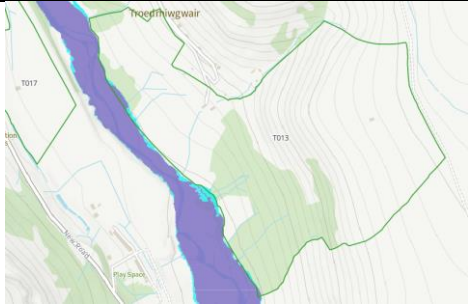
The assessment is provided in Table 8 below. It should be noted that this is a preliminary assessment, and it is advised that any site-specific FCA at the planning application stage assess each potential source of flooding in detail and advise on the location of development infrastructure accordingly. In terms of allocation, there appear to be few barriers to prevent this in future based on current evidence at the majority of the sites, with the exception of the high risk site (T025).

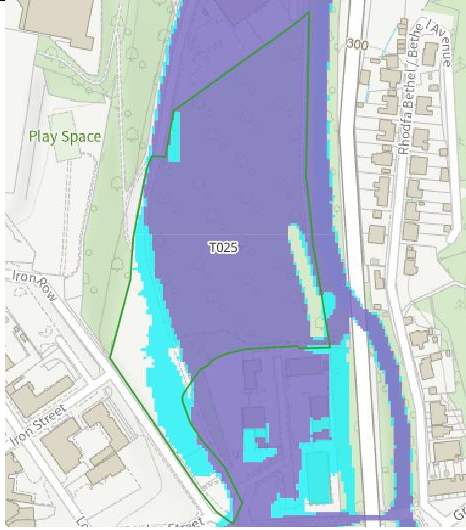
Table 8- Sequential Assessment of Candidate Sites within Flood Zones

Site Name	Percentage Site Area Inundated (%)		Current land use	Potential land use	NRW Flood Map for Planning 	Justification
	FZ2	FZ3				
EV003 – Carno Cottage	32	13	Residential and open space	Residential		<p>For the part of the site within <b>Flood Zone 2</b>, development must:</p> <ul style="list-style-type: none"> <li>• Assist, or be part of, a local authority initiative or strategy to sustain an existing settlement.</li> <li>• Meet the definition of previously developed land</li> <li>• The potential consequences of a flooding event for the particular type of development need to be considered and found to be acceptable in accordance with the criteria contained in section 11 of TAN15.</li> </ul> <p>For the part of the site within <b>Flood Zone 3</b>:</p> <ul style="list-style-type: none"> <li>• New residential development (Highly Vulnerable Development) is not permissible in Flood Zone 3</li> </ul> <p><b>Recommendations:</b> A site level sequential approach should be applied, locating development in Flood Zone 1 and any less vulnerable ancillary infrastructure (e.g. Car Parks) in Flood Zone 2 if required (providing it meets the criteria above). Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Existing access to the site is within the flood zones, any access road should be designed appropriately to allow safe access/egress.</p>
EV016 – The Wrekin, Cwm Road	3	<1	Open land	Residential		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>:</p> <ul style="list-style-type: none"> <li>• New residential development (Highly Vulnerable Development) is not permissible in Flood Zone 3</li> </ul> <p><b>Recommendations:</b> Only a very small proportion of the site is within Flood Zone 2 and Flood Zone 3 in the north west corner of this site. Reducing the site boundary away from the west boundary slightly would eliminate risk. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Access to the site is outside of the flood zone.</p>

EV028 – Reservoir Road	2	1	Open land	Settlement Boundary Change		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>, less vulnerable development will only be justified if it complies with either clause 1 or 2, and in every case with clause 3:</p> <ol style="list-style-type: none"> <li><b>1-</b> The scheme is allocated in an adopted Development Plan, with evidence to justify why it's necessary to locate in zone 3.</li> <li><b>2-</b> Its location in zone 3 is necessary to contribute to key environmental, employment or energy generating objectives supported by the local authority.</li> <li><b>3-</b> The potential consequences of a flooding event for the development have been considered and found to be acceptable in accordance with the criteria contained in section 11 of TAN15.</li> </ol> <p><b>Recommendations:</b> Only a very small proportion of this site is within Flood Zone 2 and Flood Zone 3. Reducing the site boundary away from Reservoir Road slightly would eliminate risk. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Access to this site is still problematic as the current access is within both flood zones. Any access road should be designed appropriately to allow safe access/egress.</p>
EV030 – Former Cwm Primary School	3	1	Former school	Residential		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>:</p> <ul style="list-style-type: none"> <li>• New residential development (Highly Vulnerable Development) is not permissible in Flood Zone 3</li> </ul> <p><b>Recommendations:</b> Only a very small proportion of the site is within Flood Zone 2 and Flood Zone 3 in the west corner of this site. Reducing the site boundary away from the west boundary slightly would eliminate risk. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. The main access route Canning Street is within flood zone 2, other potential access options should be reviewed.</p>

EV031 – The Works	14	0	Former Steelwork site	Mixed Use		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003. None of the site is within <b>Flood Zone 3</b>.</p> <p><b>Recommendations:</b> This is a large site boundary that encompasses existing developments. As the proposed land use is mixed use, a site level sequential approach should be applied, locating development in Flood Zone 1 wherever possible and less vulnerable uses in Flood Zone 2 if required. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Access to the site is outside of the flood zone.</p>
LEF009 – Vivian Park	22	18	Mix of uses - vacant land, garage, rebed filtration	Mixed Site Use		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>, new Highly Vulnerable Development is not permissible. Less Vulnerable Development must meet the same criteria listed for EV028.</p> <p><b>Recommendations:</b> A significant proportion of this site is within Flood Zone 2 and 3. As the proposed land use is mixed use, a site level sequential approach should be applied, locating development in Flood Zone 1 wherever possible and less vulnerable uses in Flood Zone 2 if required. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Access to the site is outside of the flood zones.</p>

LEF011 – Millenium Wood	16	2	Woodland	Mixed Site Use		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>, new Highly Vulnerable Development is not permissible. Less Vulnerable Development must meet the same criteria listed for EV028.</p> <p><b>Recommendations:</b> Only a small proportion of this site is within Flood Zones 2 and 3. Reducing the eastern site boundary slightly would eliminate risk, or a site level sequential approach should be applied. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Access to this site is within both flood zones. Any access road to the site should be designed appropriately to allow safe access egress.</p>
T011 – Old Glanrhyd Farm (Site 1)	12	4	Grazing land	Residential		<p>For the part of the site within <b>Flood Zone 3</b>:</p> <ul style="list-style-type: none"> <li>• New residential development (Highly Vulnerable Development) is not permissible in Flood Zone 3</li> </ul> <p><b>Recommendations:</b> This site has a small proportion of its extent in Flood Zone 3. This flood zone can be avoided by slightly reducing the eastern boundary of the site. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Existing access to the site is outside of the flood zone.</p>
T013 – Fountain Inn Farm	<1	<1	Farmland and Public House	Residential and Renewable Energy		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>, new residential (Highly Vulnerable Development) is not permissible. Renewable energy infrastructure (Less Vulnerable Development) must meet the same criteria listed for EV028.</p> <p><b>Recommendations:</b> This site has a small proportion of its extent in Flood Zones 2 and 3. This flood zone can be avoided by slightly reducing the western boundary of the site. Development should be set at a floor level to provide an appropriate freeboard above the design flood level. Existing access to the site from the east is outside of the flood zone.</p>

T025 – Land at Tredegar Business Park	88	76	Vacant land	Offices		<p>For the part of the site within <b>Flood Zone 2</b>, all development must meet the same criteria listed for EV003.</p> <p>For the part of the site within <b>Flood Zone 3</b>, Employment development (Less Vulnerable Development) must meet the same criteria listed for EV028.</p> <p><b>Recommendations:</b> The majority of this site is in Flood Zone 3. If the site is to be considered further for allocation a level 2 SFRA is likely required, given that a significant amount of land for development cannot be allocated outside flood risk areas.</p> <p>For any significant development to be permissible it will need to help sustain an existing settlement and consider the potential consequences of flooding to ensure it meets the requirements of TAN15 (Section 11). Development should be set at a floor level to provide an appropriate freeboard above the design flood level.</p> <p>A comprehensive Emergency Flood Plan can help manage any residual risk. Such a plan should enable staff and occupants to take the appropriate course of action during a potential extreme flood event, ensuring that a site is evacuated before access routes are flooded. Any personnel who work or live on the site should be made aware of the plan and be briefed or trained accordingly.</p>
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## 4.3 Other Sources of Flooding

### 4.3.1 Surface Water Flooding and Small Watercourses

An initial review of surface water flood risk and from small watercourses has been undertaken at each of the candidate sites. Flood risk has been assessed using NRW's Flood Map for Planning surface water and small watercourses flood zones with the proportion of each site falling in respective flood zones estimated using GIS software. The overall surface water and small watercourses flood risk has been further classified based on the criteria listed in Table 9 below. Slightly higher thresholds are set relative to the classifications for fluvial flood risk, as it is generally considered that flood risks from surface water and small watercourses are easier to manage than those associated with main rivers.

Table 9- Classification of surface water and small watercourses flood risk

Classification	Criteria
High	<ul style="list-style-type: none"> <li>More than 30% of site area located in Flood Zone 3</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>More than 10% of the site area located in Flood Zone 3</li> </ul>
Low	<ul style="list-style-type: none"> <li>Site area within Flood Zone 2 extent</li> </ul>

Table 10 details the sites at risk, in relation to the candidate sites, a total of 82 from 122 sites were identified as being at risk. A total of 47 were classed as being at low risk, 33 at moderate risk and 2 at high risk of flooding from surface water and small watercourses. The remaining 40 sites lie outside of the pluvial flood extents and are not considered to be at risk for the purposes of this preliminary assessment.

These risks should be considered in more detail when undertaking detailed FCAs for planning applications. Consideration of these risks must be undertaken in the context of TAN15, the flood map for planning and other flood risk strategies and evidence which apply at a local level. Surface water and small watercourse flood risks will not normally justify the refusal of planning permission. Risks from these sources can be mitigated in most cases, though mitigation must not increase the flood risk elsewhere. SuDS perform an important role in managing run-off from a site and must be implemented in most new developments.

Table 10- Summary of surface water and small watercourses flood risk at Candidate sites

Site Name	Percentage Site Area Inundated		Surface Water Flood Risk Classification
	Flood Zone 2	Flood Zone 3	
EV002	<1	0	Low
EV004	22	0	Low
EV006	2	1	Low
EV007	30	26	Moderate
EV009	44	36	High
EV010	29	20	Moderate
EV011	7	0	Low
EV014	5	4	Low
EV015	17	7	Moderate
EV017	8	6	Moderate
EV019	24	18	Moderate
EV020	36	26	Moderate
EV022	2	0	Low
EV026	1	<1	Low
EV027	12	8	Moderate
EV028	12	9	Moderate
EV029	3	1	Low
EV030	2	<1	Low

EV031	23	19	Moderate
EV032	15	13	Moderate
EV034	11	8	Moderate
EV035	5	2	Low
EV036	5	3	Low
EV037	31	4	Low
EV038	15	10	Moderate
LEF001	6	2	Low
LEF003	10	5	Moderate
LEF004	7	4	Low
LEF009	13	9	Moderate
LEF012	4	2	Low
LEF013	2	1	Low
LEF014	<1	0	Low
LEF015	2	0	Low
LEF016	1	1	Low
LEF017	1	<1	Low
LEF019	69	43	High
LEF020	9	5	Low
LEF021	18	14	Moderate
T001	4	3	Low
T002	8	7	Low
T003	26	24	Moderate
T004	10	5	Moderate
T006	19	15	Moderate
T007	34	17	Moderate
T009	4	3	Low
T010	11	2	Low
T011	21	15	Moderate
T012	<1	<1	Low
T013	<1	<1	Low
T014	<1	<1	Low
T016	8	0	Low
T017	7	6	Moderate
T018	2	2	Low
T019	<1	0	Low
T020	5	2	Low
T021	16	12	Moderate
T022	12	9	Moderate
T024	10	6	Moderate
T025	31	9	Moderate
T026	8	7	Moderate
T027	2	1	Low
T028	43	24	Moderate
T029	5	1	Low
T030	1	0	Low
T031	10	7	Moderate
T032	3	1	Low
T033	21	13	Moderate
T034	4	2	Low
UEF001	1	0	Low
UEF002	3	<1	Low
UEF010	3	1	Low
UEF013	<1	0	Low
UEF014	6	1	Low

UEF016	33	11	Moderate
UEF017	2	0	Low
UEF019	9	6	Moderate
UEF020	15	6	Moderate
UEF021	35	19	Moderate
UEF022	1	<1	Low
UEF023	1	0	Low
UEF024	5	0	Low
UEF025	3	2	Low

### 4.3.2 Groundwater Flood Risk

To assess groundwater flooding the BGS UK Geoviewer has been used to determine the bedrock and superficial deposits at each of the sites, and the Landis Soilsmap map used to determine the soils present. Based on this information a high-level assessment of the permeability of the underlying ground and height of the water table can be made.

Using these data, potential groundwater flood risk has been defined at a site level as High, Moderate or Low based on the criteria shown in Table 11.

Table 11- Classification of Groundwater Flood Risk

Potential Groundwater Flood Risk Classification	Criteria
High	Meets all of the criteria below: <ul style="list-style-type: none"> <li>• Soils-Freely Draining</li> <li>• Bedrock-Permeable substrate</li> </ul>
Moderate	Meets only one of the criteria below: <ul style="list-style-type: none"> <li>• Soils-Freely Draining</li> <li>• Bedrock-Permeable substrate</li> </ul>
Low	Meets all of the criteria below: <ul style="list-style-type: none"> <li>• Soils-Impeded Drainage</li> <li>• Bedrock-Impermeable substrate</li> </ul>

In relation to the candidate sites, 43 sites are classed as being at high risk of potential groundwater flooding, 47 sites are classed as being at moderate risk and none of the sites are classed at low risk. Restored quarry soils are present in some parts of Ebbw Vale and Tredegar encompassing a total of 33 sites. The permeability of these soils is variable, therefore groundwater flood risk in these locations is classed as unknown. Specific sites are identified in section 4.4. For high-risk sites it is recommended that priority is given to investigating groundwater flood risk in a site-specific FCA. It should also be noted that sites with higher drainage potential may prove viable for infiltration SuDS systems provided the water table isn't too shallow, gradients aren't too steep and there are minimal land stability issues. These site characteristics should also be investigated as part of a FCA.

### 4.3.3 Sewer Flood Risk

The data provided by DCWW (see section 3.1.5) have been used to identify active sewer incidents within 250m of the candidate sites. Where sewer flooding incidents occur close to the site it does not confirm sewer flooding to be an issue however may indicate potential issues with drainage, which should be assessed in more detail as part of a site-specific FCA.

In relation to the candidate sites, a total of 37 from 122 sites were located within 250m of an active risk incident. For 31 of these sites only one incident has been recorded, for 5 of the sites between 2-5 incidents have been recorded and at 1 site more than 5 events have been recorded. These sites

are identified in section 4.4. A table summarising the proximity of each sewer incident to the candidate sites for each electoral ward is provided in Appendix 5.

#### 4.3.4 Reservoir Flood Risk

The EA's Flood Risk from Reservoirs Map has been used to review reservoir flooding at each of the candidate sites.

In relation to the candidate sites, 22 of the 122 sites were identified as being at risk of reservoir flooding showing as either partially or fully inundated in the NRW Flood Risk from Reservoirs Map.

Reservoir flood risk has not been classified at each of the sites as in general it is considered to be a rare event with a very low probability of occurrence.

#### 4.4 Baseline Flood Risk Review

For each of the candidate sites, baseline flood risk has been assessed. This has included identifying and classifying the sources of flood risk including main rivers, surface water, groundwater, sewer, and reservoir.

The assessment of baseline flood risk has been collated in Table 13. The table is colour coded as detailed below based on the criteria set out for each source of flooding.

Table 12- Colour coding used to delineate flood risk

Flood Risk	High	Moderate	Low	No Risk
Colour Coding				

It should be noted that the risk levels are indicative at this stage, a site-specific FCA should include a detailed assessment of each source of flooding and make use of further data where this is available. Sewer flooding and reservoir flooding are not classified with a colour coding due to the point nature of the data and the rarity of a reservoir flood event respectively.

Table 13- Colour coding used to delineate flood risk

Site Name	Fluvial	Surface Water & Small Watercourses	Groundwater	Sewer	Reservoir
EV001	No Risk	No Risk	Unknown	1	No
EV002	No Risk	Low	Moderate	0	No
EV003	Moderate	No Risk	Moderate	1	No
EV004	No Risk	Low	Unknown	0	Yes
EV005	No Risk	No Risk	Moderate	0	No
EV006	No Risk	Low	High	0	No
EV007	No Risk	Moderate	Moderate	1	No
EV008	No Risk	No Risk	Unknown	0	No
EV009	No Risk	High	Unknown	0	No
EV010	No Risk	Moderate	Unknown	0	No
EV011	No Risk	Low	Moderate	0	No
EV012	No Risk	No Risk	Unknown	0	No
EV013	No Risk	No Risk	Unknown	0	No
EV014	No Risk	Low	Moderate	1	No
EV015	No Risk	Moderate	Moderate	1	No

EV016	Low	No Risk	High	0	Yes
EV017	No Risk	Moderate	Unknown	0	Yes
EV018	No Risk	No Risk	High	0	No
EV019	No Risk	Moderate	Unknown	1	No
EV020	No Risk	Moderate	Unknown	0	No
EV021	No Risk	No Risk	Moderate	3	No
EV022	No Risk	Low	Moderate	0	No
EV023	No Risk	No Risk	Unknown	1	Yes
EV024	No Risk	No Risk	High	0	Yes
EV025	No Risk	No Risk	Moderate	1	No
EV026	No Risk	Low	High	0	No
EV027	No Risk	Moderate	Unknown	0	No
EV028	Low	Moderate	Moderate	0	Yes
EV029	No Risk	Low	Moderate	1	No
EV030	Low	Low	Moderate	0	Yes
EV031	Moderate	Moderate	Moderate	2	Yes
EV032	No Risk	Moderate	Moderate	7	Yes
EV033	No Risk	No Risk	Moderate	0	Yes
EV034	No Risk	Moderate	Unknown	0	No
EV035	No Risk	Low	Moderate	0	No
EV036	No Risk	Low	Moderate	0	No
EV037	No Risk	Low	Moderate	3	No
EV038	No Risk	Moderate	Moderate	1	Yes
EV039	No Risk	No Risk	Moderate	0	No
LEF001	No Risk	Low	High	5	No
LEF002	No Risk	No Risk	High	0	No
LEF003	No Risk	Moderate	High	0	No
LEF004	No Risk	Low	High	3	No
LEF005	No Risk	No Risk	High	1	No
LEF006	No Risk	No Risk	High	0	No
LEF007	No Risk	No Risk	High	0	No
LEF008	No Risk	No Risk	High	0	No
LEF009	Moderate	Moderate	High	1	Yes
LEF010	No Risk	No Risk	High	2	No
LEF011	Moderate	No Risk	High	0	Yes
LEF012	No Risk	Low	High	0	Yes
LEF013	No Risk	Low	High	1	No
LEF014	No Risk	Low	High	0	No
LEF015	No Risk	Low	High	0	No
LEF016	No Risk	Low	High	2	No
LEF017	No Risk	Low	High	1	No

LEF018	No Risk	No Risk	High	0	No
LEF019	No Risk	High	High	0	No
LEF020	No Risk	Low	High	<b>1</b>	No
LEF021	No Risk	Moderate	High	0	No
LEF022	No Risk	No Risk	High	<b>1</b>	No
T001	No Risk	Low	Unknown	0	No
T002	No Risk	Low	Unknown	0	No
T003	No Risk	Moderate	Moderate	0	No
T004	No Risk	Moderate	Unknown	0	No
T005	No Risk	No Risk	Moderate	0	No
T006	No Risk	Moderate	Moderate	0	No
T007	No Risk	Moderate	Moderate	0	No
T008	No Risk	No Risk	Moderate	0	No
T009	No Risk	Low	Unknown	<b>1</b>	No
T010	No Risk	Low	Moderate	0	No
T011	Moderate	Moderate	Moderate	0	<b>Yes</b>
T012	No Risk	Low	Moderate	0	No
T013	Low	Low	Moderate	0	<b>Yes</b>
T014	No Risk	Low	Moderate	<b>1</b>	No
T015	No Risk	No Risk	Moderate	0	No
T016	No Risk	Low	High	0	No
T017	No Risk	Moderate	Moderate	0	No
T018	No Risk	Low	Moderate	0	No
T019	No Risk	Low	Moderate	0	<b>Yes</b>
T020	No Risk	Low	Unknown	0	No
T021	No Risk	Moderate	Moderate	0	No
T022	No Risk	Moderate	Unknown	0	<b>Yes</b>
T023	No Risk	No Risk	Moderate	<b>2</b>	No
T024	No Risk	Moderate	Moderate	0	No
T025	High	Moderate	Unknown	<b>1</b>	<b>Yes</b>
T026	No Risk	Moderate	Unknown	0	<b>Yes</b>
T027	No Risk	Low	Unknown	0	No
T028	No Risk	Moderate	Moderate	0	No
T029	No Risk	Low	Moderate	0	No
T030	No Risk	Low	Unknown	0	No
T031	No Risk	Moderate	Unknown	0	No
T032	No Risk	Low	Unknown	0	<b>Yes</b>
T033	No Risk	Moderate	Moderate	0	No
T034	No Risk	Low	Moderate	<b>1</b>	No
UEF001	No Risk	Low	Unknown	0	No
UEF002	No Risk	Low	Unknown	0	No

UEF003	No Risk	No Risk	High	0	No
UEF004	No Risk	No Risk	High	0	No
UEF005	No Risk	No Risk	High	0	No
UEF006	No Risk	No Risk	High	0	No
UEF007	No Risk	No Risk	High	<b>1</b>	No
UEF008	No Risk	No Risk	High	0	No
UEF009	No Risk	No Risk	High	0	No
UEF010	No Risk	Low	Unknown	0	No
UEF011	No Risk	No Risk	High	0	No
UEF012	No Risk	No Risk	High	0	No
UEF013	No Risk	Low	Unknown	0	No
UEF014	No Risk	Low	Unknown	<b>4</b>	No
UEF015	No Risk	No Risk	High	0	No
UEF016	No Risk	Moderate	Moderate	0	No
UEF017	No Risk	Low	High	0	No
UEF018	No Risk	No Risk	High	<b>1</b>	No
UEF019	No Risk	Moderate	Moderate	<b>1</b>	<b>Yes</b>
UEF020	No Risk	Moderate	Unknown	<b>1</b>	No
UEF021	No Risk	Moderate	Unknown	<b>1</b>	No
UEF022	No Risk	Low	Unknown	<b>1</b>	No
UEF023	No Risk	Low	High	0	No
UEF024	No Risk	Low	Moderate	0	No
UEF025	No Risk	Low	Moderate	0	No
UEF026	No Risk	No Risk	High	0	No
UEF027	No Risk	No Risk	High	0	No

## 5 Flood Risk Management

This section identifies at a strategic level how the proposed developments have the potential to improve the water environment via the use of SuDS and Natural Flood Management (NFM), in addition to remedial work on structures (i.e. culverts and bridges) and the provision of green spaces. Some of the measures and key benefits are outlined below:

- Runoff control using SuDS - SuDS slow the rate of surface water run-off and improve infiltration, by mimicking natural drainage in both rural and urban areas. This reduces the risk of “flash-flooding” which occurs when rainwater rapidly flows into the public sewerage and drainage systems. Runoff is controlled at or near source and typically, greenfield rates are maintained or there is betterment on brownfield rates at existing development sites. This minimises excess runoff to third party land, thereby managing and reducing flood risk where possible.
- Increasing flood storage and attenuation using NFM - NFM involves techniques that aim to work with natural hydromorphological processes, features and characteristics to manage the sources and pathways of flood waters. Examples include the introduction of storage/conveyance features such as water meadows along with incorporation of riverside vegetation or leaky barriers to help slow overland flows and increase interception. This in turn prevents a flashy catchment response and serves to attenuate peak flows; mainly for lower order rainfall events and in smaller catchments.
- Land Management using NFM - Incorporating good practice into the management of land for the purpose of increasing infiltration of water and sediments into soils and reducing surface runoff. Woodland creation is also encouraged in some cases.
- River and Floodplain restoration using NFM - The stabilisation of excessively eroding river banks in order to reduce deposition of sediment downstream and works that restore an altered river to a more appropriate shape and in turn reconnect the river with its floodplain.
- Maintaining and removing existing structures/channels - developments can serve to adapt problem structures within a watercourse/floodplain, which can improve conveyance and reduce impact of flooding. Diverting and daylighting of watercourses can also provide more effective flow routing through an area as well as environmental benefits.
- Managing water quality using SuDS - incorporation of SuDS features which provide filtration and capture of pollutants. These can include features such as permeable pavements and swales within the surface water system, which can settle and filter contaminants to provide treatment of surface water before being discharged. The level of treatment provided can be set relative to the risk index of the site.
- Enhancing Biodiversity - developments can improve the quality of existing habitats and help create new habitats through landscape change. Sites offer an opportunity to establish green corridors and create coherent ecological networks.
- Enhancing Amenity - development sites can provide publicly accessible green spaces and improve access networks. SuDS and NFM can also create new water features and bring associated educational benefits.

## 5.1 High level review of flood risk management opportunities

Considering the points raised above, opportunities to develop NFM schemes to help protect communities and high-level recommendations for SuDS techniques have been considered at a strategic level. This has identified where surface water flooding issues are pronounced at or close to the proposed development sites.

Specifically, in each electoral ward potential flood management opportunities have been reviewed. Flood risk areas within each ward were identified based upon the surface water flood maps from the Flood Risk Assessment Wales (FRAW) Map<sup>21</sup>, with urban areas at high risk (flooded in the 3.3% and 1.0% AEP events) prioritised.

Where at risk areas have been identified, locations and opportunities to mitigate flooding have been considered. Factors including topography, space, existing land use and proposed land use have been assessed. OS Mastermap has been used to identify these areas. There is some uncertainty in this analysis, with the surface water mapping generally not accounting for culverts, which can have a significant impact upon the conveyance of surface water and minor watercourses through an urban area.

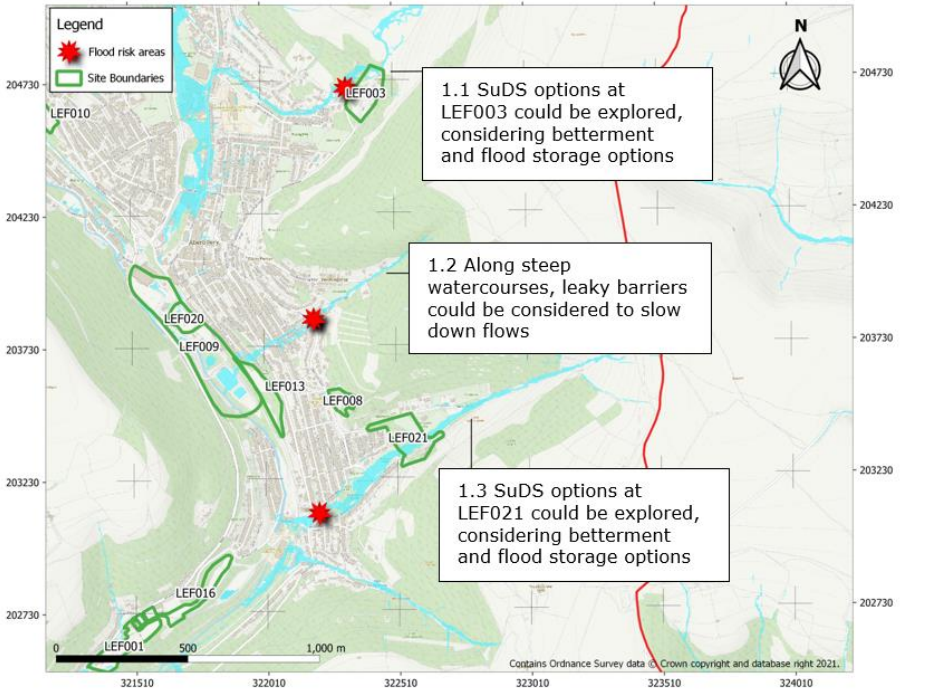
Table 14 summarises the options to reduce flood risk. Please note that the measures put forward at this stage are only recommendations on what could be considered. Upon closer analysis, they may prove unviable or unsuitable in a particular area.

In addition to the measures put forward, SuDS principles should be followed at all sites to ensure runoff rates and volumes are controlled to existing greenfield rates thus preventing any increase in flood risk downstream. A betterment on existing rates should be considered at brownfield sites.

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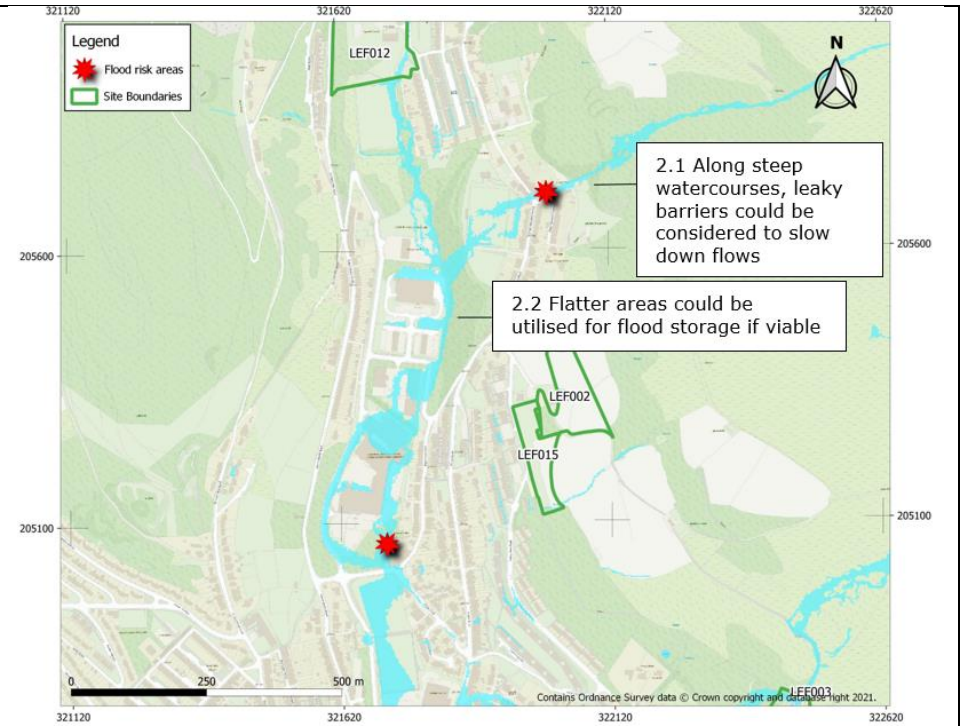
<sup>21</sup> NRW (2021) *Flood Risk Assessment Wales (FRAW) Map*, <https://www.data.gov.uk/dataset/6ac7173f-02a4-4414-a3bc-032a3760362e/flood-risk-assessment-wales-fraw>

Table 14- Potential Opportunities to reduce flood risk

Drainage Area (Sites)		
<p><b>Abertillery South (LEF003, LEF008, LEF009, LEF013, LEF020, LEF021)</b></p>	<ul style="list-style-type: none"> <li>● <b>1.1</b> There is an area upstream of the (unnamed) watercourse at NGR 322562, 204978, adjacent to LEF003 where rapid routing of surface water flows appears to be likely.</li> <li>● <b>1.2</b> Based on the surface water flood maps LEF009 is affected by runoff which originates from a very steep valley above Penrhiwgarreg (NGR 322577, 204089).</li> <li>● <b>1.3</b> LEF021 is located within a valley through which runoff is routed by the Nant y Groes watercourse.</li> <li>● Measures to slow or attenuate surface water flows could be explored at the development sites identified, these could include integrating flood storage areas into the development sites or using SuDS to provide a betterment on greenfield rates.</li> <li>● The use of NFM measures such as leaky barriers could also be investigated within the watercourses in this area.</li> </ul>	

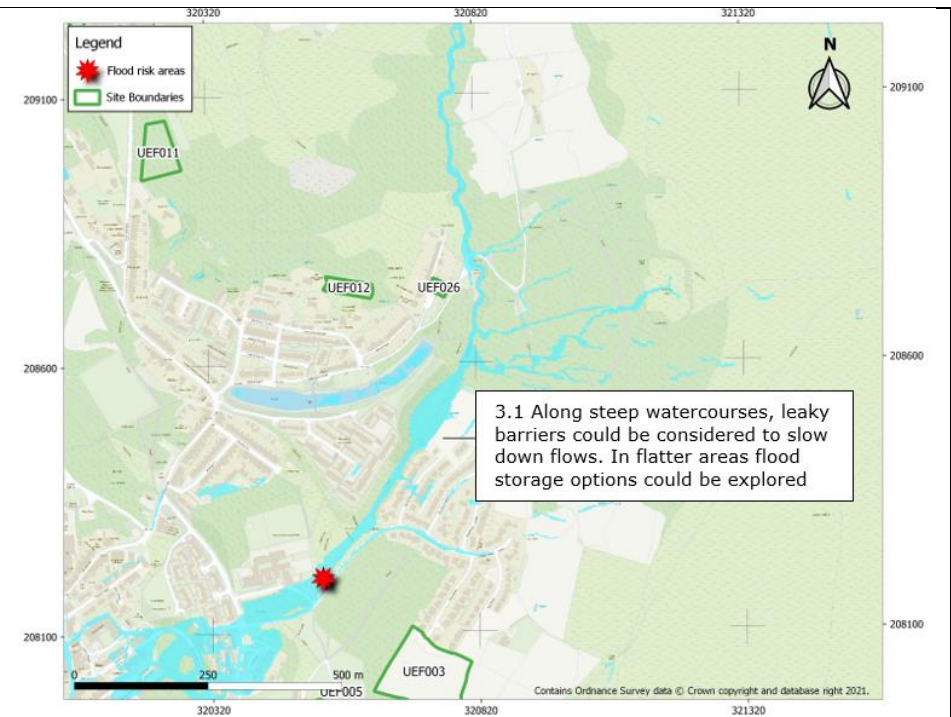
**Cwmtillery (LEF015, LEF002, LEF012)**

- **2.1** There are areas on Lower Gwastad Terrace (NGR 321960, 205681) which are at risk of flooding from rapid routing.
- The use of NFM measures such as leaky barriers could be investigated within the watercourses in this area, with flood storage areas considered in flatter areas (see 2.2)



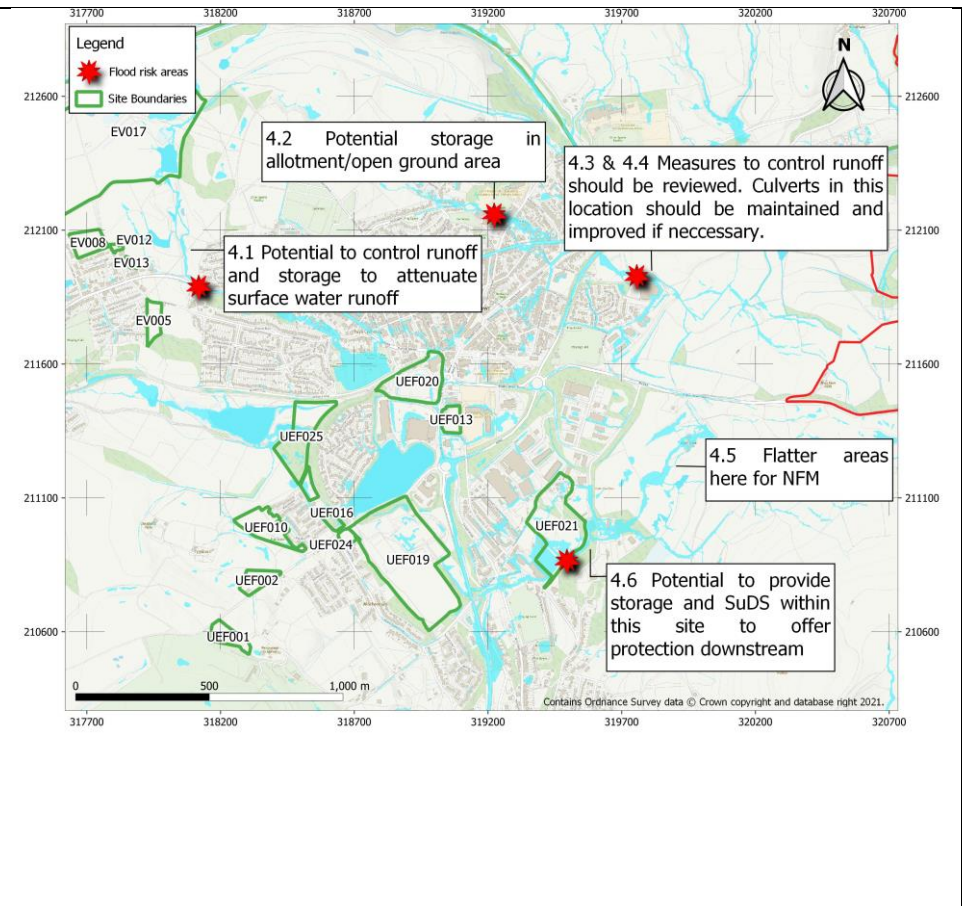
**Cwmtillery (UEF003, UEF026, UEF012)**

- **3.1** There is a large amount of flooding occurring within and upstream of Blaina along the banks of the Nant Ystruth (NGR 320570, 208222).
- The use of NFM measures such as leaky barriers could be investigated within the watercourses in this area, with flood storage areas considered in flatter areas (see 3.1)



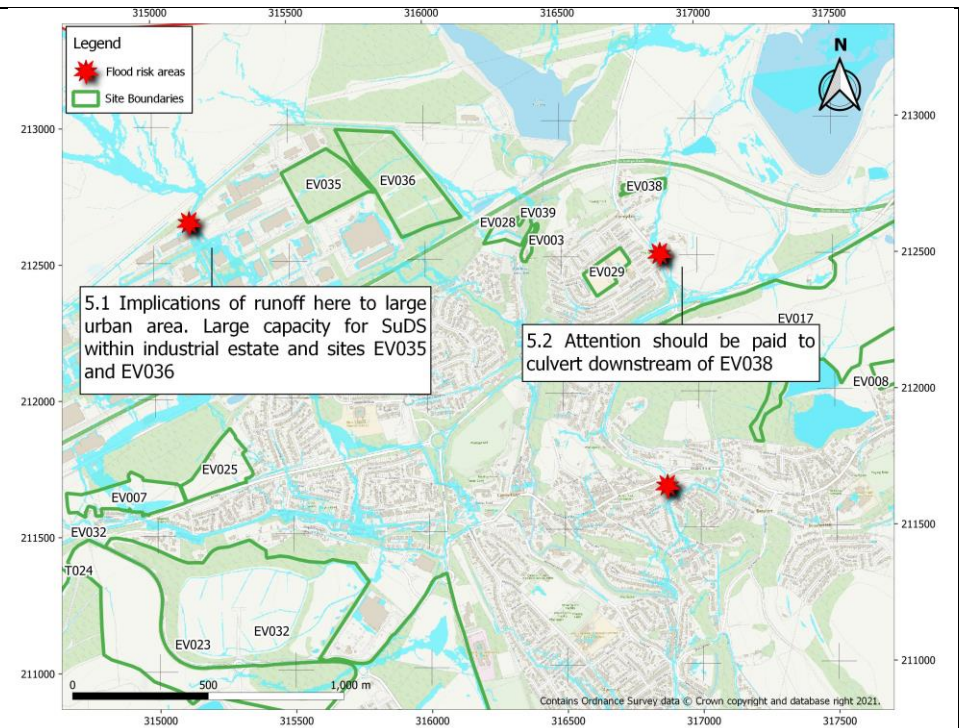
**Brynmawr (UEF020, EUF021, EUF019, EV013, UEF021, UEF025, EV008, EV005**

- **4.1** A flow route towards Twyn Cynhordy (NGR 318122, 211900) results in a large area of ponding within Welfare Park.
- **4.2** Similarly, it is considered that green areas near the Allotments and St Marys Church in Brynmawr (NGR 319256, 212163) are at risk of flooding.
- **4.3** To the east of Brynmawr (NGR 319909, 211858) there are straight and cross-contour drains, which may be resulting in rapid conveyance of surface water from the land.
- The use of NFM measures such as leaky barriers could be investigated within the watercourses in these areas, with flood storage areas considered in flatter areas or tied into nearby development sites.
- **4.4** Flows are culverted under roads in the region (see NGR 319735, 211907).
- These culverts should be regularly maintained and potentially checked in terms of design capacity.
- **4.5** Flatter areas of land around Blaen-Nant (NGR 319893, 211058) could be investigated for NFM. The area features small ponds interconnected with mostly open channel watercourses.
- **4.6** There is significant ponding within UEF021, where minor ponds and a drain are located along the southern boundary (NGR 319446, 210883).
- Measures to slow or attenuate surface water flows could be explored at this site, these could include integrating flood storage areas into the development sites or using SuDS to provide a betterment on greenfield rates.



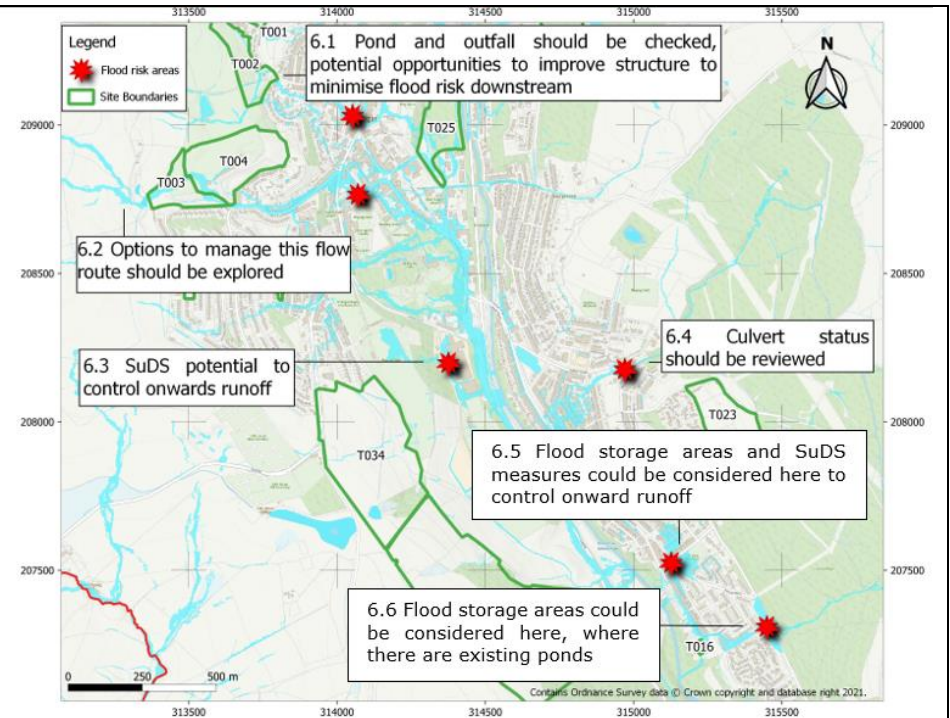
Rassau (EV038, EV025, EV017, EV008, EV007, EV025, EV032, EV023, T024)

- **5.1** There are minor watercourses (NGR 314934, 212545) positioned parallel to an industrial estate in Rassau, the surface water flood map shows significant flooding throughout development areas downstream.
- SuDS could be used to provide a betterment on greenfield rates at the two proposed development sites (EV035 and EV036) close to this location. Retrofitting SuDS in the existing industrial estate to the west of these sites could also be explored.
- **5.2** A culvert exists downstream of site EV038 (NGR 316864, 212591).
- It is suggested that particular attention is made to the maintenance (and improvement if required) of this asset.



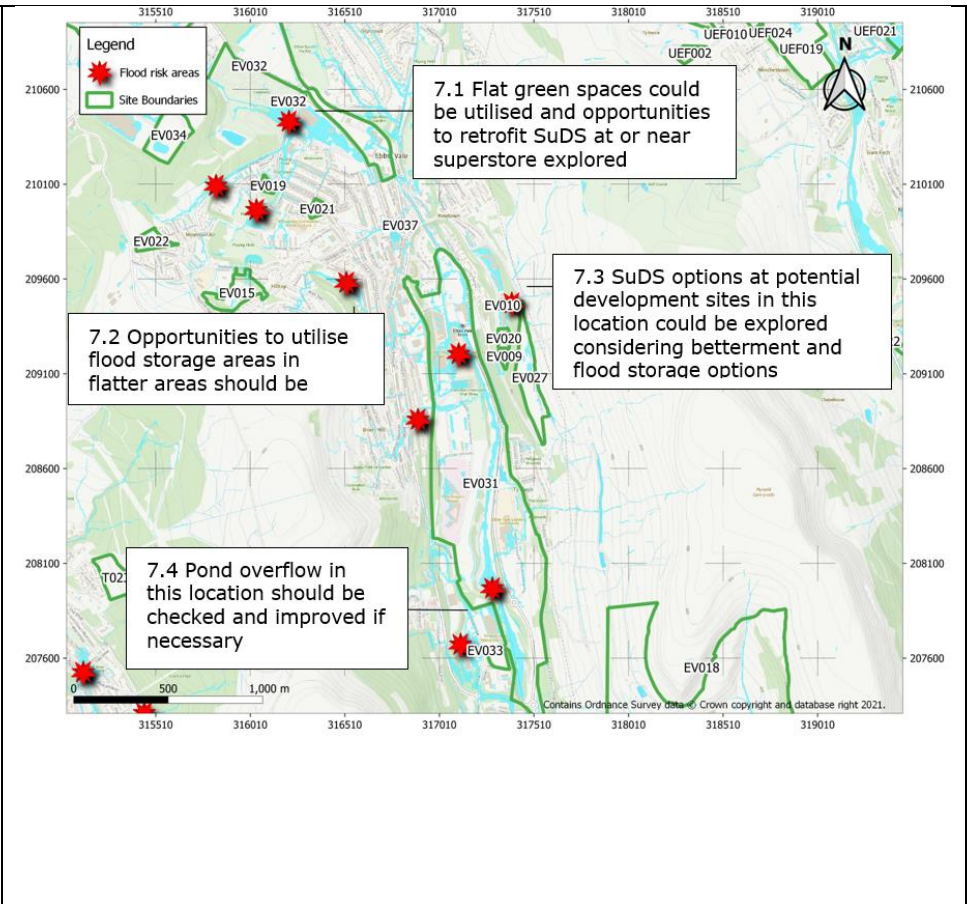
Georgetown (T004, T003, T034, T012, T025, T002, T016)

- **6.1** There is overflow from a pond above Western Crescent, Tredegar (NGR 313786, 209184). There are widespread flooding implications for the housing estate below, should this feature surcharge. The status of any structure should be checked regularly and improved if necessary.
- **6.2** There is an overland flow route through candidate sites T003 and T004.
- **6.3** There is significant runoff from the Tredegar Comprehensive School and playing fields (NGR 314369, 208200).
- Measures to slow or attenuate surface water flows could be explored at the development sites identified and at Tredegar Comprehensive School. These could include integrating flood storage areas into the development sites or using SuDS to provide a betterment on greenfield rates.
- The use of NFM measures such as leaky barriers could also be investigated within the watercourses in these areas.
- **6.4** There is large spilling observed from a minor watercourse above Vale Terrace, Tredegar. The culverts operating under the roads in this region should be checked for sizing and suitably maintained.
- **6.5** There is significant ponding observed at the western end of Vale View Allotments (NGR 315141, 207541), spilling to the road and houses.
- **6.6** There is a significant ponding of water above Walnut Close, Tredegar (NGR 315480, 207313), which threatens the housing estate below.
- Flood storage areas could be considered in flatter areas close or at these locations.



Ebbw Vale South (EV032, EV034, EV019, EV022, EV015, EV020, EV009, EV010, EV027, EV031, EV033, EV018)

- **7.1** Area above Letchworth Road Superstore and within Superstore complex (NGR 316286, 210485), sees large areas of ponding based on the surface water flood map.
- Methods of attenuating water in green space adjacent to cemetery could be explored including retrofitting SuDS within the superstore grounds and provision of flood storage areas in flatter land.
- **7.2** There is green space above Pennant Street (NGR 316386, 209629) which could operate to store/attenuate runoff and help prevent flooding to the housing estate below.
- **7.3** There are areas above proposed development areas EV010 and EV027 (NGR 317561, 209518), where there is runoff from the steep land to the east, moreover there is significant ponding within the industrial estate around EV010.
- Measures to slow or attenuate surface water flows could be explored at the development sites identified, these could include integrating flood storage areas into the development sites or using SuDS to provide a betterment on greenfield rates.
- **7.4** There is a pond located within EV031 (NGR 317321, 208040), with significant overflow to the adjacent railway line. Unclear how this feature is drained, however any development to the area should pay attention to how this is managed and any requirements for upgrade.
- SuDS principles should be followed at all sites to ensure runoff rates and volumes are controlled to existing greenfield rates. A betterment on existing rates should be considered at brownfield sites.



## 5.2 Flood Resilience

The overarching aim of TAN15 when considering new development is to prevent exposure to risk, with the priority being to locate new development in areas at minimal risk of flooding. However, if this is not possible and if the development type is not significantly vulnerable, resilient development in areas served by robust flood risk management infrastructure or in areas of relatively low risk can be permitted.

In these cases, and where existing development is already in flood risk areas, flood resilience measures could be considered. These are typically defined as sustainable measures that can be incorporated into the building fabric, fixtures and fittings to reduce the impact of floodwater on property. They allow for easier drying and cleaning, ensure that the structural integrity of the building is not compromised and reduce the amount of time until the building can be re-occupied. Flood repairability should also be considered which involves the design and construction of building elements, to ensure the ease of replacement and repair, should they suffer flood damage.

Some of the main flood resilience measures are outlined below:

- Flood doors and windows - These can prevent water from entering a property by creating a watertight seal during a flood.
- Flood barriers - These can be fitted to external doorways, windows, across driveways, garage doors and gardens. It is recommended that they are not fitted higher than 600mm in order to prevent structural damage to walls.
- Flooring - Concreate floors with damp proof membranes can be used in properties which are at particular risk of groundwater flooding as they prevent water rising up through the floors.
- Walls - Pointing which is in poor condition should be repaired with a water-resistant mortar and any cracks or holes in brickwork can be repaired with a waterproof silicone sealant.
- Drains and pipes - Fitting non-return valves to pipes will prevent backflow from toilets, sinks, drains and manholes when drains and sewers become overwhelmed with flood water.
- Airbricks and vents - There are a number of products available, examples include automatic (self closing) air bricks which allow ventilation but prevent flood water coming in when needed. Alternatively, air brick covers can be placed over airbricks.
- Adaption measures - Where flooding does occur waterproof plaster, solid concrete floors and tiled floor coverings, can reduce flood damage and greatly shorten the recovery time after a flood. Other steps include raising electric sockets to preserve electricity supply and moving paperwork and valuables to higher levels to minimise potential damage.

Planning and building standards have a complementary role in flood management and the use of flood damage resistant and mitigation measures could be considered at the proposed candidate sites where appropriate. These may be required as part of ensuring that consequences of flooding are acceptable.

It should be noted as outlined in TAN15, that mitigation and flood resilience measures are not sufficient justification to permit a development if the tolerable conditions are exceeded during an extreme flood event. High velocities and/or depths of floodwater pose a potential risk to life, may cause structural damage to buildings and could impact on human health and wellbeing.

## 6 Conclusions and Recommendations

### 6.1 Conclusions

- 6.1.1** A collation of potential sources of flood risk has been carried out in accordance with TAN15 and PPW, developed in close consultation with the Council, Natural Resources Wales and other key stakeholders.
- 6.1.2** The dominant flooding mechanisms in the valley areas including parts of Abertillery, Rassau, Cwm, Carmeltown and Ebbw Vale are fluvial in origin. In general, fluvial flood extents are relatively constrained due to the topography of the area.
- 6.1.3** Flood risk to properties in valley areas and elsewhere also arise from surface water flooding, with parts of Cwm, Ebbw Vale, Tredegar and Rassau at risk.
- 6.1.4** Sewer flooding incidents have been recorded across the Blaenau Gwent area. The wards of Brynmawr and Rassau have the most active risk incidents according to DCWW.
- 6.1.5** In terms of groundwater flood risk, low lying areas in the south of the study area may be at risk where the water table is expected to be mobile.
- 6.1.6** NRW flood defences are present alongside the River Ebbw and Ebbw Fach in the form of embankments and walls. The defences offer a 1 in 100-year SOP and are mostly in fair or good condition, safeguarding against a breach event.
- 6.1.7** NRW is responsible for issuing flood warnings in the Blaenau Gwent area. The flood warning systems were reviewed and updated recently as part of the Ebbw hydraulic modelling study. In this regard they are considered to be robust and up to date.
- 6.1.8** A total of 122 candidate sites are promoted for consideration in the local development plan. Flood risk from all relevant sources has been reviewed at each of these sites to inform strategic decisions on future development.
- 6.1.9** An assessment of fluvial flood risk has been made based on the NRW fluvial flood maps and hydraulic modelling data supplied for the River Ebbw and Ebbw Fach.
- 6.1.10** In total 10 of candidate sites put forward lie either within Flood Zone 2 or Flood Zone 3. Four of these sites are classed as low risk, five of the sites are classed as moderate risk and one of the sites is classed as high risk. All remaining sites are in Flood Zone 1 and are not considered to be at risk from main river flooding.
- 6.1.11** The flood risk associated with surface water and small watercourses was reviewed using the NRW's Flood Map for Planning and BGBC historical register of flooding incidents. Based on the flood mapping it was found that 82 of the proposed sites are at risk of surface water flooding.
- 6.1.12** In total 47 of these sites are at low risk, 33 of these sites are at moderate risk, and 2 sites are at high risk. The remaining 40 sites lie completely outside of the mapped surface water flood extents.
- 6.1.13** Sewer flooding data supplied by DCWW was used to identify active sewer incidents within 250m of the candidate sites. A total of 37 sites were located within 250m of an active risk incident.
- 6.1.14** A high-level review of groundwater flooding has been undertaken based on available geological data. 43 sites are classed as being at high risk of groundwater flooding, 47 sites are classed as being at moderate risk and none of the sites are classed at low risk.
- 6.1.15** Reservoir flooding has been assessed using NRW's reservoir flood maps. Whilst 22 of the sites are shown to be at risk of reservoir flooding, such an event is rare with very low probability of occurrence.

## 6.2 Recommendations

- 6.2.1** This SFCA has made high level recommendations for application of the sequential test at each site falling within the NRW fluvial flood zones.
- 6.2.2** In general, development should be located in Flood Zone 1 wherever possible and less vulnerable uses in Flood Zone 2 if required. Highly vulnerable development should be located on higher ground away from flood risk areas.
- 6.2.3** Where flood risk is significant and access may be compromised in extreme events, a comprehensive Emergency Flood Plan can help manage any residual risk.
- 6.2.4** Sustainable drainage principles should be followed at every site to safeguard against increasing flood risk both onsite and to third party land downstream.
- 6.2.5** For greenfield development sites runoff rates should be controlled to be no greater than the existing (greenfield) rate of runoff from the site.
- 6.2.6** For developments on previously developed (brownfield) sites the rate of runoff should not exceed the runoff of the site in its previously developed condition, and may seek a betterment on pre-existing rates, especially in locations where drainage is poor.
- 6.2.7** Where possible, opportunities to reduce flood risk at sites and downstream should be identified, for example through the creation of wetland features, encouraging vegetation growth and use of NFM practices.
- 6.2.8** This SFCA does not replace the need for site specific flood risk assessments. A greater level of detail should be provided by such assessments. FCAs should factor in the latest climate change guidance.
- 6.2.9** Site specific FCAs are required for all sites over 1 hectare in size and for all sites located within Flood Zones 2 and 3. FCAs for sites within Flood Zone 1 may be required to assess surface water and non-fluvial forms of flood risk.

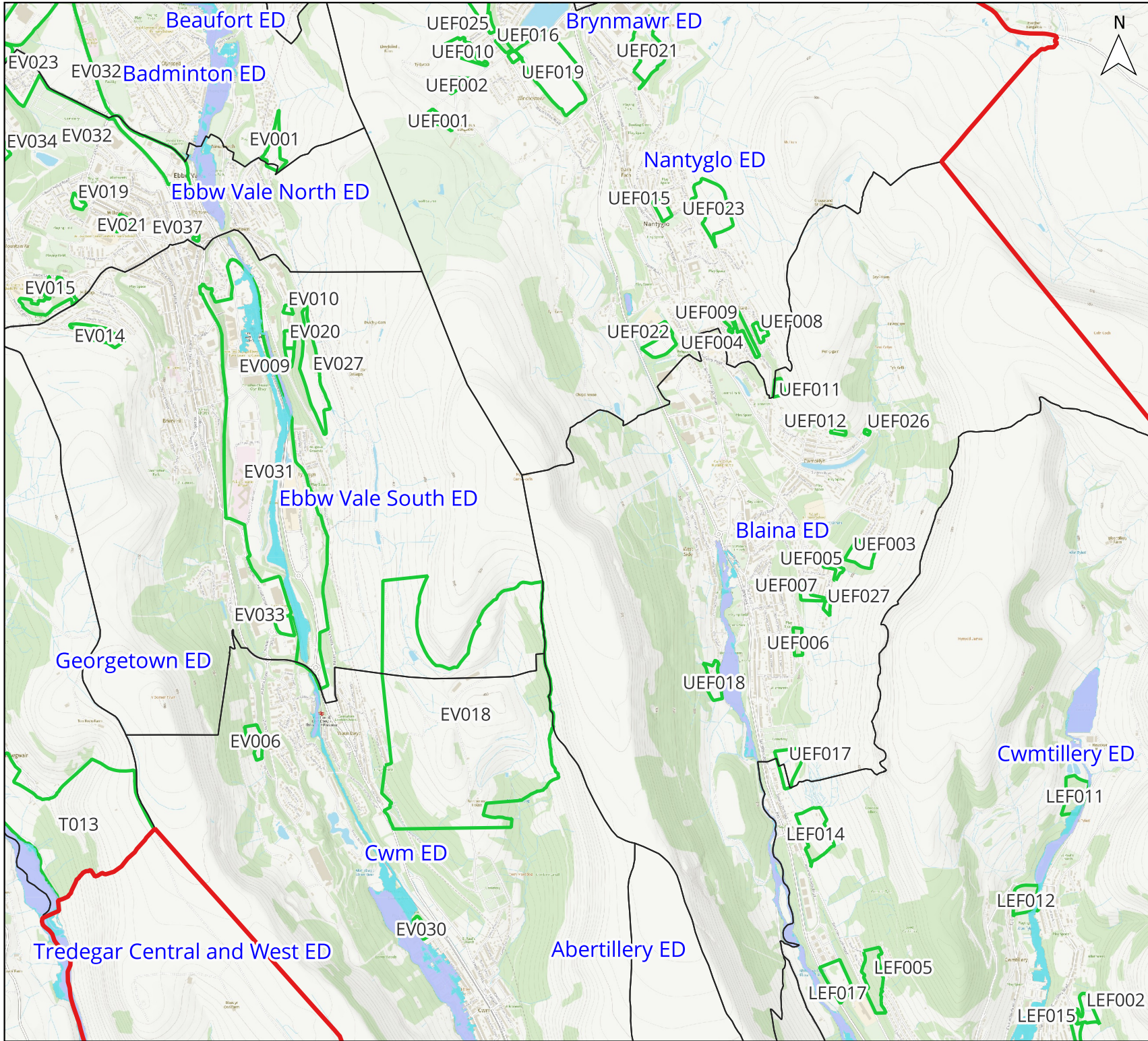
In terms of the assessment of flood risk at the candidate sites, it should be possible to accommodate all development types at the majority of sites. These lie exclusively in Flood Zone 1 (Main Rivers) and are at no to low risk from surface water flooding.

For 9 of the sites (EV003, EV016, EV028, EV030, EV031, LEF009, LEF011, T011 and T013) it should be possible to accommodate all development types however a sequential approach will be required with regards to layout. These sites lie predominantly in Flood Zone 1 (Main Rivers); however, Flood Zone 2 (Main Rivers) and Flood Zone 3 (Main Rivers) encroach on some of sites. In these cases, more vulnerable development should be prioritised where flood risk is lowest and less vulnerable infrastructure located in areas at higher risk if necessary; this is particularly relevant for mixed use sites.

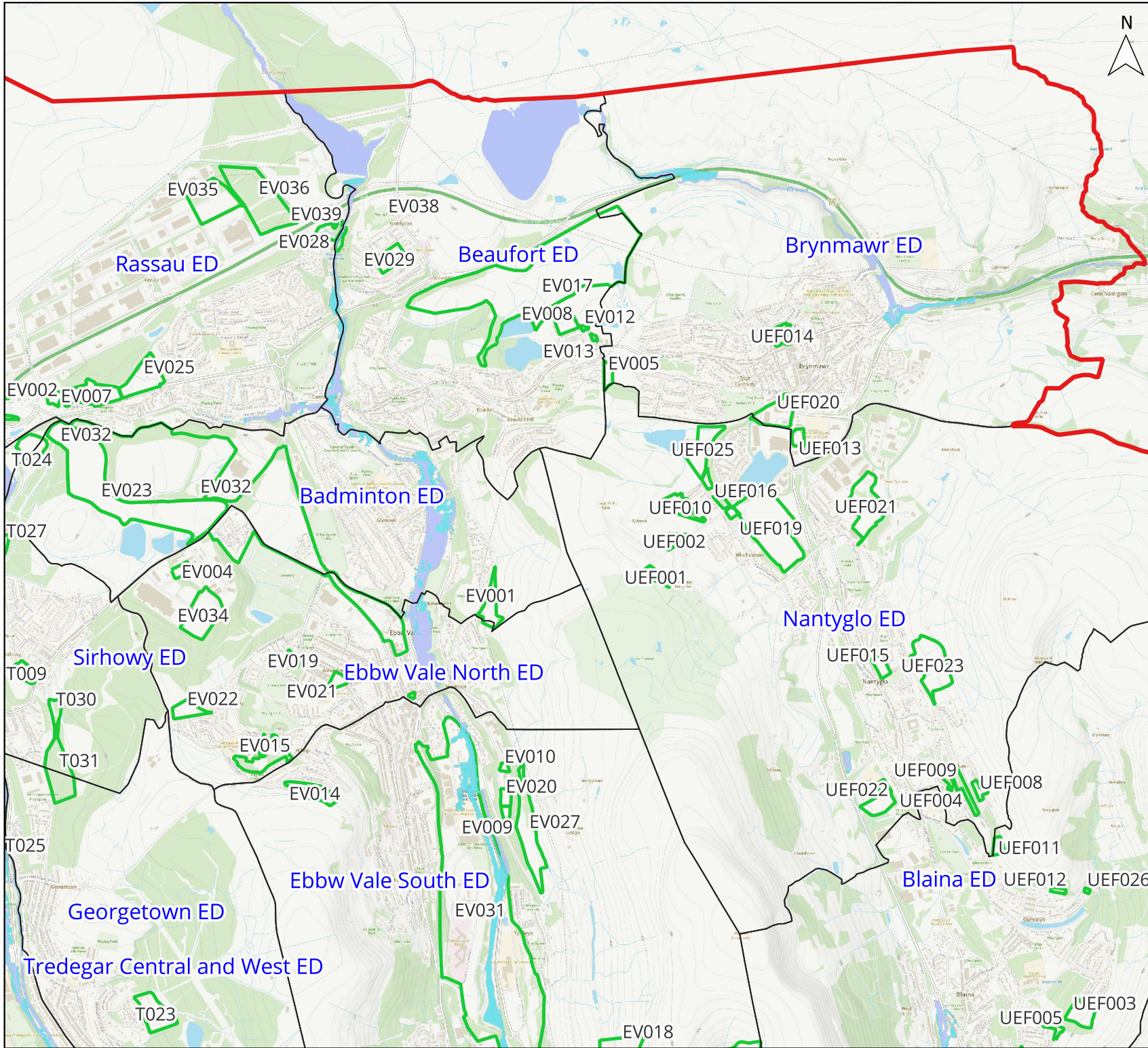
A sequential approach may also be required for sites where other sources of flood risk pose a significant risk. This requirement should be assessed as part of site specific FCAs.

One site (T025) has a significant proportion of land (>75%) in Flood Zone 3 (Main Rivers). If the site is to be considered further for allocation a level 2 SFRA is likely required, given that a significant amount of land for development cannot be allocated outside of flood risk areas.

## Appendix 1 – Fluvial (Main Rivers) Flood Maps



Project : <b>Blaenau Gwent SFCA</b>	
Client :  <b>Blaenau Gwent</b> <small>County Borough Council</small>	
Legend : <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; border: 2px solid red; margin-right: 5px;"></span> Blaenau Gwent Administrative Boundary</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Electoral Ward Boundary</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 2px solid green; margin-right: 5px;"></span> Candidate Sites</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; margin-right: 5px;"></span> Flood Zone 3</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: cyan; margin-right: 5px;"></span> Flood Zone 2</li> </ul>	
Contains Ordnance Survey data © Crown copyright and database right 2023	
Scale : <div style="display: flex; align-items: center; gap: 10px;"> <span>0</span> <span>500</span> <span>1,000 m</span> </div> 	
Title : Fluvial Flood Risk (Main Rivers) in Eastern Area	
Drawing : WHS1855-T01-0004	Rev : 2
	



Project :  
**Blaenau Gwent SFCA**

Client :  
  
**Blaenau Gwent**  
 County Borough Council

Legend :

-  Blaenau Gwent Administrative Boundary
-  Electoral Ward Boundary
-  Candidate Sites
-  Flood Zone 3
-  Flood Zone 2

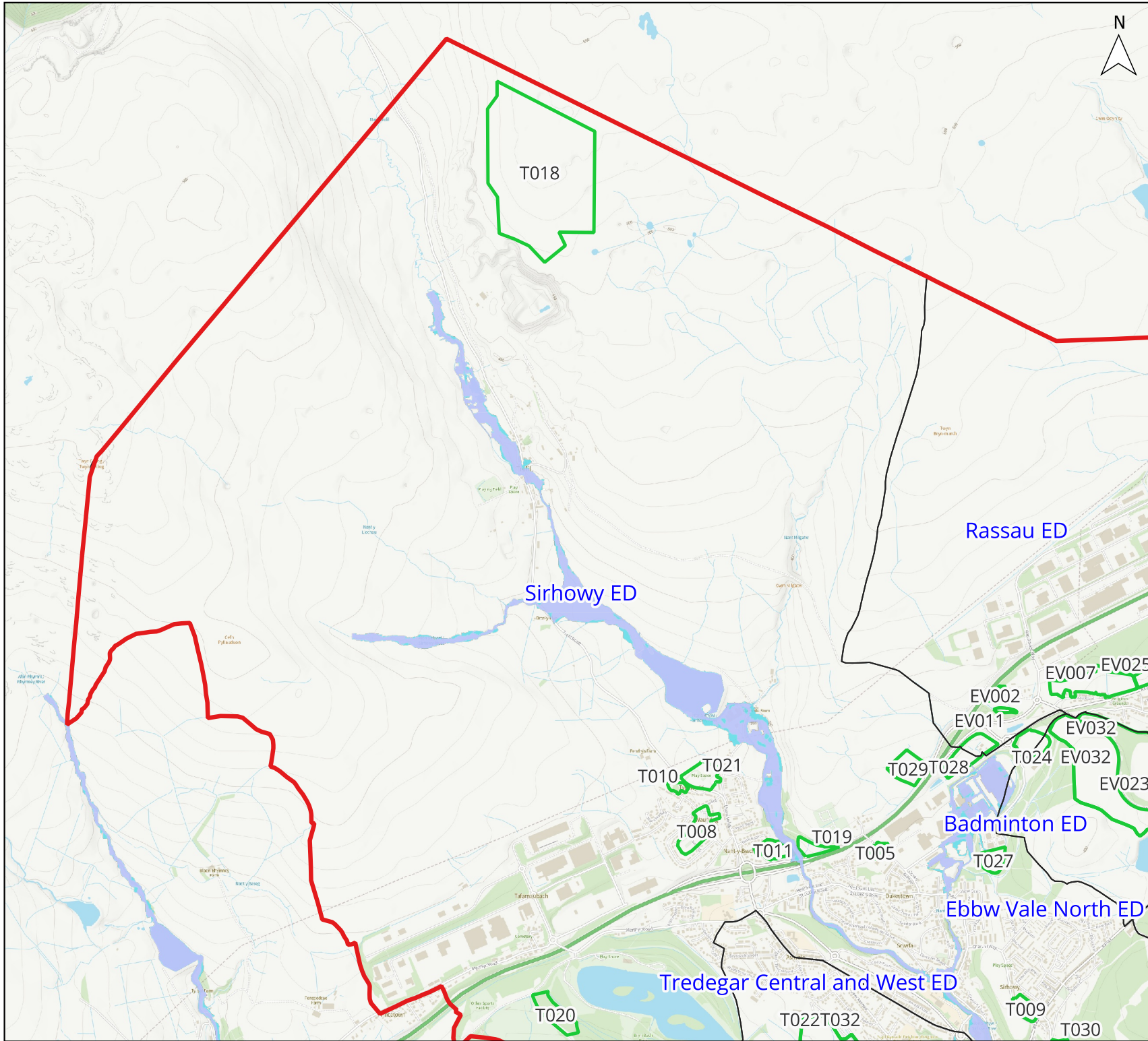
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Scale :  0 500 1,000 m

Title :  
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Drawing : WHS1855-T01-0005      Rev : 2



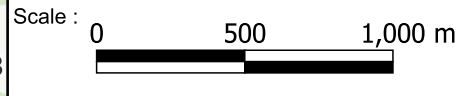


Project :  
**Blaenau Gwent SFCA**



- Legend :
- Blaenau Gwent Administrative Boundary
  - Electoral Ward Boundary
  - Candidate Sites
  - Flood Zone 3
  - Flood Zone 2

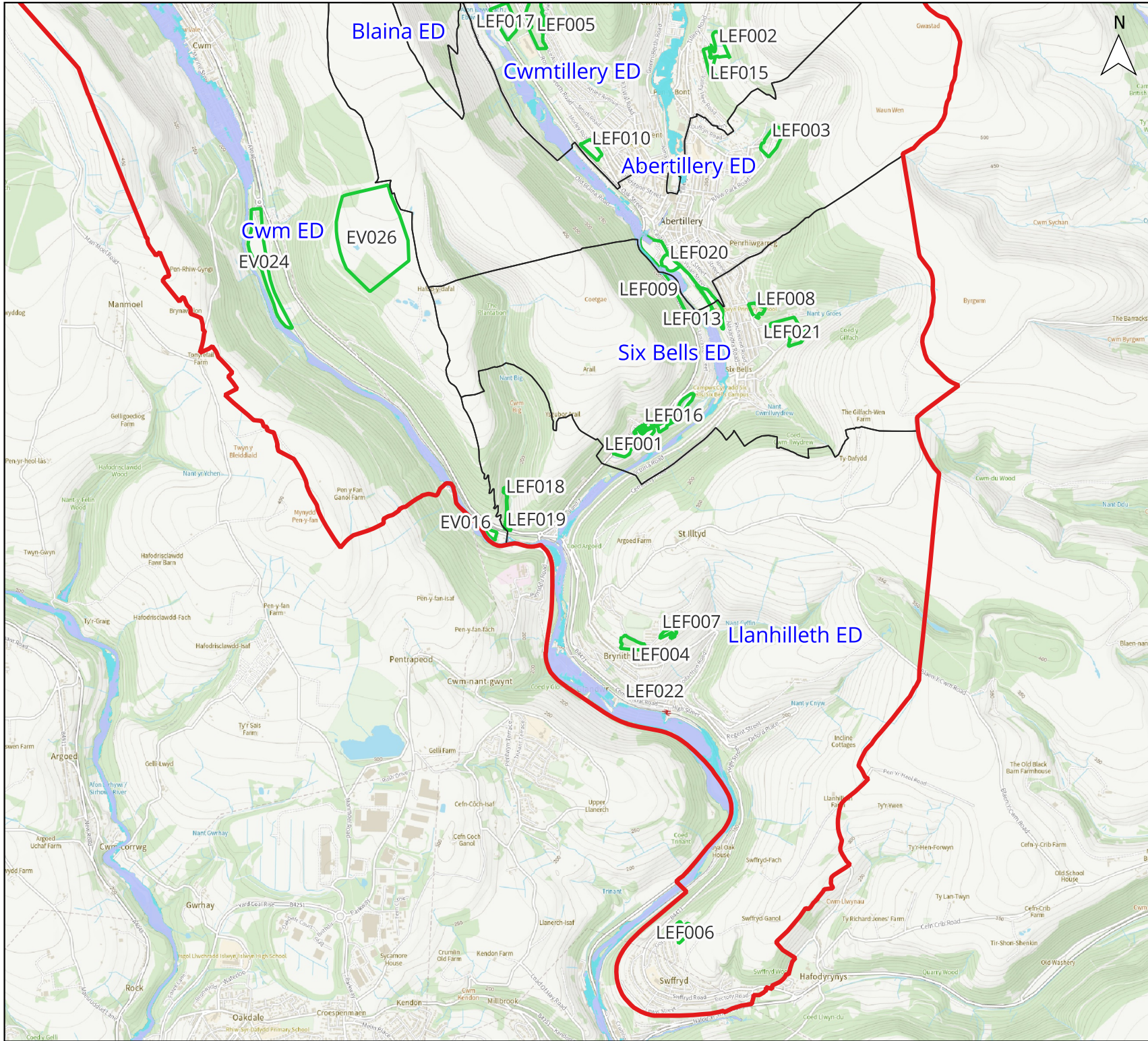
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Title :  
 Fluvial Flood Risk (Main Rivers) in NW Area

Drawing : WHS1855-T01-0001	Rev : 2
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**Project :** Blaenau Gwent SFCA

**Client :**  **Blaenau Gwent**  
Cynion Bwrdeistref Sirral  
County Borough Council

**Legend :**

-  Blaenau Gwent Administrative Boundary
-  Electoral Ward Boundary
-  Candidate Sites
-  Flood Zone 3
-  Flood Zone 2

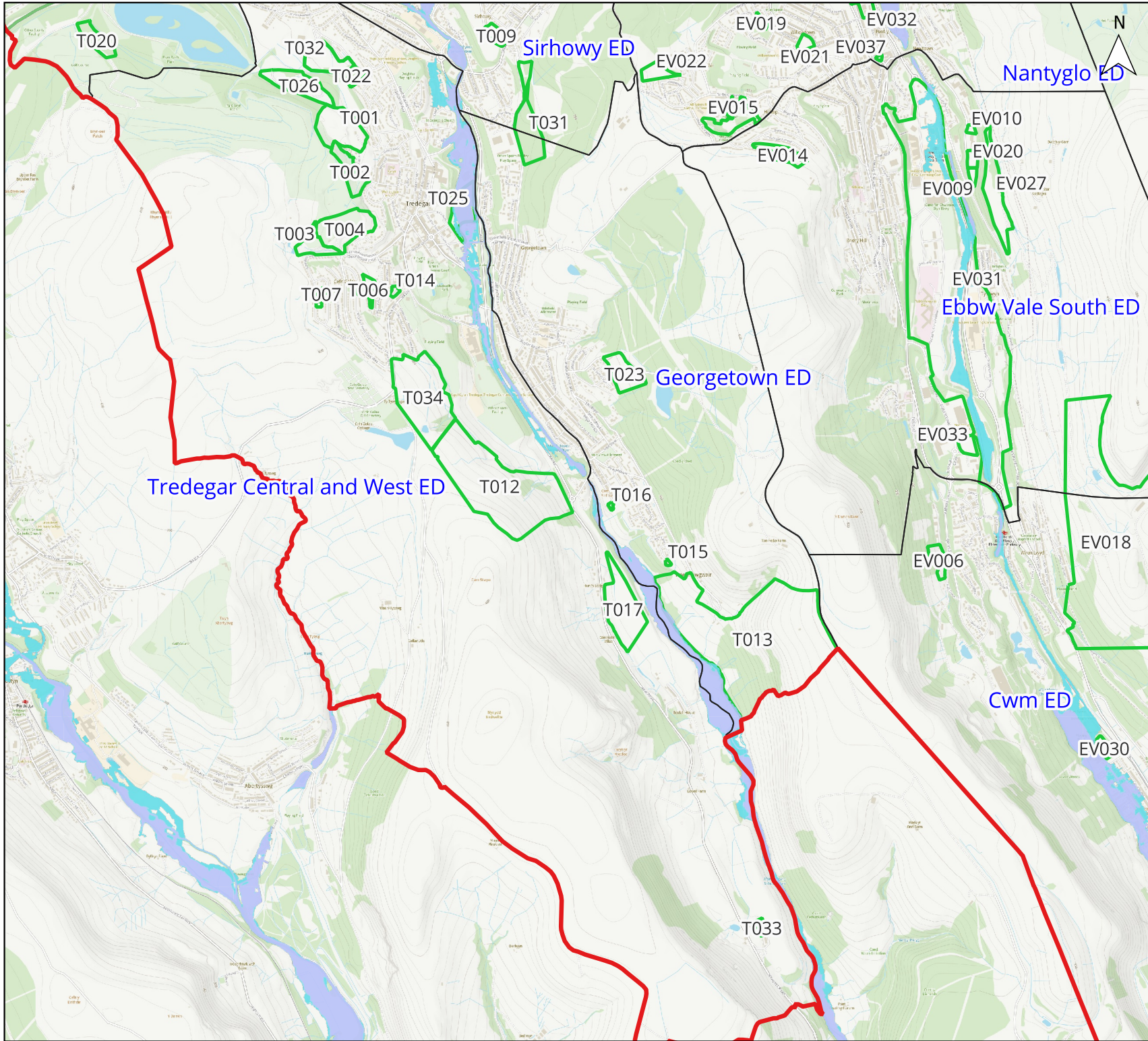
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**Drawing :** WHS1855-T01-0003 **Rev :** 2



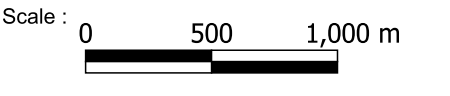


Project :  
**Blaenau Gwent SFCA**



- Legend :
- Blaenau Gwent Administrative Boundary
  - Electoral Ward Boundary
  - Candidate Sites
  - Flood Zone 3
  - Flood Zone 2

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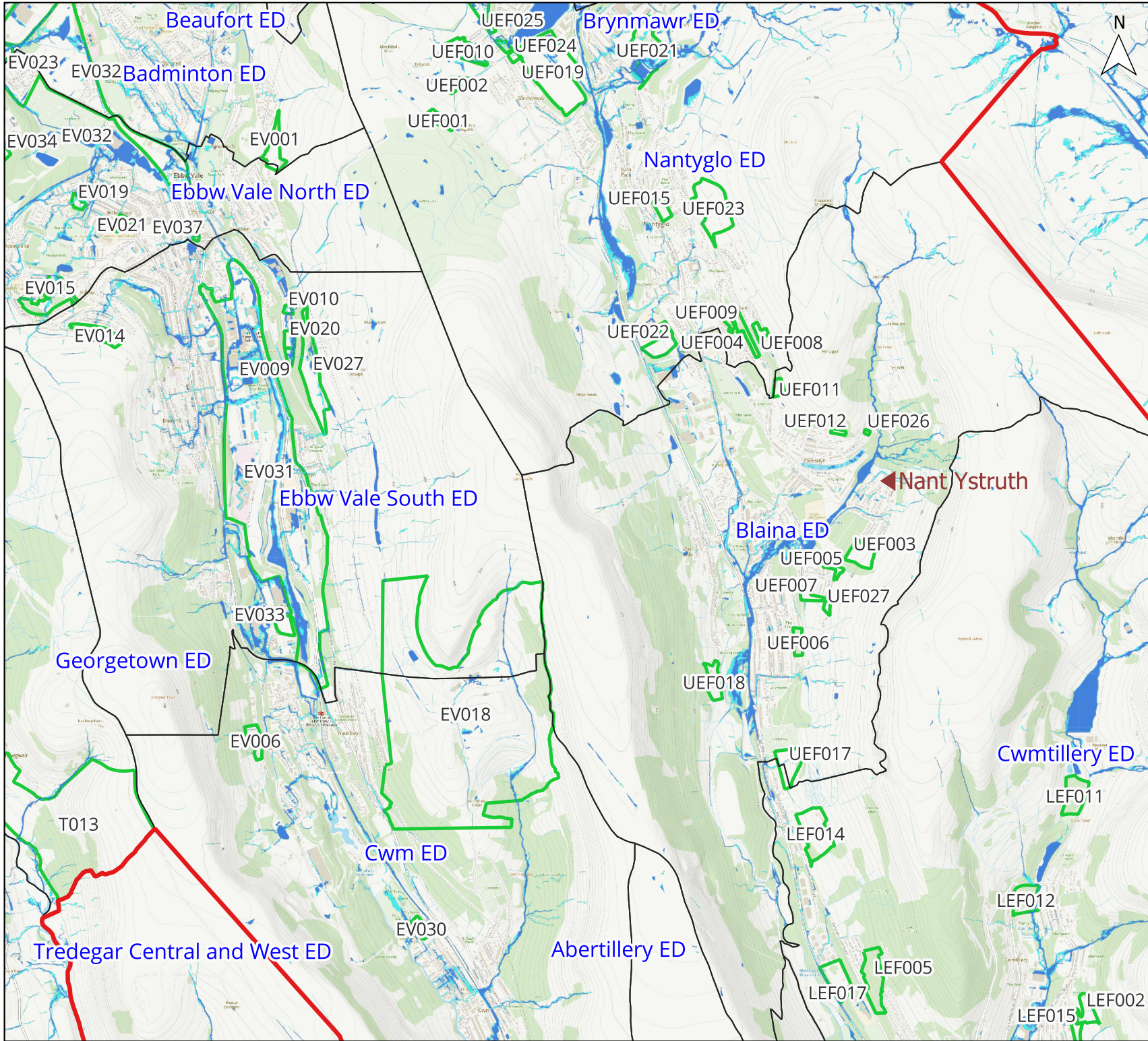


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Drawing : WHS1855-T01-0002	Rev : 2
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




**Appendix 2 – Surface Water and Small Watercourses Flood Maps**



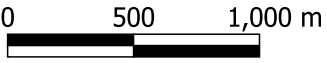
Project :  
**Blaenau Gwent SFCA**

Client :  
  
**Blaenau Gwent**  
 County Borough Council

Legend :


-  Blaenau Gwent Administrative Boundary
-  Electoral Ward Boundary
-  Candidate Sites
-  Small Watercourses
-  Flood Zone 3
-  Flood Zone 2

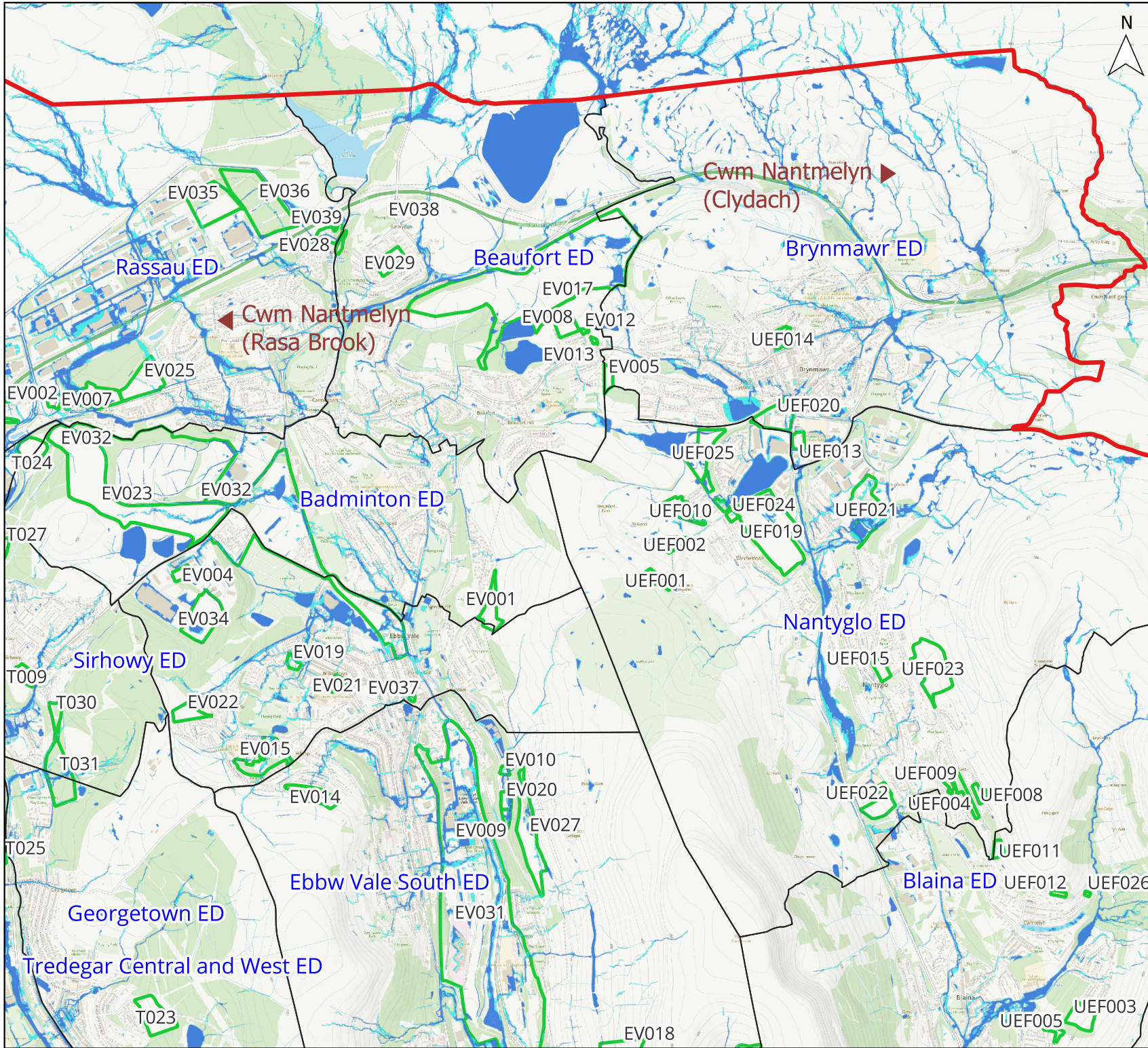
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Scale :  0 500 1,000 m


Title :  
Surface Water and Small Watercourses in Eastern Area

Drawing : WHS1855-T01-0009	Rev : 2
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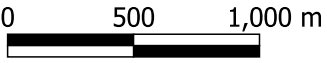
Project :  
**Blaenau Gwent SFCA**

Client :  
  
**Blaenau Gwent**  
Cynigror Bwrdeistref Sirral  
County Borough Council

Legend :


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-  Electoral Ward Boundary
-  Candidate Sites
-  Small Watercourses
-  Flood Zone 3
-  Flood Zone 2

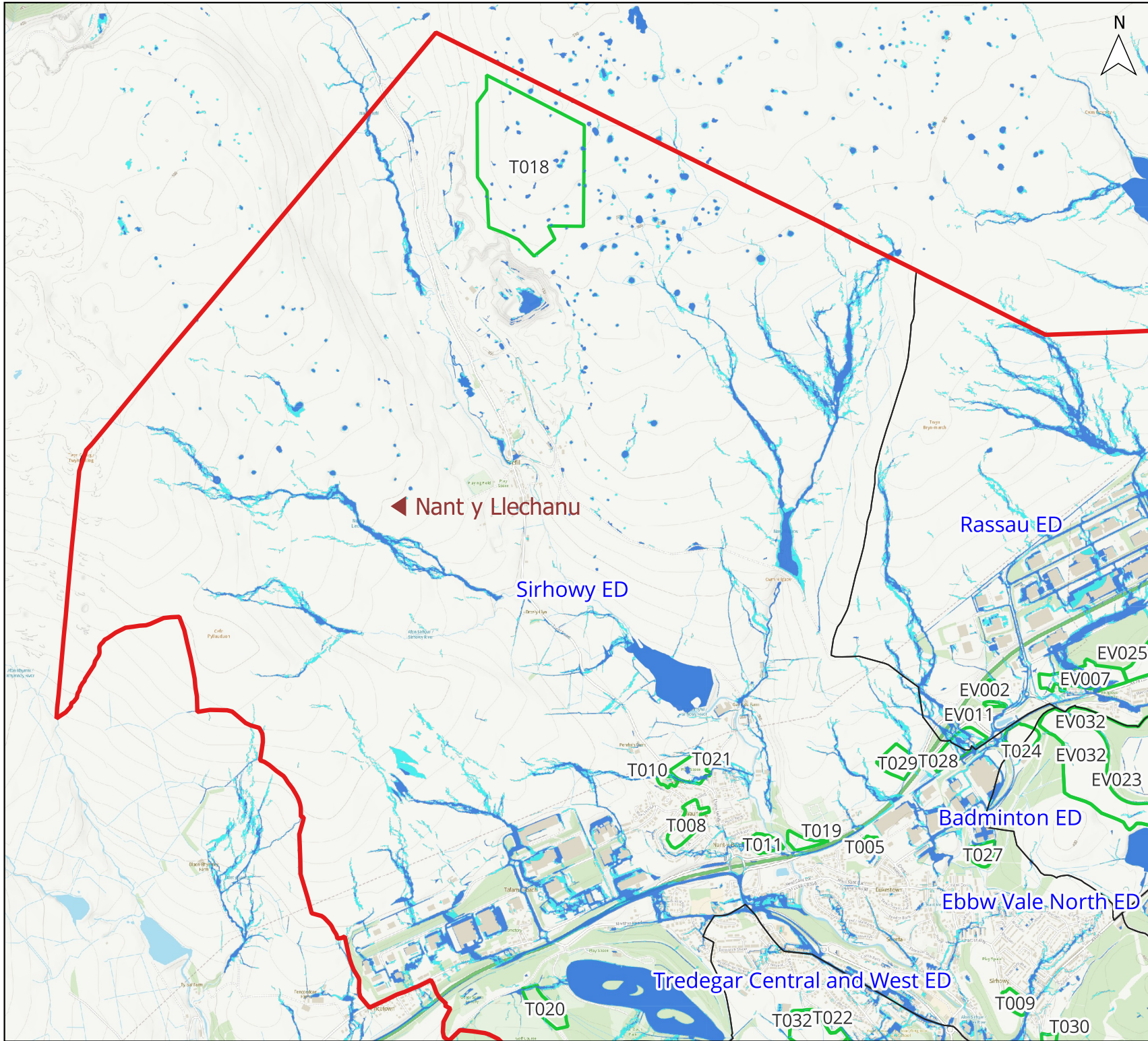
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




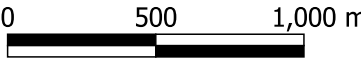

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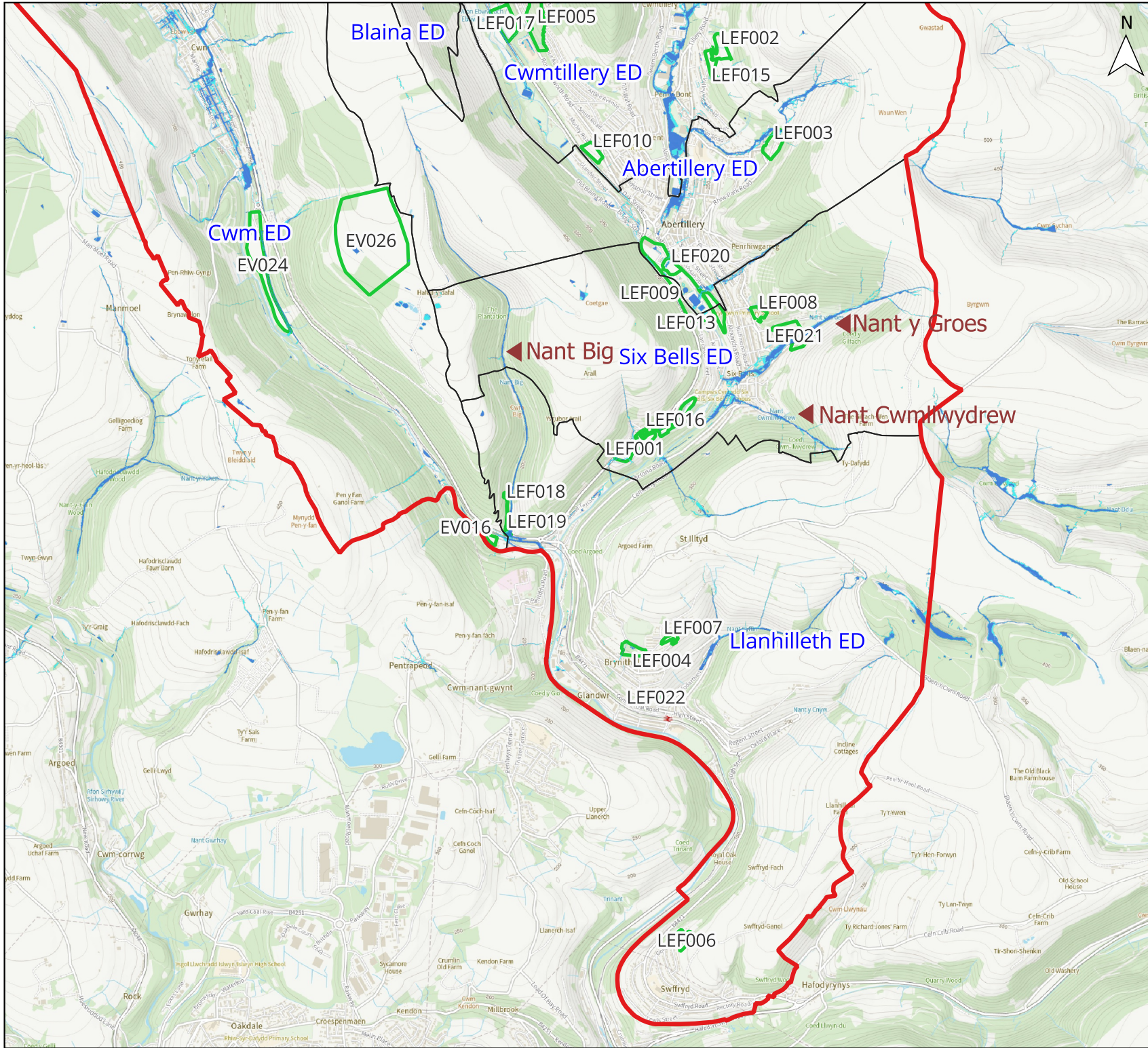
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Surface Water and Small Watercourses in NE Area








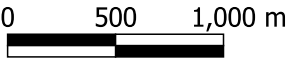

Drawing : WHS1855-T01-0010	Rev : 2
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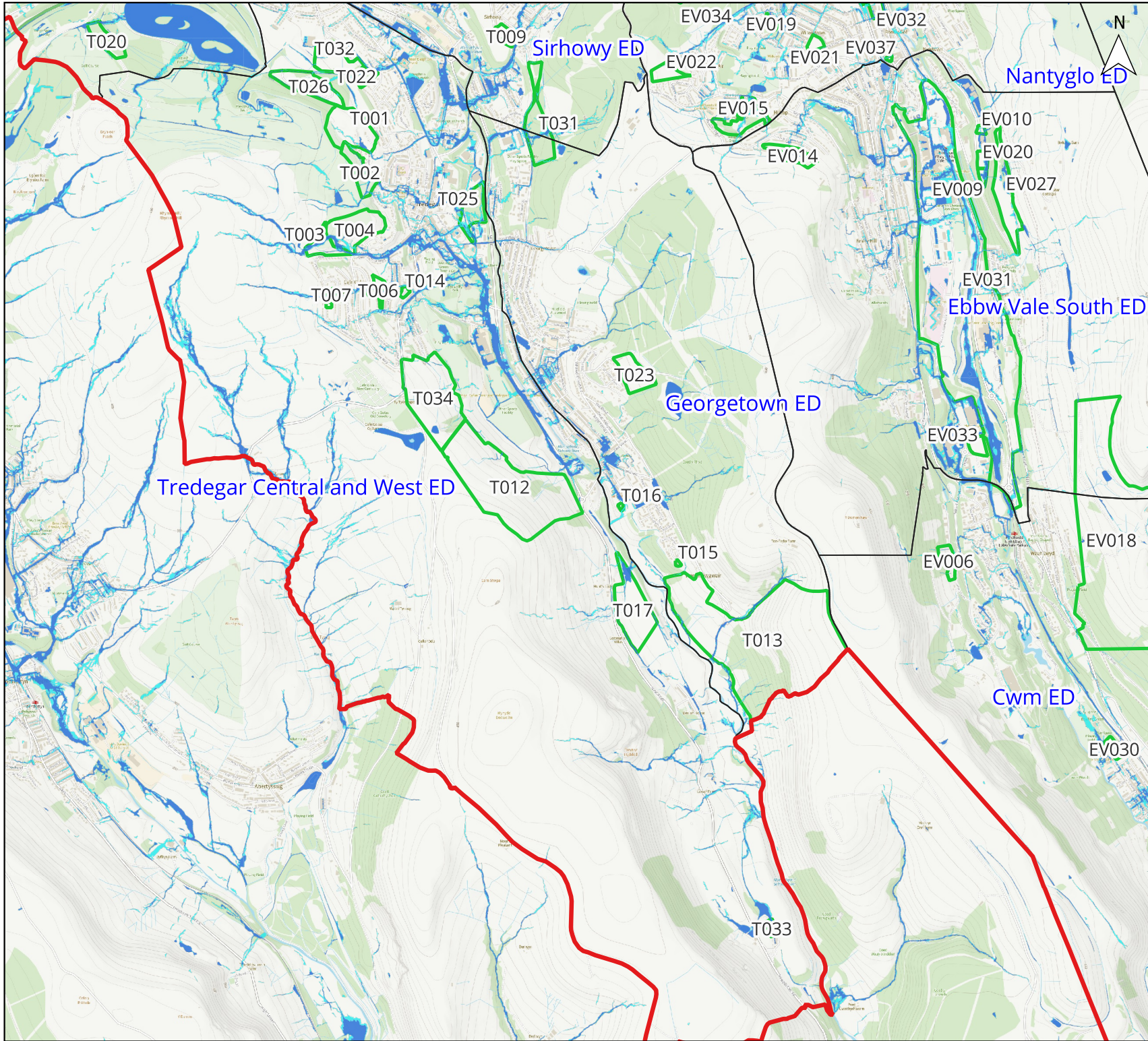





Project :		Blaenau Gwent SFCA	
Client :			
Legend :			
	Blaenau Gwent Administrative Boundary		Electoral Ward Boundary
	Candidate Sites		Small Watercourses
	Flood Zone 3		Flood Zone 2
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Scale :			
Title :			
Surface Water and Small Watercourses in NW Area			
Drawing :		Rev :	
WHS1855-T01-0006		2	
			









Project :		Blaenau Gwent SFCA	
Client :			
Legend :			
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	Candidate Sites		Small Watercourses
	Flood Zone 3		Flood Zone 2
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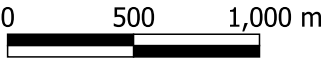
Project :  
**Blaenau Gwent SFCA**

Client :  
  
**Blaenau Gwent**  
 County Borough Council

Legend :


-  Blaenau Gwent Administrative Boundary
-  Electoral Ward Boundary
-  Candidate Sites
-  Small Watercourses
-  Flood Zone 3
-  Flood Zone 2

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Scale :  0 500 1,000 m

Title :  
**Surface Water and Small Watercourses in Western Area**

Drawing : WHS1855-T01-0007	Rev : 2
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## Appendix 3 – LLFA flood incidents

## Appendix 4 – Geological and Soils Mapping

## Appendix 5 – DCWW sewer flood incidents

