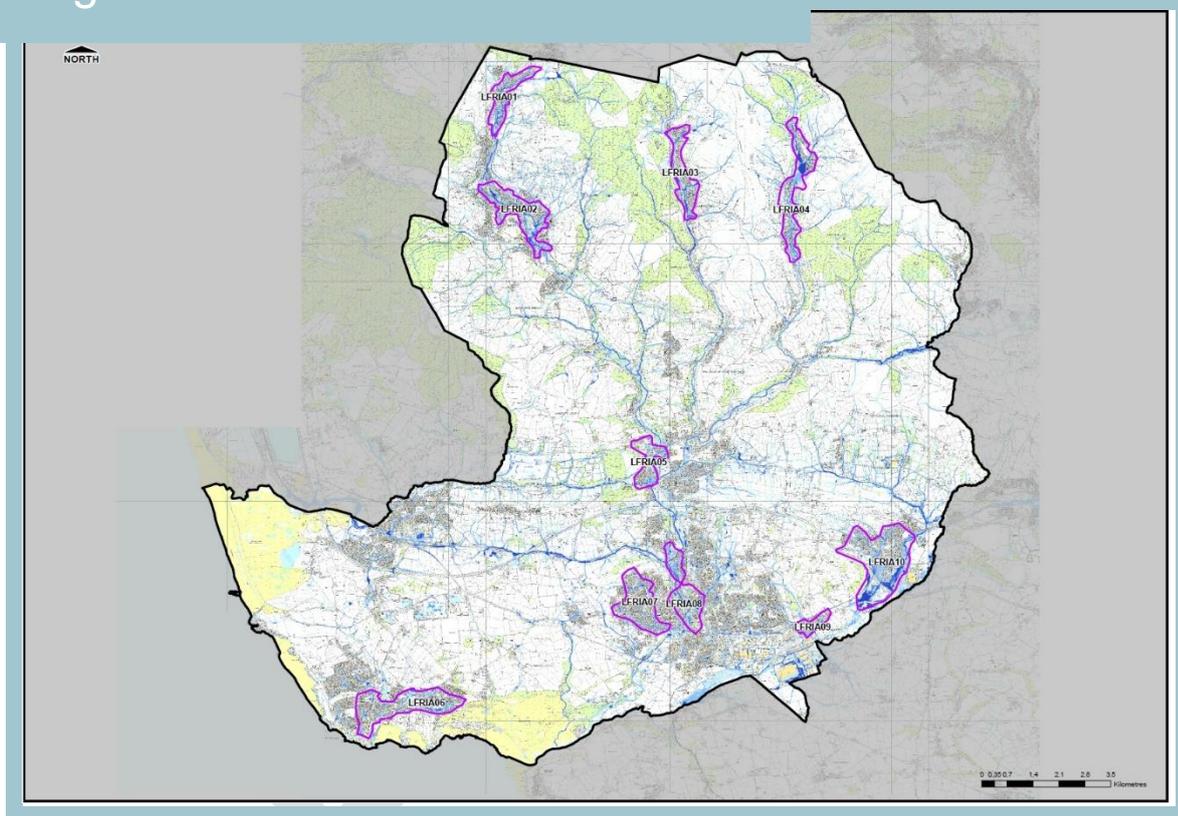


Bridgend Flood Risk Management Plan

Local Flood Risk Investigation Areas

August 2016



Quality Management

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1. Introduction

The Pitt Review, commissioned following the extreme floods of 2007, revealed the necessity for improved legislation for the effective management of flooding, particularly surface water flooding. Many of the recommendations from the Pitt Review have been implemented throughout the Flood and Water Management Act (2010), placing greater responsibilities on upper tier local authorities under their new role as Lead Local Flood Authorities (LLFAs).

Flooding remains a key threat to communities across Wales, and managing this risk through careful planning is important to minimise the risk to communities.

Flood Risk Management Plans (FRMPs) are designed to highlight hazardous areas and areas at risk of flooding from surface water, rivers, tidal, groundwater and reservoirs. FRMPs allow Risk Management Authorities (RMAs) to develop a better understanding of risk from surface water, ordinary watercourses and groundwater flooding and set out how RMAs can work together with communities to mitigate flood risk. FRMPs set out how, over the next six years, the Councils will manage flooding so that the communities most at risk and the environment benefit the most.

To assist the Bridgend County Borough Council (BCBC) to complete their FRMP, Capita was commissioned to highlight the areas at most risk from surface water flooding and ordinary watercourses in the BCBC area, draw conclusions from these risks and set out the measures the BCBC should hope to undertake over the next 6 years to mitigate these risks and make communities more resilient.

This report focuses on the flood risk posed to people, economic activity and the natural and historic environment at 10 Local Flood Risk Investigation Areas (LFRIAs).

Due to the nature of flooding and the current funding environment, we have also looked at measures to reduce the likelihood of flooding using non-structural measures including raising awareness of flooding. All the measures identified in this plan have been classed in four categories:

- Prevention;
- Protection;
- Preparedness; and
- Recovery and Review.

2. Identification of Local Flood Risk Investigation Areas

For the purpose of identifying flood risk areas within the Bridgend Administrative boundary, the updated Flood Map for Surface Water (uFMfSW) has been used. The uFMfSW reflects the maximum flood extents for the following return periods: 1 in 30, 1 in 100 and 1 in 1000 chance of surface water flooding in any year.

The data supplied enabled the identification of residential and non-residential properties located in areas of surface water flood risk under the three flood extents, high (1 in 30 year event), Medium (1 in 100 year event) and Low (1 in 1000 year event). The analysis for this plan has therefore adopted an approach, which is consistent across Wales, to take into account areas predicted to be affected by flood levels greater than 200mm. This level was chosen reflecting the typical level of a property threshold level above adjacent road levels. The risk to economic activity and the natural and historic environment was identified only for the high risk areas after consultation with BCBC. The number of people at risk has been assumed using the assumed property multiplier of 2.35 people per dwelling.

Data included in this FRMP:

1. **Risk to people and property:**
 - a. Number of people in areas at risk of flooding – depth >200mm
 - b. Number of residential properties at risk of flooding – depth >200mm
2. **Risk to economic activity:**
 - a. Non-residential properties in areas at risk of flooding – depth >200mm
 - b. Airports
 - c. Roads/Motorways
 - d. Main Line Railways
 - e. Agricultural Land- Grades 1, 2, 3, 4 and 5
3. **Risk to Natural and historic Environment:**
 - a. Bathing Waters
 - b. Environmental Permitting Regulations (EPR) Installations
 - c. Special Areas of Conservation (SAC)
 - d. Sites of Special Scientific Interest (SPA)
 - e. Ramsar Sites
 - f. World Heritage Sites
 - g. Sites of Special Scientific Interest (SSSI)
 - h. Parks and Gardens
 - i. Scheduled Ancient Monuments
 - j. Listed Buildings
 - k. Licensed Abstractions (LA)
 - l. Sites of Interest for Nature Conservation (SINC)

Data collection was carried out in accordance with the revised EA methodology and information provided in the following dataset:

1. **Cadw datasets of designated historic assets** which contains data on Scheduled Ancient Monuments, Listed Buildings, Registered Historic Parks and Gardens, Historic Landscapes polygon, World Heritage Sites, Designated Wrecks.
2. **Natural Resources Wales (NRW) Datasets** including EPR Installations and Licensed Abstractions
3. **uFMfSW Property Point Dataset** containing residential and non-residential property point data within a defined LA's area. In addition to the standard OS address layer 2 property data, the dataset provides details of the percentage of a perimeter that is wetted in a P30, P100, and P1000 rainfall event at 6 different depths: 0mm, 150mm, 200mm, 300mm, 600mm and 900mm.
4. **Lle Geo-Portal for Wales Datasets** including Bathing Waters, SPA, SAC, SSSI.
5. **Licensed Abstraction spreadsheet:** Spreadsheet containing details of all active water extraction licenses within each LLFA.
6. **BCBC User Datasets** including **OS MasterMap data** which contains data on roads and railways, **OS Mapping** - background mapping for reference purposes and **SINC**.

The LFRIAs were chosen based on the outcomes of the above analysis. Draft LFRIA outlines were sent to BCBC for confirmation. These were refined based on BCBC comments. The identification of the final LFRIAs was focused on the density of the residential and non-residential property counts as shown in Figure 2-1.

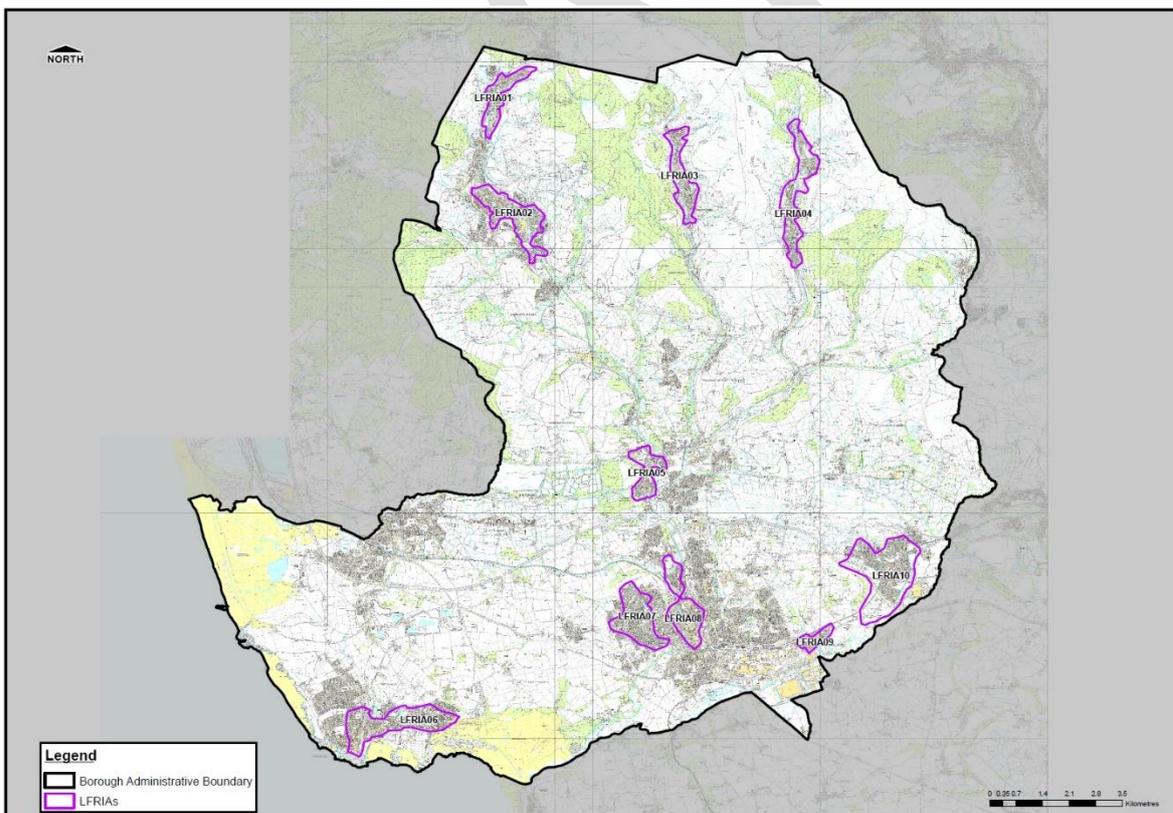


Figure 2-1: Location of the 10 LFRIAs within the Bridgend Administrative Boundary

3. Local Flood Risk Investigation Areas

BCBC currently has a Local Flood Risk Management Strategy¹ which sets out the ways in which the authority manage flood risk within the Bridgend administrative boundary. The strategy sets out a number of measures to mitigate against flood risk in Bridgend and their current status, which are shown in the table below. Further details on these measures can be found via the link below.

Table 3-1 Flood Risk Management Measures

| | Flood Risk Management Measures | Status | Funding |
|----|--|---|-----------------------|
| | | O- Ongoing P- Proposed A- Aspirational R- Review | |
| 1 | Bridgend County Borough Council Flood Plan | R | BCBC |
| 2 | Wildmill Community Flood Plan | O | BCBC |
| 3 | BCBC Strategic Flood Consequence Assessment | O | BCBC |
| 4 | Investigation of flooding incidents | O | BCBC |
| 5 | Maintain a register of surface water assets | O | BCBC |
| 6 | Regular and hot-spot inspections | O | BCBC |
| 7 | Provide flood risk observations | O | BCBC |
| 8 | Inspect coastal defences | O | BCBC |
| 9 | Shoreline Management Plan | O | BCBC |
| 10 | Assist in the preparation of catchment Flood Management Plan | O | BCBC |
| 11 | Prepare Local Development Plan | O | BCBC |
| 12 | Provide advice of management of flood risk | O | BCBC |
| 13 | Collaborative work between departments | O | BCBC |
| 14 | Liaison with other risk management authorities and owners | O | BCBC |
| 15 | Liaison with Welsh Government and other LLFAs on flood risk management | O | BCBC |
| 16 | Ad hoc maintenance of assets | O | BCBC |
| 17 | Electronic flood warning sensors at strategic culverts | O | BCBC |
| 18 | Consenting Works on Ordinary Watercourses | O | BCBC |
| 19 | Prepare SuDS Policy | P | Developer |
| 20 | Prepare Local Supplement Planning Guidance | P | BCBC |
| 21 | Retrospective SuDS with DCWW | P | Developer |
| 22 | Culvert Location and Condition Survey | O | Welsh Government (WG) |
| 23 | Record Highway Drainage Network | O | BCBC |

¹ <http://www1.bridgend.gov.uk/media/138008/105765.pdf>

| Flood Risk Management Measures | | Status | Funding |
|--------------------------------|---|---|---------|
| | | O- Ongoing P- Proposed A- Aspirational R- Review | |
| 24 | Asset Maintenance rolling Programme | P | |
| 25 | Historical 3 rd Party Culvert Review | A | |
| 26 | Review Pre-feasibility Flood Studies | A | |
| 27 | Culvert Policy | P | BCBC |
| 28 | Riparian Duties, Public Awareness Raising | P | |
| 29 | Risk Management Public Awareness Campaign | P | BCBC |
| 30 | Public Engagement on inspection/maintenance | O | BCBC |
| 31 | Enforcement using permissive powers | P | |

Existing flood risk management measures already in place will continue, subject to review and amendment in line with changing requirements and legislation. Proposed measures will be implemented as required subject to availability of resources.

DRAFT

3.1 Caerau (LFRIA 01)

Overview

This LFRIA is located in the northern most area of the Bridgend administrative boundary around the village of Caerau and covers an area of approximately 81ha. This LFRIA contains the Llynfi River flowing through the centre from the north east to the south. The area is mainly residential with a total of 1,977 properties including 893 residential and 51 non-residential. Using the property multiplier of 2.35 per residential household the population of the area is 2,099. The site is bounded by Afan Forest Park to the north and west, rough grassland to the east, with the village of Measteg located to the south. The area slopes from the north east corner of the site boundary to the south from 250m AOD to 150m AOD.

The British Geological Survey (BGS) highlights that the area is comprised of South Wales Middle Coal Formation with the predominant superficial deposit of Till. The Llynfi River channel has a superficial deposit of Alluvium.

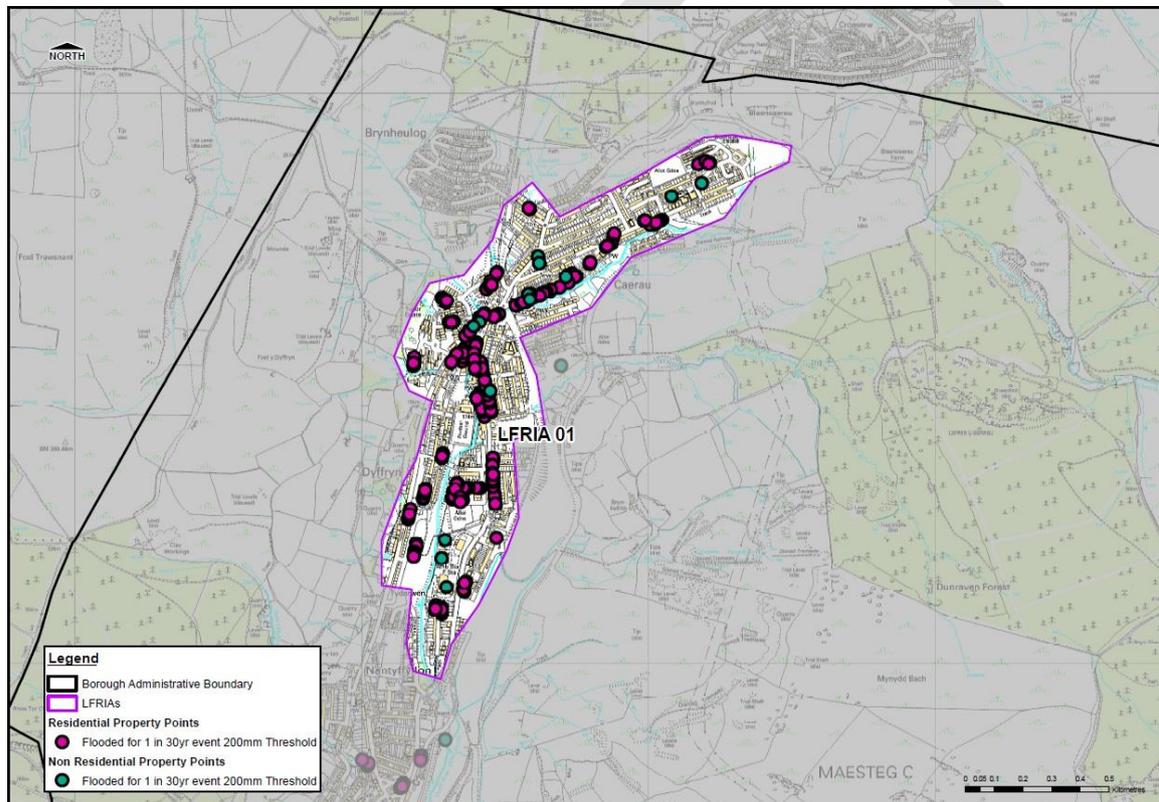


Figure 3-1: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Caerau LFRIA

Analysis of the uFMfSW for Caerau

The total number of properties within Caerau is 1,977, of which there are 248 residential properties and 18 non-residential properties considered to be at high risk of surface water flooding. Using the property multiplier of 2.35 people per dwelling this equates to 582 people considered to be at high risk from surface water flooding. High surface water flow paths are located adjacent to the Llynfi River. High surface water

flow paths are also located along Caerau Road flowing from the north east of the site. A significant flow path is also seen along Hermon Road flowing from north to south of the LFRIA.

Historical Data provided by NRW identifies a number of past flood events. In June 2009 reports of flooding in Caerau and Nanttyfyllon was caused by blocked culverts and drains. A number of properties have been protected during flood events due to the deployment of sandbags. In 1998, 12 properties in Nanttyfyllon and Caerau would have been flooded if these sandbags were not deployed.

A summary of the counts for Caerau are presented in Table 3-2 and Table 3-3.

Table 3-2: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Caerau

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 2,099 | 583 |
| Residential Properties | 893 | 248 |
| Non Residential Properties | 51 | 18 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | - | - |
| Agricultural Land - Grade 4 (m ²) | 102,707 | 4,201 |
| Agricultural Land - Grade 5 (m ²) | 2,943 | 54 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 805,910 | 38,100 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 17,338 | 185 |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | - | - |
| Number of Listed Buildings | 16,488 | - |
| Number of Licensed Abstractions | - | - |

Table 3-3: People living in areas at medium and low risk of surface water flooding within Caerau

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 1,081 | 2,099 |
| Number of Residential Properties | 460 | 893 |
| Number of Non Residential Properties | 104 | 189 |

Modelling Verification and Ground Truthing

This LFRIA has a number of properties located within high surface water flood risk during the 1 in 30 year event with a 200mm building threshold. In particular, residential properties located along Caerau Road are observed to be located within an area considered to be at high risk of surface water flooding. Additionally some of the properties along this road are located within Flood Zone 3 as the Llynfi River is located approximately 18m to the south of these properties. Similarly properties located at the northern end of Dyffryn Road are observed to be located within Flood Zones 2 and 3. LiDAR demonstrates that the land slopes from north to south; therefore, it is recommended that as the Llynfi River is a Main River a joint approach with NRW is taken in order to mitigate flood risk at these properties. NRW is responsible for the management of flooding from Main Rivers.

High surface water flooding is also seen for residential properties located along Hermon Road, Glanafon Terrace, Coegnant Road and Magazine Street. The properties along these roads are located at ground level, with no threshold protecting the properties from flooding, which suggests that these properties are at high risk of surface water flooding entering these properties.

Measures

A summary proposed measures to mitigate surface water flooding within Caerau are presented in the table below.

Table 3-4: Summary of flood risk management plan measures for Caerau

| FRMP Measure | EU Reporting Code | Measure Status | Responsible Authority |
|--|--------------------|----------------|-----------------------|
| Bridgend County Borough Council Flood Plan | M24 - Prevention | Review | BCBC |
| Provide Flood Risk observations | M42 - Preparedness | 2016 - 2021 | BCBC |
| Maintain a register of surface water assets | M43 - Preparedness | 2016 - 2021 | BCBC |
| Culvert Inspection/ investigation/ condition survey work | M41- Preparedness | Proposed | BCBC |
| Electronic flood warning sensors at strategic culverts | M41 – Preparedness | Ongoing | BCBC/WW |
| Provide advice of management of flood risk | M43 – Preparedness | Ongoing | NRW/BCBC |

Summary of Measure Counts for Caerau



DRAFT

3.2 Maesteg (LFRIA 02)

Overview

This LFRIA is situated within the northern area of the Bridgend boundary around the village of Maesteg, with the Llynfi River flowing from north to south through the LFRIA. The site covers an area of approximately 146 ha. The area is mainly residential with a total of 1,759 residential properties and a population of 4,134 using the 2.35 property multiplier. The site is bounded by Caerau to the north, Llangynwyd to the south Margam Park to the west and grassland/agricultural land to the east.

The British Geological Survey (BGS) highlights that the area is comprised of South Wales Middle Coal Formation, with alluvium superficial deposits located at the southern boundary. The remainder of the site contains Glacial Till. The LFRIA is located around a valley with the topography sloping from north to south from 144m AOD to 99m AOD. High surface water flood risk has been identified along the river corridor with ponding occurring near the southern boundary.

This LFRIA contains the Llynfi River, the areas adjacent are located within Flood Zone 2, as identified on NRW's Flood Maps. Flood Zone 2 is defined as land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year. There are a number of areas that are located within Flood Zone 3, land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year, most notably the recreation ground to the north of Garth railway station and the area to the south of Talbot Road.

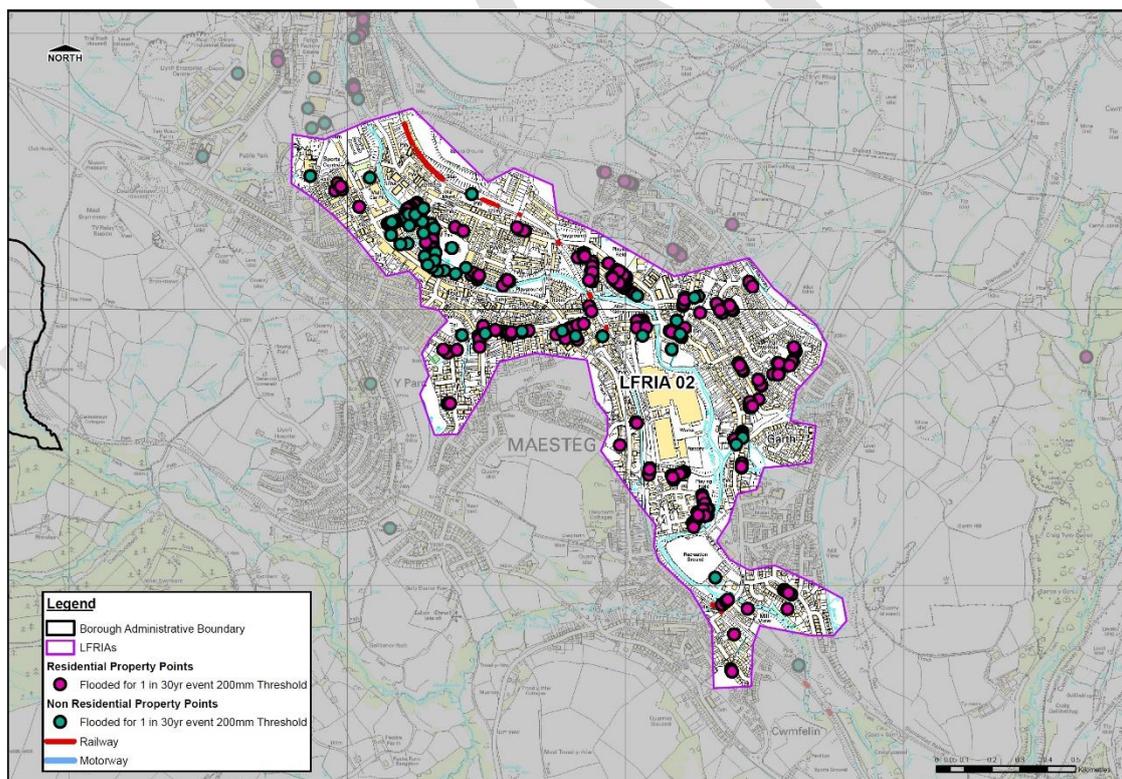


Figure 3-2 Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Maesteg LFRIA

Analysis of the uFMfSW for Maesteg

The total number of properties within Maesteg is approximately 3,252, of this 320 residential properties and 752 non-residential properties are considered to be at high risk of surface water flooding. Using the property multiplier of 2.35 people per dwelling this equates to approximately 752 people living in areas at high risk of surface water flooding. The areas located adjacent to the river are at high risk, with surface water ponding occurring to the south of the site and an area towards the north. The remainder of the site is considered to be at low risk of surface water flooding.

The areas of surface water ponding coincide with the topographic low points. These areas are located along the valley floor with surface water expected to flow down the slopes towards the river. Preferential flow paths can be seen on many roads within this area. In the west of the LFRIA flow paths are expected along Wood Street and Garn Road flowing west to east down the valley and also along Upper Street and Llynfi Road.

Historic flooding data have been provided by NRW. The area of Maesteg has a number of recorded flood events from 1994 to 2009 due to the Llynfi River bursting its banks. Within this LFRIA one event in 1994 resulted in the River Llynfi bursting its banks at Caerau Road. This caused flooding of one property and several garages.

A summary of the counts for Maesteg is presented in Table 3-5 and Table 3-6.

Table 3-5: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Maesteg

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 4,134 | 752 |
| Residential Properties | 1,759 | 320 |
| Non Residential Properties | 239 | 74 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | 2.0 | 0.3 |
| Agricultural Land Grade 4 (m ²) | 9,359 | 204 |
| Agricultural Land Grade 5 (m ²) | 43,234 | 1,999 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 1,456,456 | 38,800 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 3,713 | - |
| Parks and Gardens | - | - |

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|---|------------------------|-------------|
| | | High Risk |
| Scheduled Ancient Monuments (m ²) | 1,127 | 1,127 |
| Number of Listed Buildings | 430 | 1 |
| Number of Licensed Abstractions | 1 | - |

Table 3-6: People living in areas at medium and low risk of surface water flooding within Maesteg

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 1,730 | 4,134 |
| Number of Residential Properties | 736 | 1,759 |
| Number of Non Residential Properties | 104 | 189 |

Modelling Verification and Ground Truthing

Properties located along Talbot Street are predicted to flood during the 1 in 30 year event with a 200 mm building threshold. These properties are located within 60 metres of Llynfi River. This area falls within the NRW Fluvial Flood Zone 2 and a smaller part is within Fluvial Flood Zone 3. As these properties are also affected by fluvial flooding, a joint approach with NRW should be taken to mitigate flood risk from combined sources in this area. Properties located along Church Street, Meadow Street, Bridgend Road, Oakwood and Mill Street are also located within the Fluvial Flood Zone 2. Fluvial flooding also affects properties along Ewenny Road which is located within Flood Zone 2. However just to the north Ewenny Road to the south of the Llynfi River, the area is located within Flood Zone 3. The topography in these areas is relatively flat.

The LiDAR data provided, along with the use of readily available Street View maps, show that the rest of the properties at risk of surface water flooding are also located within relatively flat areas. Properties in some of these areas seem to be located at a lower ground level compared to that of the surrounding areas. Therefore, they are more likely to be affected by surface water flooding.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code² are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

²

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Table 3-7: Summary of flood risk management plan measures for Maesteg

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|--|--------------------|-------------|-----------------------|
| Promote property and community level flood resilience | M61 - other | 2016 - 2021 | BCBC |
| Ensure the preparation and testing of Emergency Plans | M42 - Preparedness | 2016 - 2021 | BCBC |
| Public Engagement in inspection/maintenance | M43 - Preparedness | Ongoing | BCBC |
| Work in partnership with NRW. Further consideration of the interaction of Surface Water Flooding and Main River Flooding sources* is required to understand the flood extents and sources. | M24 - Prevention | 2016 - 2021 | NRW/BCBC |
| SuDS Adoption | M34 - Protection | Proposed | BCBC |
| Surface Water Modelling | M24 - Prevention | 2016 - 2021 | BCBC |

*Natural Resources Wales is responsible for managing Main River flooding.

Summary of Measure Counts for Maesteg



3.3 Pontycymer (LFRIA 03)

Overview

Pontycymer is located in centre of the northern portion of the Bridgend administrative boundary. The area is bounded by grassland and farmland to the east, Cwmyogwr Forest to the west and the village of Blaengarw to the north and Pantgog to the south. The site slopes from north to south from a height of 219m AOD to 138m AOD. The Afon Garw River flows down the western boundary of the site.

The LFRIA is approximately 98.7ha and has approximately 1,966 properties with 438 residential and 98 non-residential. The LFRIA is predominantly comprised of residential properties with a number of recreational areas.

Information obtained from the BGS identifies that the LFRIA is comprised of South Wales Middle Coal Measures Formation with a number of superficial deposits. Devensian Till is located through the centre of the area, with Alluvium deposits located along the western boundary of the site. No records of superficial deposits are identified in the remainder of the area.

The majority of the site is located within Flood Zone 1, land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). However areas located adjacent to the river are located within Flood Zone 3, and assessed as having a 1 in 100 or greater annual probability of river flooding (>1%). The overall risk of fluvial flooding to the area is considered to be low.

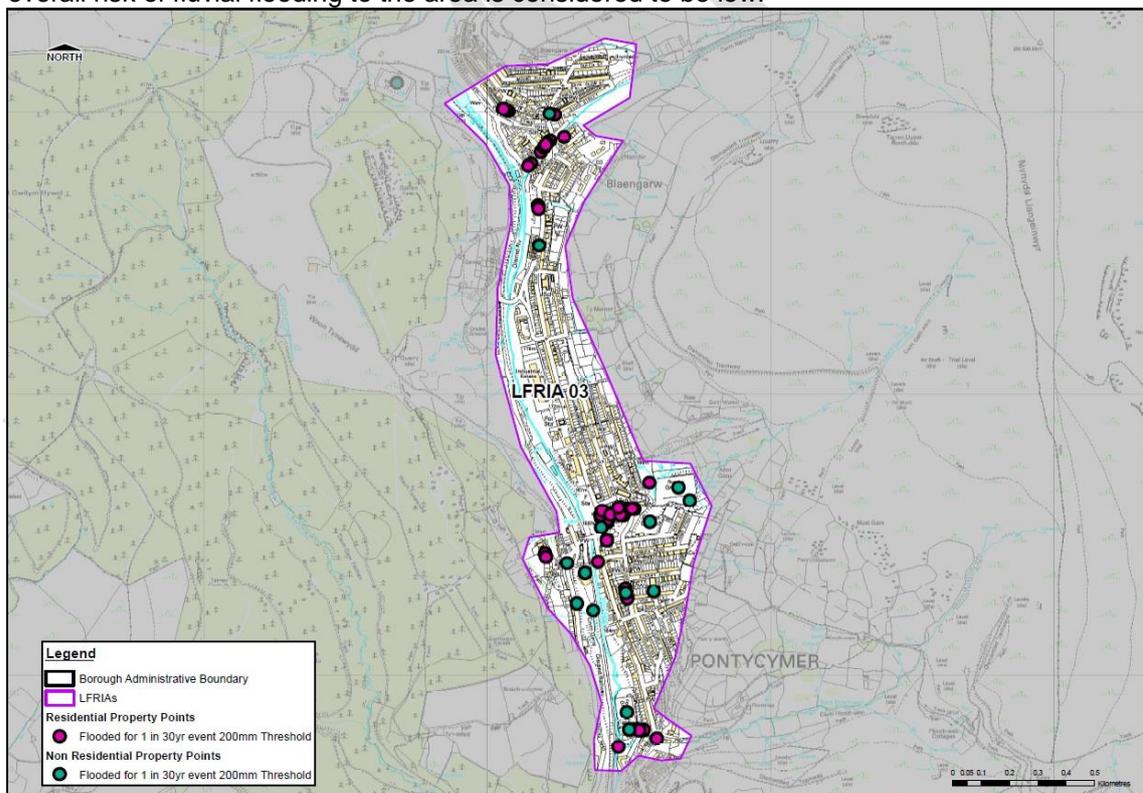


Figure 3-3: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Pontycymer LFRIA

Analysis of the uFMfSW for Pontycymer

The total number of properties within Pontycymer is 1966 with 86 residential and 74 non-residential at high risk of surface water flooding. Using the property multiplier 2.35 this equates to 202 people at risk from high surface water flooding. High surface water flow paths can be seen around the area adjacent to the River. A high surface water flow path is also established along Bridgend Road. Significant surface water ponding can be seen at the Football ground, the southern area of the Rugby Ground and at the southern end of the site boundary on Pant-Y-Gog. No historical flood records are available for this site.

A summary of the counts for Pontycymer are presented in Tables 3-8 and 3-9:

Table 3-8 People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Pontycymer

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 1,029 | 202 |
| Residential Properties | 438 | 86 |
| Non Residential Properties | 98 | 74 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | 24 | - |
| Railways (km) | 2 | - |
| Agricultural Land Grade 4 (m ²) | 893,548 | 65,048 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 986,857 | 221,300 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 8,758 | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | - | - |
| Number of Listed Buildings | 8 | - |
| Number of Licensed Abstractions | - | - |

Table 3-9: People living in areas at medium and low Risk of surface water flooding within Pontycymer

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 392 | 1,029 |
| Number of Residential Properties | 167 | 438 |
| Number of Non Residential Properties | 28 | 50 |

Modelling Verification and Ground Truthing

Properties located within the north of the LFRIA around the village of Blaengarw, notably around Station Road, are at high risk of surface water flooding during the 1 in 30 year with 200mm building threshold. Upon inspection using Street view it is observed that the properties along Station Road have entrances which have varying threshold values, the front entrances to these properties are located at a higher level than the entrances at the rear of the buildings. Properties along Station Road are entered though the first floor, whereas the entrances to the rear of these properties are at a lower elevation, on the ground floor. These properties are located within Flood Zone 1. Properties located at the western end of Station Road are located closer to the Afan Garw River LiDAR identifies that the rear of these properties are at a lower elevation than the front of the property. The area to the rear of the properties along King Edward Street is also at a lower elevation than the front of the properties.

The area within the to the south of the LFRIA shows properties along Gwaun Bant are at risk during the 1 in 30 year event. LiDAR demonstrates that the road slopes from east to west from 165mAOD to 155mAOD. Properties on the northern side of Gwaun Bant are located at a much lower elevation than the properties behind

Properties along Fenton Place are located at high risk from surface water flooding. The Road slopes from west to east. These properties are located within Flood Zone 1 and approximately 60m from the Afon Garw River. As the land slopes up from the River these properties are not considered to be at risk from fluvial flooding. One residential property located on the western side of the river (not located on a specific road) at the end Fenton Place, is located in Flood Zone 3. The topography of these area is relatively flat, therefore this property is at risk from fluvial flooding.

Measures

A summary of the flood risk mitigation measures for Pontycymer are presented in the table below.

Table 3-10: Summary of Flood Risk Management Plan Measures for Pontycymer

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Ensure the preparation and testing of Emergency Plans | M42 - Preparedness | 2016 - 2021 | BCBC |
| Public Engagement in inspection/maintenance | M43 - Preparedness | Ongoing | BCBC |

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---------------|-------------------|-----------|-----------------------|
| SuDS Adoption | M34 - Protection | Proposed | BCBC |

Summary of Measure Counts for Pontycymer



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3.4 Ogmore Vale (LFRIA 04)

Overview

Ogmore Vale LFRIA is located in the north eastern area of the Bridgend administrative boundary and occupies an area of approximately 147.7ha. The LFRIA contains the villages of Nant-y-Moel, Wyndham and Ogmore Vale. The area slopes from north to south from approximately 206m AOD to 125m AOD. The site is bounded by grassland. The River Nant y Moel enters the site boundary in the northwest and the Ogwr Fawr flows through the centre of the site.

The LFRIA comprises of a variety of different Sandstones. The area also contains both Alluvium and Till superficial deposits.

Due to the Ogwr Fawr running through the central belt of the LFRIA, the areas adjacent to the site are at a high risk of fluvial flooding. The majority of the site area is located within Flood Zone 1, the areas located around the Ogwr Fawr River especially to the east of the river around the Sports Ground and the Cemetery in Price Town are located within Flood Zone 3.

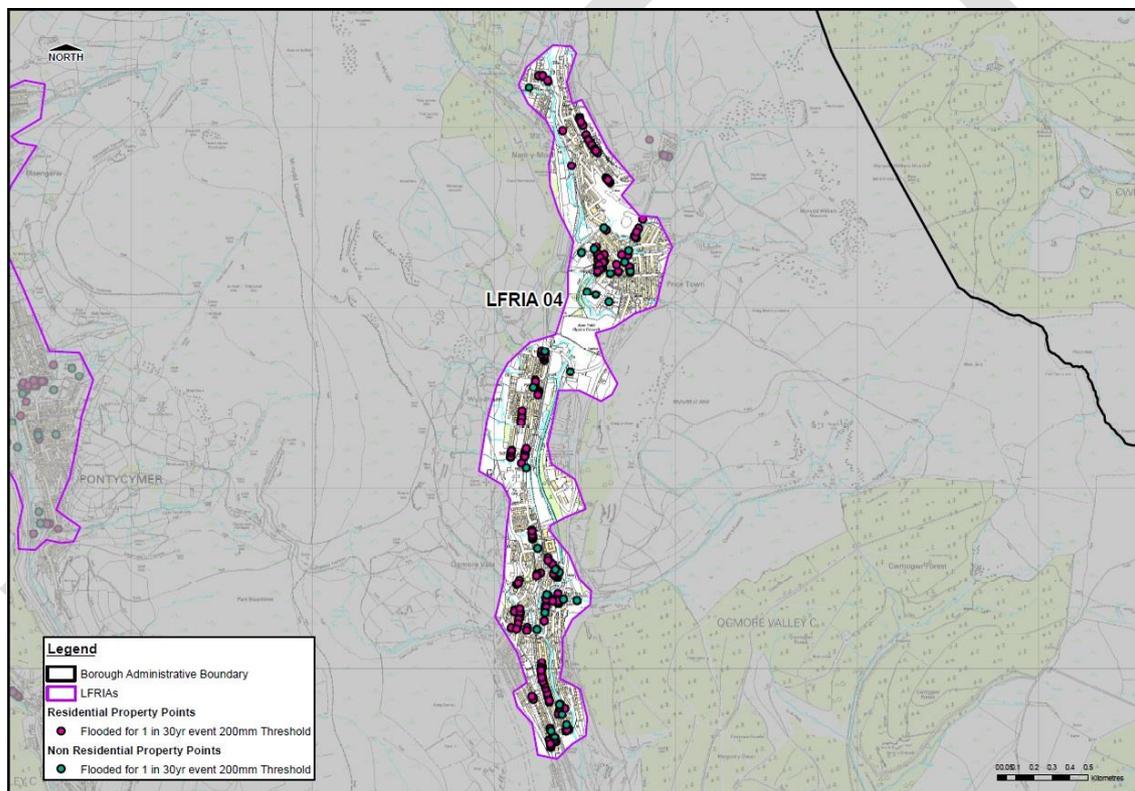


Figure 3-4: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Ogmore Vale LFRIA

Analysis of the uFMfSW for Ogmore Vale

The total number of properties at high risk of surface water flooding for the Ogmore Vale LFRIA is 321, of which are 290 residential properties and 31 non residential properties. Using the property multiplier of 2.35 people per dwelling this equates to 682 people living in an area considered to be at high risk of surface water flooding. Additionally the uFMfSW mapping shows areas of significant high surface water ponding around the Sports Ground, School and Cemetery area within Price Town.

Historical flood data provided by NRW highlights a flood event that occurred in 2007 for the Ogmore Vale. The highest recorded level was recorded since the installation of the gauge in 2000. During this flood event sandbags were deployed at the rear doors of properties along St John Street in Ogmore Vale and garden walls were washed away by the Ogwr Fawr flooding.

Table 3-11: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Ogmore Vale

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 2,747 | 682 |
| Residential Properties | 1,169 | 290 |
| Non Residential Properties | 119 | 31 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | - | - |
| Agricultural Land Grade 4 (m ²) | 88,384 | 58,07 |
| Agricultural Land Grade 5 (m ²) | 1,388,748 | 152,102 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 1,477,132 | 473,700 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 33,915 | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | - | - |
| Number of Listed Buildings | 8,591 | 1 |
| Number of Licensed Abstractions | - | - |

Table 3-12: People living in areas at medium and low Risk of surface water flooding within Ogmores Vale

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 1,215 | 2,811 |
| Number of Residential Properties | 517 | 1,169 |
| Number of Non Residential Properties | 40 | 100 |

Modelling Verification and Ground Truthing

A large number of properties within this LFRMA are considered to be at risk from surface water flooding during the 1 in 30 year event plus a 200mm building threshold. Residential properties located along Valview Terrace Pembroke Road, the southern end of Commercial Street and Llewellyn Street in the northern area of the LFRMA are considered to be at risk from high surface water flooding. A review of LiDAR data and online aerial imagery identifies that a number of these properties have no threshold and are located at ground level. Furthermore, some properties located in Price Town are considered to be at high risk of surface water flooding and there are a number of properties within Price Town which are located within the NRW Flood Zones 2 and 3. These include residential properties located along Waun Fach Terrace, Waun Lwyd Terrace and Gwendoline Street. This is also the case for properties situated in the Ogmores Vale area of the LFRMA. Properties on Commercial Street, Corbett Street, St John Street, Bridge Street, Walters Road and Water Street are considered to be at risk of fluvial flooding. Therefore, it is recommended that a joint approach with NRW to mitigate the fluvial and surface water risk within these areas should be taken.

Within the southern half of the LFRMA, residential properties on Wyndham Street, Dunraven Place, Adare Street and Eron – Wen Terrace are considered to be at high risk of surface water flooding. Further inspection of these properties using aerial imagery has identified that these properties have little or no threshold.

Measures

A summary of the recommended measures to mitigate flood risk within Ogmores Vale are presented in the table below.

Table 3-13: Summary of Flood Risk Management Plan Measures for Ogmores Vale

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Ensure the preparation and testing of Emergency Plans | M42 - Preparedness | 2016 - 2021 | BCBC |
| Public Engagement in inspection/maintenance | M43 - Preparedness | Ongoing | BCBC |
| SuDS Adoption | M34 - Protection | Proposed | BCBC |

Summary of Measure Counts for Ogmore Vale



3.5 Aberkenfig (LFRIA 05)

Overview

Aberkenfig is located in the centre of the Bridgend administrative boundary and occupies an area of approximately 72ha. The area is bounded by grassland to the north and west, the towns of Sarn and Brycethin to the east and the M4 to the south. The Llynfi River enters the eastern portion of the site boundary with the Ogmore River running through the southernmost boundary of the site. The topography of the site slopes from the north to the south from approximately 96m AOD to 35m AOD.

The LFRIA has 1,307 properties in the area with 1044 residential and 130 non residential properties . The site comprises of mainly residential properties with parkland located in the north west. The predominant bedrock for the site is South Wales middle Coal Measures, which contain a mixture of Mudstone, Siltstone and Sandstone.

The majority of the site is located within Flood Zone 1, which is , land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). The area located to the south east of the LFRIA – between Sandfields Road and Dunraven Street – as well as the area to the north east of the LFRIA are located within Flood Zone 3, which is land assessed as having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Historical flooding has been recorded around the Aberkenfig area in 1994 and 1995, however exact details of the historical flood events are not known.

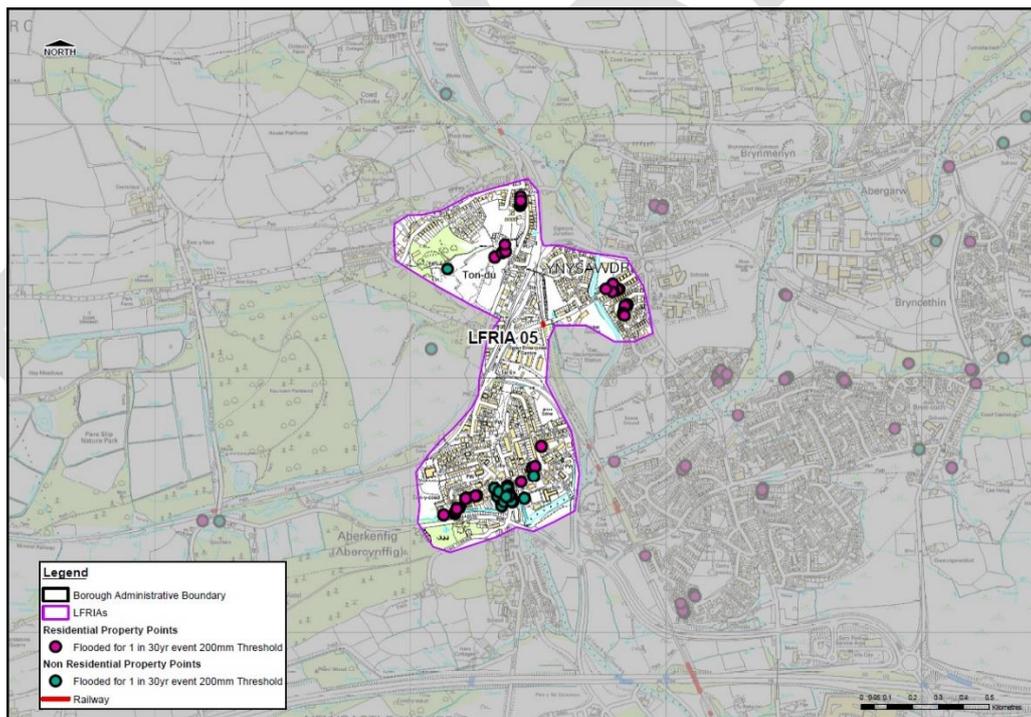


Figure 3-5: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Aberkenfig LFRIA

Analysis of the uFMfSW for Aberkenfig

A review of the uFMfSW with this LFRIA identifies a high surface water flow path along Dunraven Street from west to east flowing onto Pandy Road. Surface water ponding areas are located in the north eastern area along Bryn Road and around the residential area off Heol Adare located in the north eastern boundary of the site.

The total number of residential properties considered to be at high risk of surface water flooding is 55, which equates to 129 people at high risk of surface water flooding using the 2.35 proproperty multiplier. A summary of the counts for Aberkenfig are presented in Tables 3-14 and 3-15.

Table 3-14 People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Aberkenfig

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 2444 | 129 |
| Residential Properties | 1040 | 55 |
| Non Residential Properties | 130 | 22 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | 1.2 | - |
| Agricultural Land Grade 4 (m ²) | 720,384 | 21,156 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 720,384 | 33,800 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 17,974 | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | 14,176 | 14,200 |
| Number of Listed Buildings | 90 | - |
| Number of Licensed Abstractions | - | - |

Table 3-15: People living in areas at medium and low Risk of surface water flooding within Aberkenfig

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 813 | 2,444 |
| Number of Residential Properties | 346 | 1,040 |
| Number of Non Residential Properties | 31 | 124 |

Modelling Verification and Ground Truthing

The area located in the northern part of this LFRIA, along Maseteg Road identifies five properties at high risk during the 1 in 30 year event with a 200mm building threshold of surface water flooding. A review of the LiDAR data provided, along with online aerial imagery, shows that these properties are located at ground level with no threshold into the property. Thus these properties are considered to be at high risk of surface water flooding entering these properties.

Four properties off Iron Way are considered to be at risk of surface water flooding during the 1 in 30 year event with a 200mm building threshold. A review of the LiDAR identifies that this area is relatively flat. These properties are located at a lower level than the surrounding land to the north and therefore are likely to be affected by surface water flooding.

In the north east of the LFRIA a number of properties along Bryn Road and Heol Adare are identified as being at high risk of surface water flooding. These properties are also located within Flood zone 3. A review of the LiDAR and online aerial imagery shows that the elevation of the land slopes from north to south, resulting in surface water ponding along the roads and at these properties. Properties located within the south east of the LFRIA are also located within NRW Flood Zone 3, with the exception of four residential properties located to the north of Dunraven Street. At the western end of Dunraven Street residential properties are located at ground level with little threshold. Properties located along the south of Bridgend Road are located within an area considered to be at risk from surface water ponding. The street comprises of both residential and retail properties that have no threshold from the road.

As all these properties located in the north east and south east of the LFRIA lie within Flood Zone 3, it is recommended that a combined approach with NRW to mitigate the sources of flooding to these properties is taken.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code³ are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Table 3-16: Summary of Flood Risk Management Plan Measures for Aberkenfig

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Ensure the preparation and testing of Emergency Plans | M42 - Preparedness | 2016 - 2021 | BCBC |
| Public Engagement in inspection/maintenance | M43 - Preparedness | Ongoing | BCBC |
| SuDS Adoption | M34 - Protection | Proposed | BCBC |

Summary of Measure Counts for Aberkenfig



3.6 Porthcawl (LFRIA 06)

Overview

LFRIA 06 is approximately 184ha and is situated in the south eastern corner of the Bridgend Boundary to the south of Porthcawl. The area is very low lying compared to the rest of the LFRIAs and slopes from east to west from approximately 21m AOD to 5m AOD in the south western corner of the LFRIA.

The area has a population of 5,682 and approximately 4,451 properties. The majority of the site area is residential with a number of recreational playing areas distributed throughout the site.

The geology of the site is comprised of Oxwich Head Limestone Formation to the west of the site with no superficial deposits recorded. The remainder of the site comprises of Mercia Mudstone with a mixture of superficial deposits recorded. The south western corner is contains Mercia Beach deposits, with clay, silt, sand and gravel and intersecting blown sand deposits being located in the north and east.

The area is located entirely within Flood Zone 1, land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) and therefore considered to be at low risk of fluvial flooding.

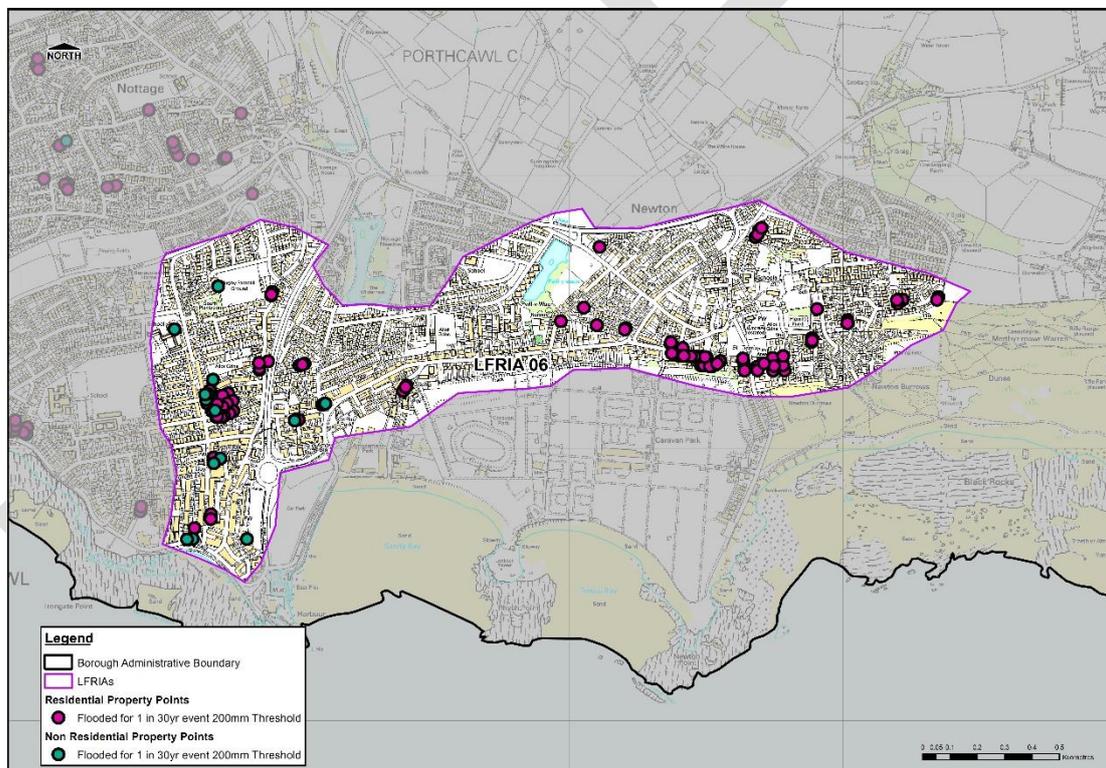


Figure 3-6 Identification of Key Receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Porthcawl LFRIA

Analysis of the uFMfSW for Porthcawl

This LFRIA has a number of high surface water ponding areas located throughout the site. Approximately 161 residential properties and 14 non-residential properties are considered to be at high risk of surface water flooding. These areas coincide with topographic lows located within the site boundary. A number of preferential flow paths within this LFRIA are located along the roads. A predominant surface water flow route can be seen along Bridgend Road. The road slopes from the north east to the south west from 17.7m AOD to 7.10m AOD. Significant surface water ponding can be seen around the residential area just to the south of St. John's Well. The topography surrounding this area is higher, resulting in surface water collecting in the lower elevation.

Additional flow paths can be seen along Poplar Road and Northways resulting in high surface water ponding at the roundabout intersecting new Road and Eastern Promenade.

Another surface water ponding area is observed around the eastern corner of the Rugby Football Ground located in the west of the LFRIA. Mainly non-residential properties are located in this area.

Historic flooding data shows no incidents of flooding in the Porthcawl area, however a flood incident in 2014 due to tidal flooding resulted in water pooling on Bay View Road, no internal property damage was reported.

A summary of the counts for Porthcawl is presented in Tables 3-17 and 3-18.

Table 3-17: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Porthcawl

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 5,682 | 378 |
| Residential Properties | 2,418 | 161 |
| Non Residential Properties | 311 | 14 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | - | 0.27 |
| Agricultural Land Grade 2 (m ²) | 226,045 | 11,931 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 1,587,035 | 109,900 |
| Special Area of Conservation | 11,785 | - |
| Sites of Special Scientific Interest (SSSI) (m ²) | 11,785 | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 77,297 | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | 1,127 | 1,127 |

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|---------------------------------|------------------------|-------------|
| | | High Risk |
| Number of Listed Buildings | 1,228 | - |
| Number of Licensed Abstractions | 1 | - |

Table 3-18 People living in areas at Medium and Low Risk of surface water flooding within Porthcawl

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 1,708 | 5,682 |
| Number of Residential Properties | 727 | 2,418 |
| Number of Non Residential Properties | 42 | 188 |

Modelling Verification and Ground Truthing

The LiDAR data provided, along with the use of online aerial photography, show that the properties predicted to flood within this LFRIA are located in low laying parts where surface water is likely to pond. Surface water flooding in this area is localised and is mainly predicted along the roads for the 1 in 30 year event. Some of the buildings seem to be located outside the flood extent for the 1 in 30 year event. However, due to the buffer used in the building footprint when identifying the flooded properties these are reported as flooded.

Measures

As this LFRIA is made up of mostly residential properties, the following measures are recommended in order to mitigate surface water flood risk.

Table 3-19: Summary of Flood Risk Management Plan Measures for Porthcawl

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Surface Water Flow Modelling and investigate accumulations of surface water | M24 - Prevention | 2016 - 2021 | BCBC |
| Flood Awareness | M42 - Preparedness | 2016 - 2021 | BCBC |
| Property Level Protection | M43 - Preparedness | 2016 - 2021 | BCBC |
| Development of procedures for the effective clearance of debris | M24 - Prevention | 2016 - 2021 | NRW/BCBC |
| SuDS Adoption | M34 - Protection | 2016 - 2021 | BCBC |
| Community Resilience | M24 - Prevention | 2016 - 2021 | BCBC |

Summary of Measure Counts for Porthcawl



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3.7 Bryntirion (LFRIA 07)

Overview

This LFRIA is located in the southern boundary of Bridgend and occupies an area of approximately 134.6ha. The site is comprised of 3235 properties with 933 residential and 24 non residential properties. An unnamed watercourse is located down the eastern boundary of the LFRIA. LiDAR shows that the land slopes from the north west of the site to the south east from approximately 74m AOD to 16m AOD. The predominant bedrock is Porthkerry Member consisting of Limestone and Mudstone. No superficial deposits have been recorded for the site.

A review of the NRW Flood Map identified that the LFRIA is located entirely within Flood Zone 1, which is land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

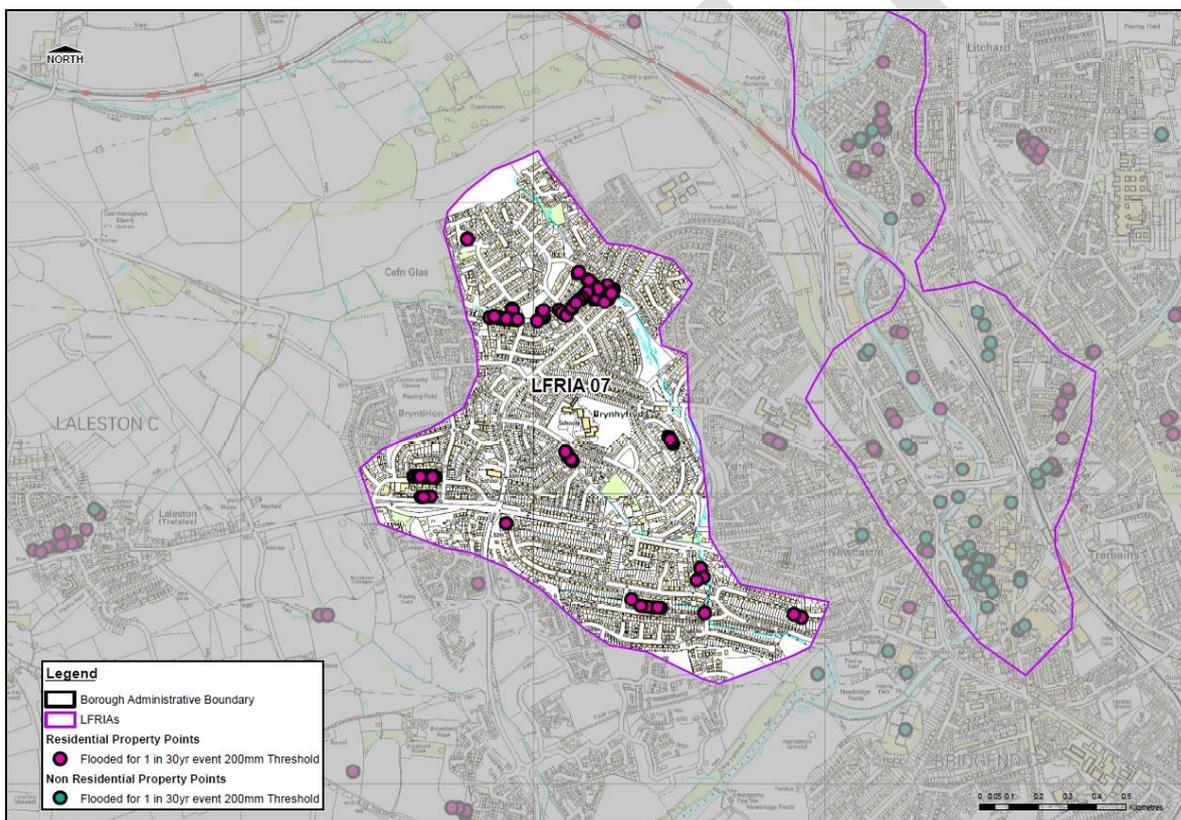


Figure 3-7: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Bryntirion LFRIA

Analysis of the uFMfSW for Bryntirion

The total number of properties within Bryntirion is 3,235, with 109 residential properties located in an area at high risk of surface water flooding. This equates to 256 people considered to be at high risk of surface water flooding using the property multiplier. High surface water ponding can be seen to the north of Merlin Crescent, before the Nant Cefn-glas is deculverted. Here a number of residential properties to the west of Willesden Road and north of Merlin Crescent are considered to be at high risk of surface water flooding. A surface water flow path is identified along the north of Byron Avenue. A high surface water flow path is

observed in the centre of the LFRIA, along the north of Heol-y-Frenhines, flowing down onto Philip Avenue before reaching an unnamed tertiary watercourse to the south of Bryntirion Hill. This results in high surface water flooding along this road. Additionally a number of properties on Elm Crescent in the west of the LFRIA are at risk of high surface water ponding. Significant surface water flooding can also be seen in gardens along Oakland Road, to the north of Greenfields Avenue, and properties to the south of Park Court Road located in the south of the LFRIA. No historical flood records have been provided for this LFRIA.

A summary of the counts for Bryntirion are summarised in Tables 3-20 and 3-21.

Table 3-20: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Bryntirion

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 2,193 | 256 |
| Residential Properties | 933 | 109 |
| Non Residential Properties | 24 | 0 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | - | - |
| Agricultural Land Grade 2 (m ²) | 51,519 | 250 |
| Agricultural Land Grade 3 (m ²) | 287,318 | 6,128 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 1,345,606 | 91,100 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) (m ²) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | - | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | - | - |
| Number of Listed Buildings | 82 | - |
| Number of Licensed Abstractions | - | - |

Table 3-21: People living in areas at medium and low risk of surface water flooding within Bryntirion

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 771 | 2,193 |
| Number of Residential Properties | 328 | 933 |
| Number of Non Residential Properties | 1 | 32 |

Modelling Verification and Ground Truthing

This LFRIA only identifies residential properties at risk of high surface water flooding for the 1 in 30 year event with a 200mm building threshold. Properties located Chiswick Close, Ffordd-yr-Afon, Elm Crescent, Philip Avenue and Cricklewood Close are at high risk of surface water flooding. A review of LiDAR and online aerial imagery identifies that these properties are at lower elevation than the surrounding land. These properties are therefore considered to be at risk of surface water flooding.

Properties located along Merlin Crescent contain front gardens which slope away from the road. These properties are at risk during the 1 in 30 year event and therefore at risk of surface water flooding.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code⁴ are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

Table 3-22: Summary of Flood Risk Management Plan Measures for Bryntirion

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Surface Water Flow Modelling and investigate accumulations of surface water | M24 - Prevention | 2016 - 2021 | BCBC |
| Flood Awareness | M42 - Preparedness | 2016 - 2021 | BCBC |
| Property Level Protection | M43 - Preparedness | 2016 - 2021 | BCBC |

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Summary of Measure Counts for Bryntirion



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3.8 Wildmill (LFRIA 08)

Overview

Wildmill is located adjacent to LFRIA 07 in the central southern boundary of Bridgend. The site occupies an area of 119 ha and has a total of 2,703 properties, comprised of 1,663 residential and 499 non residential properties. The LFRIA contains the Ogmore River which flows down the central belt of the LFRIA, entering the LFRIA in the north and exiting the in the south west of the LFRIA.

A review of the BGS data set highlights that the area is located with an area of mixed geology. The predominant bedrock geology is Penarth Group Sandstone. In the eastern boundary the site consists of Limestone and Mudstone bedrock. Superficial deposits of Alluvium are found along the central belt of the site where the Ogmore River is located.

A review of the NRW Flood Risk Map identifies that the area in the northern most part of the site boundary, to the north of the Ogmore River, is located in Flood Zone 3, which is land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. However, this area is observed to be within an area benefiting from defences, which means that the area is protected from a flood up to the 1 in 100 year fluvial event and the 1 in 200 year sea flooding. The area to the south of Ogmore River in Wild Mill is located in Flood Zone 2 and is also in an area benefiting from defences. Within the southern area of the LFRIA the land to the west of the Ogmore River is located in Flood Zones 2 and 3. The land adjacent to the river Ogmore in the east is located in Flood Zone 3 with the remainder of the eastern boundary, to the east of the railway line is located in Flood Zone 1.

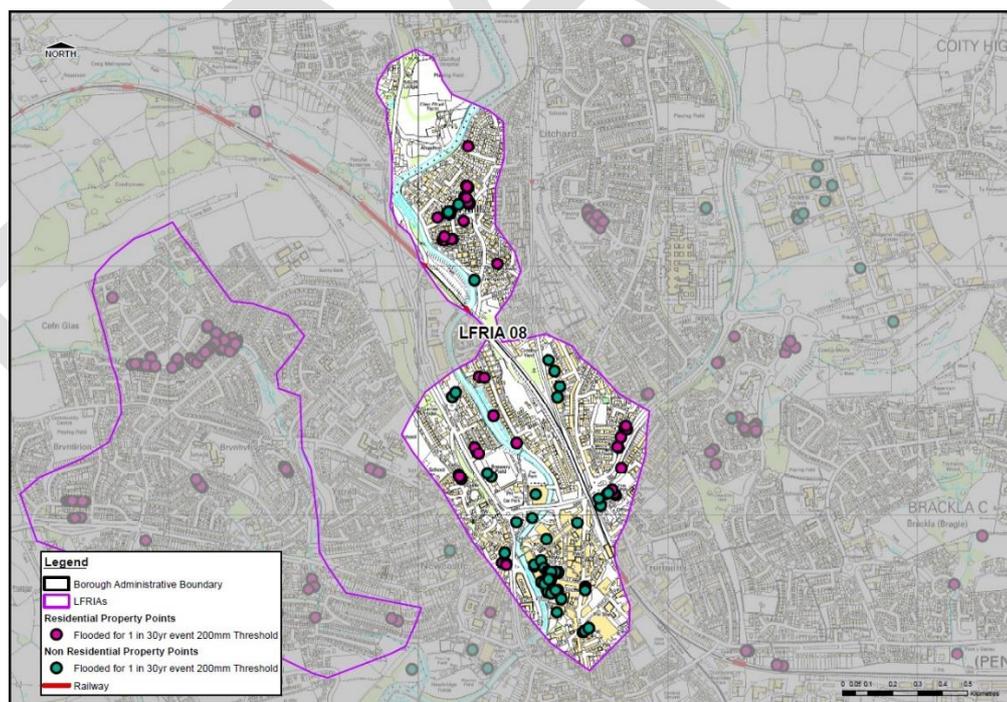


Figure 3-8: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Wildmill LFRIA

Analysis of the uFMfSW for Wildmill

Wildmill LFRIA has 110 residential properties and 75 non-residential properties at high risk of surface water flooding. Using the property multiplier of 2.35 people per dwelling this equates to 259 people. In the northern portion of the LFRIA there is a high risk of surface water ponding located at Glan Rhyd Farm and around South Lodge. Significant surface water flooding is also predicted along the path to the south of Heol yr Afon and residential areas to the north of Trem y Bryn. In the southern boundary of the LFRIA high surface water ponding can be seen around the junction along Tremains Road, Minerva Street and the A4061. These areas all correspond with topographic lows. A high surface water flow path is established along the A4061. High surface water ponding can also be seen along Duraven Place, Elder Street and Caroline Street.

Historical flood data identifies that in 1960 extensive flooding of the central Bridgend area including Caroline Street, Duraven Place, Water Street, Adare Street, Wyndham Street, Market Street and Sunnyside Road resulted in water exceeding depths of 1m in some places. The majority of properties along these roads were severely damaged. More recently in 1970 a flood event resulted in flooding of The Rhiw adjacent to the Three Horseshoes pub house. In 1998 two properties were flooded at Newbridge Fields with one property at Garn Tyn y Wern also affected.

A summary of the counts for Wildmill are summarised in Tables 3-23 and 3-24.

Table 3-23: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Wildmill

| Risk to People and Property | Total within the LFRIA | Risk Counts |
|--|------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 3,908 | 259 |
| Residential Properties | 1,663 | 110 |
| Non Residential Properties | 499 | 75 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | 2.9 | - |
| Agricultural Land Grade 3 (m ²) | 353,347 | 33,983 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 1345606 | 137200 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 19,905 | 479 |
| Parks and Gardens | 56,086 | - |
| Scheduled Ancient Monuments (m ²) | 3,605 | 3,600 |
| Number of Listed Buildings | 100 | 3 |
| Number of Licensed Abstractions | 3 | - |

Table 3-24: People living in areas at medium and low risk of surface water flooding within Wildmill

| Risk to people and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 1,027 | 3,908 |
| Number of Residential Properties | 437 | 1,663 |
| Number of Non Residential Properties | 159 | 532 |

Modelling Verification and Ground Truthing

Properties located in the northern area of the LFRIA in Glanffornwg and Tairfelin are at high risk of surface water flooding during the 1 in 30 year event with a 200mm building threshold. These properties are also located within Flood Zone 3. Residential properties located in the south western area of the LFRIA are also located within an area at high risk of surface water flooding along with a high risk of fluvial flooding. These include a number of properties located along Tynton Road and Quarella Road. Residential properties off Minerva Street are located in Flood Zone 2 and also at high risk of surface water flooding. A number of properties, mainly non-residential properties located in the southern part of the LFRIA, are considered to be at high risk of surface water flooding and are located within Flood Zone 3. These properties are located on Dunraven Place, Caroline Street and The Rhiw. It is therefore recommended that in order to mitigate the surface and fluvial flood risk within these areas, a joint approach with NRW should be taken.

A number of non-residential properties are located with areas of high risk of surface water flooding. These are located of Australian Terrace and Tondy Road in the north of the LFRIA, properties adjacent to Brewery Field in the centre of the LFRIA and properties off Derwen Road and Nolton Road.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code⁵ are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

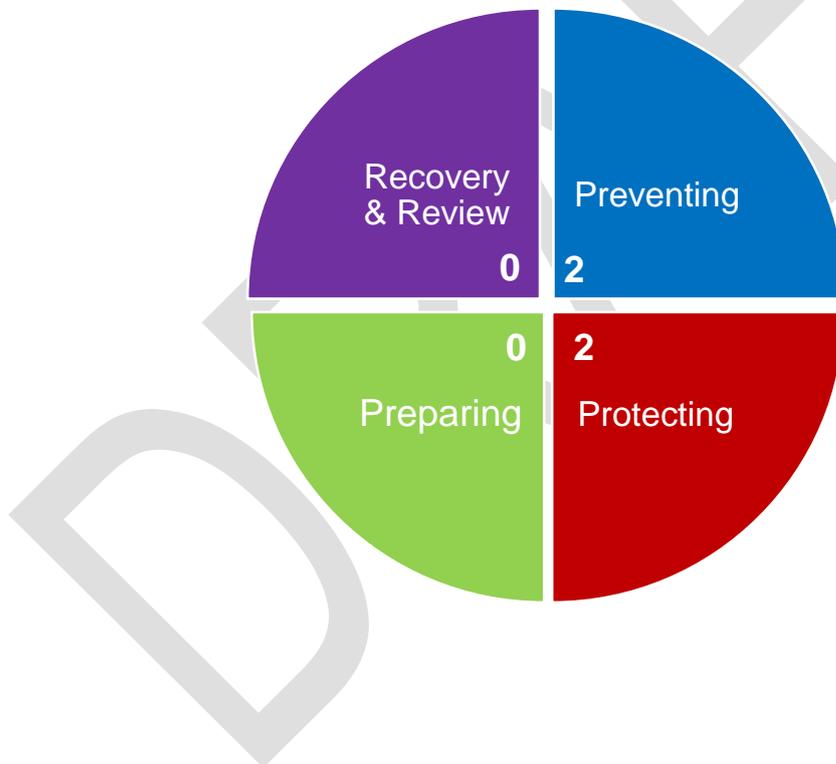
⁵

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Table 3-25: Summary of Flood Risk Management Plan Measures for Wildmill

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Surface Water Flow Modelling and investigate accumulations of surface water | M24 - Prevention | 2016 - 2021 | BCBC |
| Flood Awareness | M42 - Preparedness | 2016 - 2021 | BCBC |
| Property Level Protection | M43 - Preparedness | 2016 - 2021 | BCBC |
| Development of procedures for the effective clearance of debris | M24 - Prevention | 2016 - 2021 | NRW/BCBC |
| SuDS Adoption | M34 - Protection | 2016 - 2021 | BCBC |
| Community Resilience | M24 - Prevention | 2016 - 2021 | BCBC |

Summary of Measure Counts for Wildmill



3.9 Coychurch (LFRIA 09)

Overview

This LFRIA is located in the southern area of the Bridgend administrative boundary and is 31ha in size. The area has 414 residential properties and 11 non-residential properties. The topography of the site slopes from the north east to the south west from 28m AOD to 16m AOD. The Nant Bryn-Glas River enters the northern boundary and exits to the south. The LFRIA is mainly residential and is bounded by a golf course to the north, Bridgend Industrial Estate to the west and agricultural land to the east and south.

The majority of the site LFRIA is located in Flood Zone 1, which is land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). However land adjacent to the river around Bryn Road is located within Flood Zone 3, which is land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

The area has mixed geology with the north western boundary of the LFRIA consisting of Sandstone. The western area of the site consisting of Limestone and Mudstone with Alluvium superficial deposits and the eastern boundary consisting of Mercia Mudstone Group.

Two historic flood events have been recorded within the Coychurch area. One event in 1998 resulting in one property being flooded in Treoes Village and 8 properties in Coychurch. A historical flood event in 2000 from the Nant Bryn Glas resulted in three properties and a garage along Bryn Road flooding.

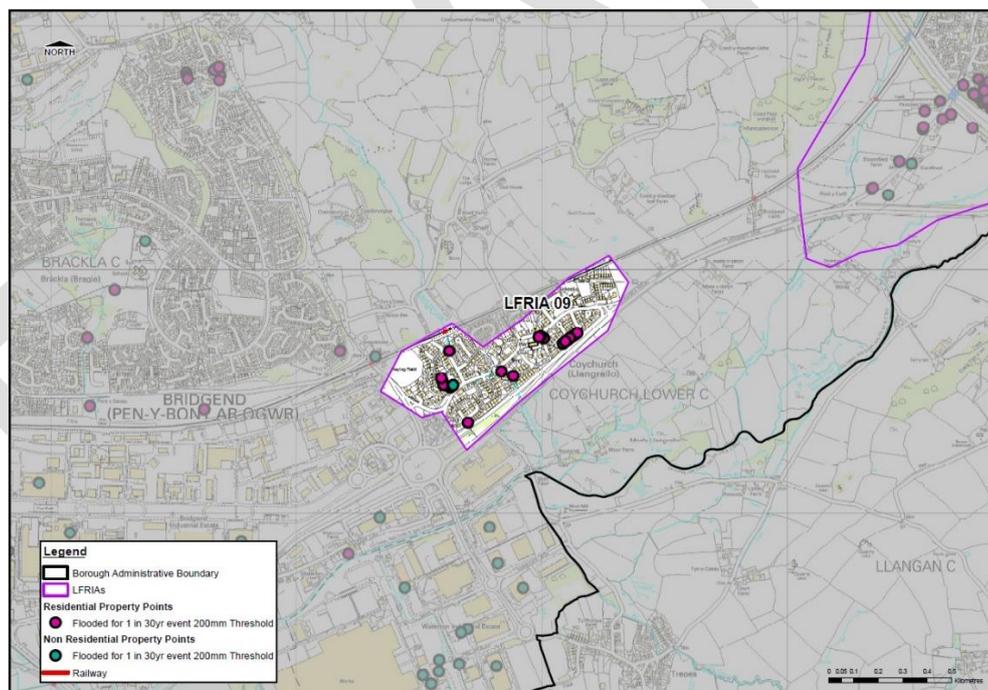


Figure 3-9: Identification of key receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Coychurch LFRIA

Analysis of the uFMfSW for Coychurch

A number of high surface water ponding areas have been identified within this LFRIA. Residential properties to the south of St Mary's view are at high risk of surface water flooding. Surface water flow paths have been established along Park View and Grange Crescent. In the central area of the LFRIA along Heol-y-Capel a high surface water flow path can also be seen. A surface water flow path along Coychurch Road in the south western boundary of the LFRIA is at high risk. A summary of the counts for Coychurch are summarised in Tables 3-26 and 3-27.

Table 3-26: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Coychurch

| Risk to people and Property | Total within the LFRIA Area | Risk Counts |
|--|-----------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 973 | 531 |
| Number of Residential Properties | 414 | 226 |
| Number of Non Residential Properties | 11 | 6 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | - | - |
| Railways (km) | 0.3 | - |
| Agricultural Land Grade 2 (m ²) | 276,284 | 8,429 |
| Agricultural Land Grade 4 (m ²) | 16,239 | 807 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 312,452 | 32,800 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) (m ²) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | - | - |
| Parks and Gardens | - | - |
| Scheduled Ancient Monuments (m ²) | 21 | 21 |
| Number of Listed Buildings | 199 | 1 |
| Number of Licensed Abstractions | 1 | - |

Table 3-27: People living in areas at medium and low risk of surface water flooding within Coychurch

| Risk to people and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 331 | 996 |
| Number of Residential Properties | 141 | 424 |
| Number of Non Residential Properties | 2 | 93 |

Modelling Verification and Ground Truthing

A review of the Ground truthing dataset identifies only residential properties at high risk of surface water flooding during the 1 in 30 year event plus a 200mm building threshold. Properties located along St Mary's View, The Court, Grange Crescent and one property located adjacent to the river off Glebeland Close are at high risk from surface water flooding. A review of LiDAR and online aerial imagery identifies that properties along St Mary's View have a front garden area which slopes down from the road to the properties. This will intensify the risk of surface water flooding into the properties themselves. This is also the case for a few properties located along Grange Crescent.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code⁶ are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

Table 3-28: Summary of Flood Risk Management Plan Measures for Coychurch

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|---|--------------------|-------------|-----------------------|
| Surface Water Flow Modelling and investigate accumulations of surface water | M24 - Prevention | 2016 - 2021 | BCBC |
| Flood Awareness | M42 - Preparedness | 2016 - 2021 | BCBC |
| Property Level Protection | M43 - Preparedness | 2016 - 2021 | BCBC |
| Development of procedures for the effective clearance of debris | M24 - Prevention | 2016 - 2021 | NRW/BCBC |
| SuDS Adoption | M34 - Protection | 2016 - 2021 | BCBC |
| Community Resilience | M24 - Prevention | 2016 - 2021 | BCBC |

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Summary of Measure Counts for Coychurch



3.10 Pencoed (LFRIA 10)

Overview

This LFRIA is located in the south eastern corner of the Bridgend boundary in the Pencoed area. The site has an approximate area of 269ha. The majority of the site area is residential with the M4 motorway intersecting across through the southern belt of the site. The railway line runs through the centre of the site from north to south. The population of the area is 20,572 using the property multiplier 2.35 with approximately 8,754 properties.

The site comprises of a mixture of geology from Limestone running through the central and southern belt of the LFRIA with mudstone, Siltstone and Sandstone located in the north. A mixture of superficial deposits is located within the site boundary.

The LFRIA contains both the Afon Ewenny River and the Nant Heol Y Geifr River. The adjacent land surrounding these rivers are located within Flood Zone 2 and 3. Observations from the NRW Fluvial Flood Map identifies a large area to the north of the M4 around the residential areas of Heol Maes Yr Haf and Pencoed Rugby Football Club that is located within Flood Zone 3. Areas to the south of the M4 are also located with Flood Zone 3.

Historical flood records show a number of events which have occurred within the Pencoed area. The sources of flooding are fluvial from the River Ewenny from 1995 to 2012. The events mainly consisted of a small number of properties or garages being flooded. The 2012 event resulted in at least 30 properties being flooded at Heol Croesty housing estate.

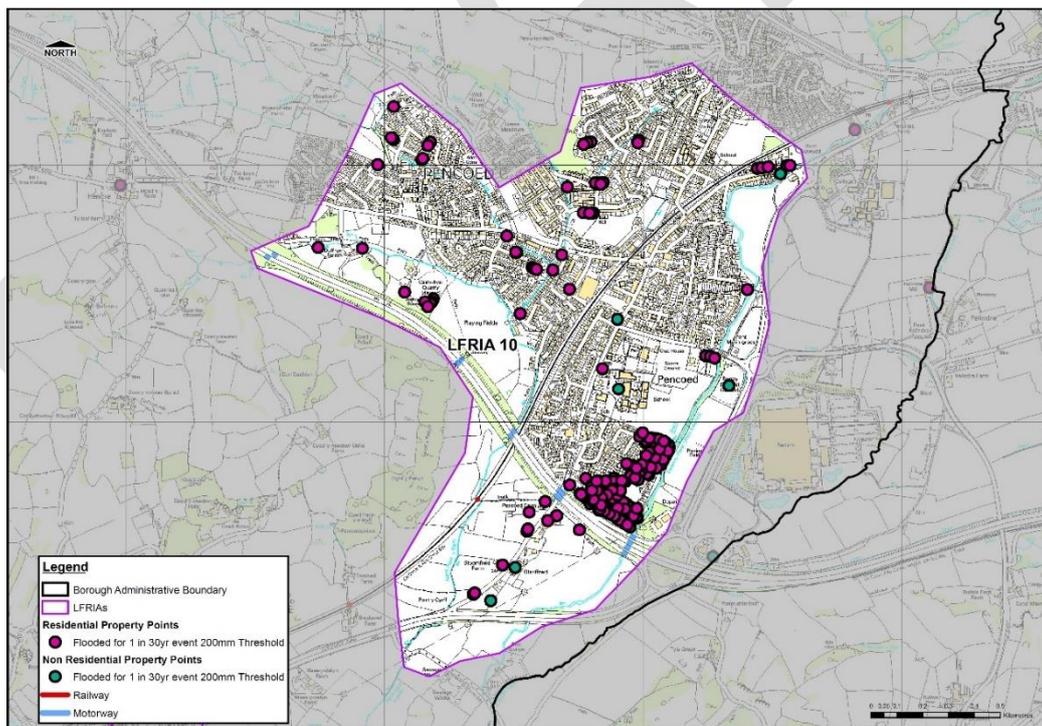


Figure 3-10: Identification of Key Receptors located within areas of high risk of surface water flooding (1 in 30 year event) in the Pencoed LFRIA

Analysis of the uFMfSW for Pencoed

The uFMfSW identifies significant surface water ponding to the north east of the M4 around the residential areas along Heol Maes-yr-Har and Heol Ewenny. This is due to water flowing down the valley of the Afon Ewenny River and backing up to the north of the M4 motorway, which is at a lower elevation than the motorway. The M4 is located at approximately 35m AOD whereas the area to the north is only 26m AOD. A significant surface water flow path can also be seen flowing from north to south along Woodland Avenue resulting in surface water ponding where the M4 and railway line intersect.

A preferential flow path can be seen flowing under the M4 along Coychurch Road from the north to the south of the LFRIA, resulting in high surface water ponding on the agricultural land to the south of the M4 around Broomfield Farm.

Approximately 226 residential properties and 6 non-residential properties are considered to be at high risk of surface water flooding.

Historic flood data from NRW identifies a number of historic flood incidents within the Pencoed area. A flood event in 1998 caused at least 30 properties at Heol Croesty housing estate to be flooded.

A summary of the counts for Pencoed is presented in Tables 3-29 and 3-30.

Table 3-29: People, economic activity and the natural and historic environment located in areas of high risk of surface water flooding within Pencoed

| Risk to people and Property | Total within the LFRIA Area | Risk Counts |
|--|-----------------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (multiplier 2.35) | 3250 | 531 |
| Number of Residential Properties | 1383 | 226 |
| Number of Non Residential Properties | 124 | 6 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | 4.53 | 0.1 |
| Railways (km) | 0.9 | - |
| Agricultural Land Grade 2 (m ²) | 870,996 | 186,000 |
| Agricultural Land Grade 3 (m ²) | 243,492 | 3,359 |
| Agricultural Land Grade 4 (m ²) | 1,575,976 | 121,000 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 2,690,464 | 931,600 |
| Special Area of Conservation | - | - |
| Sites of Special Scientific Interest (SSSI) (m ²) | - | - |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 41,846 | - |
| Parks and Gardens | - | - |

| Risk to people and Property | Total within the LFRIA Area | Risk Counts |
|---|-----------------------------|-------------|
| | | High Risk |
| Scheduled Ancient Monuments (m ²) | - | - |
| Number of Listed Buildings | 2,749 | 1 |
| Number of Licensed Abstractions | 1 | - |

Table 3-30: People living in areas at medium and low risk of surface water flooding within Pencoed

| Risk to people and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 1,213 | 3,250 |
| Number of Residential Properties | 516 | 1,383 |
| Number of Non Residential Properties | 10 | 44 |

Modelling Verification and Ground Truthing

There are a number of properties shown to flood in the southern part of this LFRIA. The LiDAR data provided, show that there are some properties in the southern part of this area (along Heol Maes-Yr-Haf) which are located 300-500 mm above the road level. However, the depths of the water predicted for these properties are high (up to 0.9m for the 1 in 30 year event, 200mm threshold) due to the fact that M4 (just south of this area) is raised by approximately 9m. Surface water is flowing towards that area from higher ground to the north and ponds along the M4. This area falls within the NRW Flood Zone 3. Therefore, these properties are also affected by fluvial flooding and it is suggested that a combined approach with NRW is taken in order to mitigate flood risk in this area.

The northern part of this LFRIA also seems to be largely affected by fluvial flooding based on a review of the NRW's Flood Zones. Fewer properties are affected within this area of the LFRIA and most of them are located within the Flood Zone 3. Properties in some of these areas seem to be located at a lower ground level compared to that of the surrounding areas. Therefore, they are likely to be at risk of flooding.

Measures

A summary of the flood investigation area and the recommended FRMP measures in line with the European Union (EU) Reporting Code⁷ are presented in the table below. We propose these actions in order to manage local flood risk at an acceptable level within the community.

Table 3-31: Summary of flood risk management plan measures for Pencoed

| FRMP Measure | EU Reporting Code | Timescale | Responsible Authority |
|--|---------------------------------------|-------------|-----------------------|
| Surface Water Flow Modelling and investigate accumulations of surface water. | M24 - Prevention | 2016 - 2021 | BCBC |
| Flood Awareness | M41 - Preparedness | 2016 - 2021 | BCBC |
| Flood Warning | M41 - Preparedness | 2016 - 2021 | BCBC |
| Community Resilience and Education | M43 Public Awareness and Preparedness | 2016-2021 | BCBC |
| Work in partnership with NRW. Further consideration of the interaction of Surface Water Flooding and Main River Flooding sources* is required to understand the flood extents and sources. | M24 - Prevention | 2016 - 2021 | NRW/BCBC |
| SuDS Adoption | M34 - Protection | 2016 - 2021 | BCBC |
| Identify at risk group, within communities | M43 - Preparedness | 2016 - 2021 | BCBC |
| Identify at risk group, within communities | M52 – Recovery and Review | 2016-2021 | BCBC |

*Natural Resources Wales is responsible for flooding from Main Rivers.

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https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307111/FRMPs_Measures_and_EU_Reporting_codes.pdf

Summary of Measure Counts for Pencoed



4. Summary of Surface Water Flood Risk within the BCBC LFRIAs

This section provides an overall summary of the surface water flood risk within the BCBC administrative boundary. There are 1627 residential properties and 3824 people using the 2.35 people per dwelling multiplier within the BCBC LFRIAs at risk from high surface water flooding. The majority of the properties at high risk are located along the valleys floors, which correspond with low ground elevations and those areas adjacent to watercourses.

A number of areas shown to be at high risk of surface water flooding also coincide with historical flood events provided by NRW that have occurred within the LFRIAs. The majority of flood events are from the Borough's Main Rivers, the Ogmore and Llynfi.

A summary of the total counts for the BCBC LFRIAs are presented in Table 4-1.

Table 4-1: Summary of people, economic activity and the natural and historic environment located in areas of high risk of surface water flooding across all BCBC LFRIAs

| Risk to People and Property | Total in Defined Area | Risk Counts |
|--|-----------------------|-------------|
| | | High Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 28,459 | 3,824 |
| Residential Properties | 12,110 | 1,627 |
| Non Residential Properties | 1,606 | 256 |
| Economic Activity | | |
| Airports | - | - |
| Roads (Motorway) (km) | 4.5 | 0.09 |
| Railways (km) | 7.3 | 0.28 |
| Agricultural Land - Grade 2 (m ²) | 1,424,844 | 206,609 |
| Agricultural Land - Grade 3 (m ²) | 614,400 | 43,470 |
| Agricultural Land - Grade 4 (m ²) | 3,406,598 | 218,223 |
| Agricultural Land - Grade 5 (m ²) | 1,434,926 | 154,159 |
| Risk to Environmental Receptors | | |
| Bathing Water (m ²) | 12,572,191 | 2,006,000 |
| Special Area of Conservation | 11,785 | 127 |
| Sites of Special Scientific Interest (SSSI) (m ²) | 11784.6 | 127 |
| Sites of Interest for Nature Conservation (SINC) (m ²) | 220,746.4 | 17,314 |
| Parks and Gardens | 5,6086 | - |
| Scheduled Ancient Monuments (m ²) | 18,930 | 17,820 |
| Number of Listed Buildings | 29,965 | 7 |
| Number of Licensed Abstractions | 6 | - |

Table 4-2: Summary of people living in areas at medium and low risk of surface water flooding across all BCBC LFRIAs

| Risk to People and Property | Risk Counts | |
|--------------------------------------|-------------|----------|
| | Medium Risk | Low Risk |
| Risk to People and Properties | | |
| People (property multiplier 2.35) | 10,281 | 28,482 |
| Number of Residential Properties | 4,375 | 12,120 |
| Number of Non Residential Properties | 439 | 1,404 |

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5. Conclusion

Ten Local Flood Risk Investigation Areas (LFRIs) within the Bridgend County Borough Council (BCBC) administrative boundary that are at risk from surface water flooding have been identified and the flood risk assessed to identify people, properties and services most at risk. The flood risk dataset analysed included data provided by BCBC and NRW including the uFMfSW, historical flood data and property counts. In order to reduce the risk of surface water flooding within the borough, Flood Risk Management Measures from the draft Local Flood Risk Management Strategy were reviewed and appropriate measures for each LFRIA have been identified. BCBC has no statutory duty to undertake a FRMP and the outcomes of this report are subject to available funding and resourcing.

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