Topic Paper 8A: Strategic Flood Consequence Assessment (Stage 1) 8A

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Anglesey & Gwynedd Joint Local Development Plan

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Background

This is one of a range of topic papers prepared to offer more detailed information and explain the approach of the Plan to different topics and issues affecting the Joint Local Development Plan Area. This paper will look specifically at ***'Strategic Flood Consequences Assessment Stage 1***. It will explain the background which will help to identify the issues, objectives and options for the Deposit Plan.

The Deposit Plan is the second statutory stage in the preparation of the Joint Local Development Plan (JLDP). The JLDP shapes the future growth of communities in the Joint Local Development Plan Area and will set out the policies and land allocations against which planning applications will be assessed.

The Deposit Plan will be submitted to the Welsh Government, which will appoint an independent inspector to assess the soundness of the Plan in the Examination in Public. If the inspector considers the Plan to be sound it will be recommended for adoption. When adopted the JLDP will supersede the Gwynedd Unitary Development Plan (2009) for the Gwynedd Local Planning Authority Area and the Gwynedd Structure Plan (1993) and Ynys Môn Local Plan (1996) for the Ynys Môn Local Planning Authority.

This Topic Paper can be read in isolation or in conjunction with the other Topic Papers and Background Papers that have been prepared to give a full picture the Joint Local Development Plan Area

This is the 3 version of the Topic Paper and updates the version presented with Deposit Plan. The update has been undertaken following the release of the Welsh Government's Development Advice Maps and to reflect the latest information arising from the Deposit Plan consultation period in respect of housing allocations..

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Contents

1. BACKGROUND

1.1 The Anglesey and Gwynedd Joint Planning Policy Unit (JPPU) are in the Process of preparing a Joint Local Development Plan (JLDP) for both Unitary Authority areas (excluding the Snowdonia National Park). As part of this process the JPPU have decided to prepare a Strategic Flood Consequence Assessment (SFCA) Stage 1. This 'assessment' forms part of a series of Topic Papers being prepared by the JPPU and has been carried out in accordance with TAN15 (TAN15): Development and Flood Risk'. The SFCA Stage 1 forms a key part of the evidence base for the JLDP, helping to:

- determine appropriate development policies and land allocations that avoid or minimise flood risk from all sources;
- assess any future development proposals in line with the precautionary framework in PPW and TAN15.

1.2 Whilst there is no specific Welsh Assembly Government (WAG) advice about the undertaking of a Strategic Flood Consequences Assessment (SFCA), it is generally accepted that SFCA should be undertaken in three stages:

- Stage 1 - This should mainly be a desk-based study compiling all the existing information on flooding from sources such as the Natural Resources Wales, Welsh Assembly Government, Welsh Water and the Local Authority. Stage One assessment should provide an initial assessment of how much growth falls in flood risk areas within the Plan area and its implications for the Local Development Plan. It should also be detailed enough for the LPA to apply a sequential approach towards selecting potential development sites, as indicated in TAN15 (Paragraph 6.2) that is to direct development first to zone A, then zone B and only zone C where no other suitable sites are available.
- Stage Two – This stage should examine in more detail any sites that Stage 1 identified as being at risk from flooding. It is recommended (Natural Resources Wales) that potential allocations outside but immediately adjacent to the high risk flood zone to them should be examined.
- Stage 3 – This stage involves the testing of the suitability of allocated sites by confirming that the flood risk to any proposed site(s) can be managed to an acceptable level and that the site itself will not exacerbate flooding elsewhere over the lifetime of the development.

1.3 Sections 2-8 of this document covers Stage One SFCA and will consider:

- both river (fluvial), tidal (coastal) and groundwater/surface/sewer flooding issues within the JLDP area
- assess flood risk to existing allocations
- highlight the flood risk in areas that are not presently allocated for development but may be considered as possible development sites within the Joint Local Development Plan.

1.4 Section 9 of this document covers the detailed Stage Two work undertaken in Bangor and Porthmadog arising from the Stage One Assessment.

1.5 This 'topic paper' should be considered as a live document and should be updated on a regular basis as new information becomes available. Also it is emphasised that this topic paper does not remove the need for more detailed site specific FCAs undertaken by developers at the planning application stage, as required by Technical Advice Note 15 (TAN15): Development and Flood Risk.

2. STUDY AREA

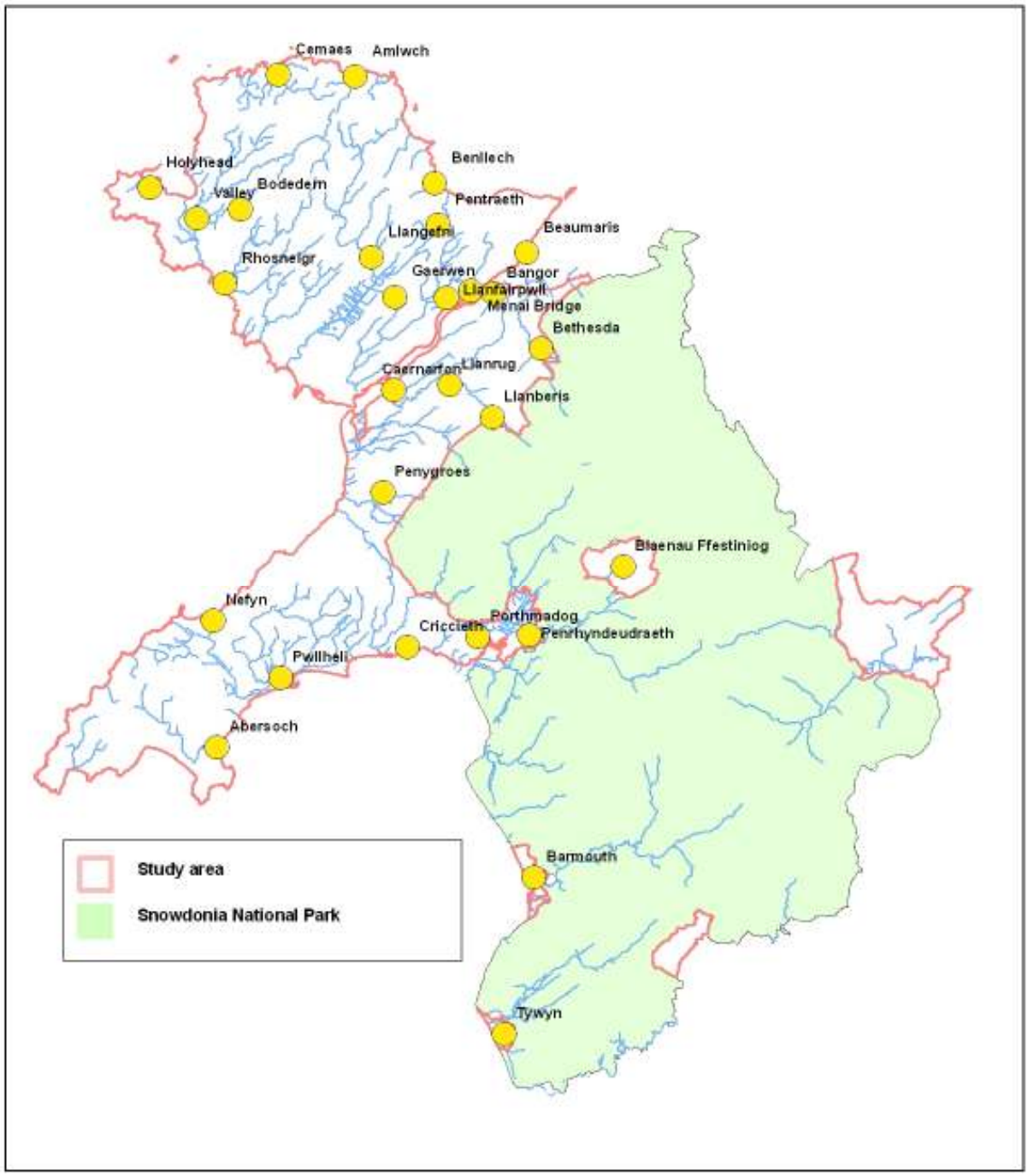
2.1 **SFCA area** - The SFCA study area (please refer to Map 1) covers the JLDP Plan area. This includes the whole of Anglesey County Council and the area of Gwynedd located outside the Snowdonia National Park. The JLDP area has a number of river systems and a high proportion of the Plan Area's main settlements are located along the coastline (see Map 1). The Stage One SFCA focuses on the following settlements which have been identified in the Deposit Plan (2015) (Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026) settlement hierarchy:

Sub-Regional Centre:	Bangor
Urban Service Centres:	***Anglesey -*** Amlwch, Holyhead, Llangefni ***Gwynedd -*** Blaenau Ffestiniog, Caernarfon, Porthmadog, Pwllheli
Local Service Centres:	***Anglesey -*** Beaumaris, Benllech, Bodedern, Cemaes, Gaerwen, Llanfairpwll, Pentraeth, Menai Bridge, Rhosneigr, Valley ***Gwynedd -*** Abersoch, Barmouth Bethesda, Criccieth, Llanberis, Llanrug, Nefyn, Penrhyndeudraeth, Penygroes, Tywyn

Figure 1: Settlements which have been identified in the Deposit Plan (2015)

2.2 A broad level assessment of the identified settlements has been undertaken in section 8 of this study using all available information. The assessment does not go into a level of detail expected for site specific proposals, i.e. FCAs, in line with TAN15.

2.3 This Study does not consider flood risk in smaller settlements, although flood risk will be a consideration in the allocation of land within these settlements as part of the site assessment process.

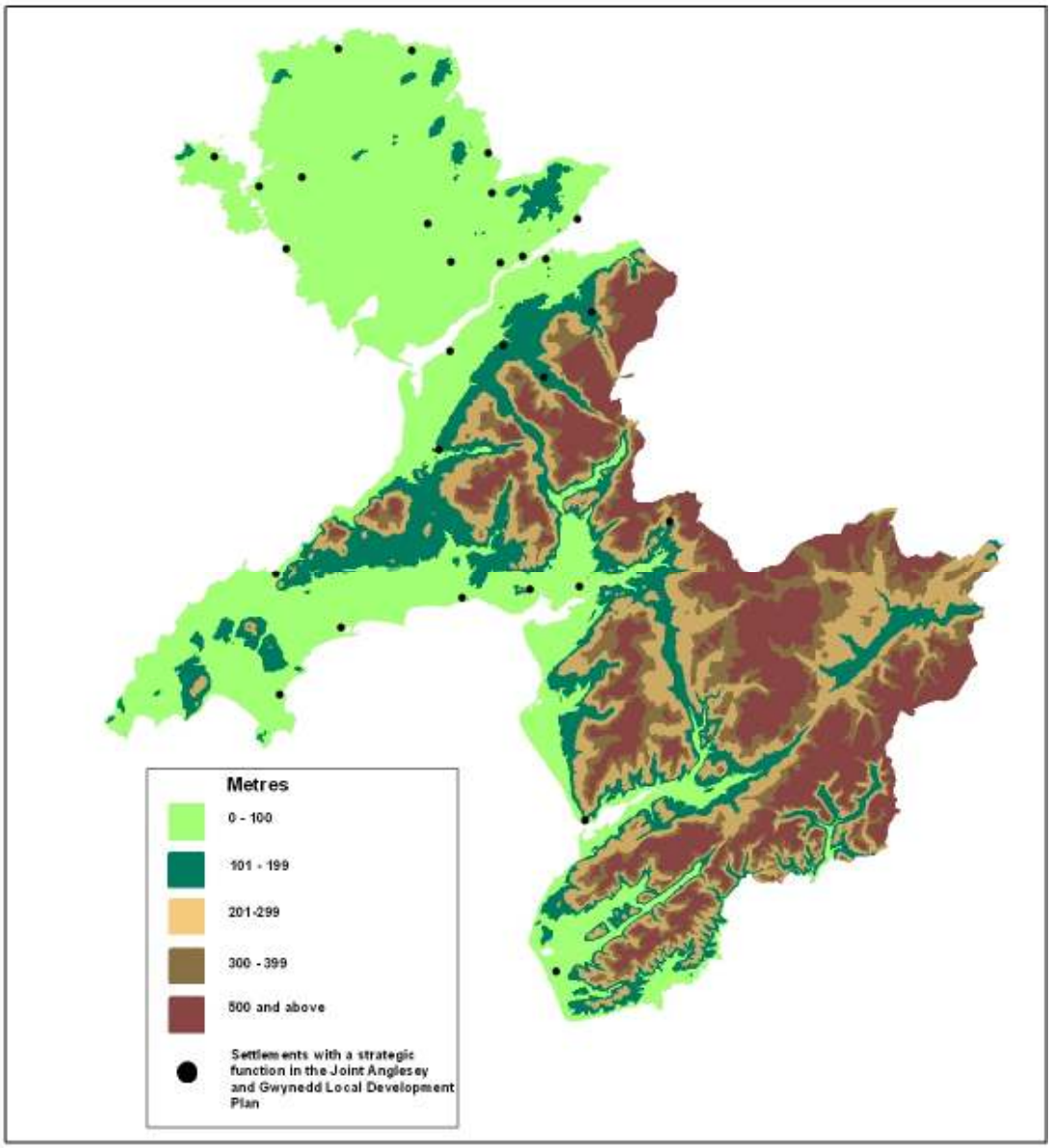


Map 1: The main rivers within the SFCA Study Area (Source: Natural Resources Wales)

2.4 **Topography (see Map 2) -** The topography of land affects how watercourses respond to rainfall. There is a varied topography within study area. Whilst the majority of Anglesey is predominantly below the 100 metre contour line, Gwynedd is characterised by the low lying areas of Llŷn and Eifionydd, areas to the west and the mountainous highland of Snowdonia to the east. The majority of those settlements identified as part of this study lie in areas below the 100 metre contour line

2.5 The location of settlements and the topography of the surrounding land plays an important role in how that settlement will cope with flood risk. For example, settlements sited on rivers with relatively long slow rising gradients (i.e. slow river channels) will be able to prepare for flood as waters will take longer to arrive. However, flood waters will be around for longer. Conversely, settlements sited on relatively steep rising gradients (i.e. with fast river channels) will have less time to prepare for flood, but will pass through the town in a much shorter time

2.6 The majority of those settlements identified as part of this study lie in areas below the 100 metre contour line.



Map 2: SFCA study area topography

3. PLANNING POLICY FRAMEWORK

3.1 The national planning policy framework for addressing land use planning issues in preparation of LDPs is set out in Planning Policy Wales (PPW) (8th Edition 2016) with additional advice given by Technical Advice Notes.

3.2 *Planning Policy Wales (8th Edition 2016)* - PPW seeks planning authorities to adopt a precautionary approach when formulating policies on development and flood risk. To meet Welsh Government's (WG's) sustainable development objectives, PPW states that action is required through the planning system to move away from flood defence and the mitigation of the consequences of new development in areas of flood hazard towards a more positive avoidance development in areas defined as being of flood hazard. A strategic approach to flood risk which considers the catchment as a whole is suggested. Development proposals should seek to reduce, and certainly not increase, flood risk arising from either river and/or coastal flooding or from additional run-off from development in any location.

3.3 In preparing development plans, LPA's are advised:

- to consult with the Natural Resources Wales and adjacent authorities and ensure that, as well as not being at risk itself, development does not increase the risk of flooding elsewhere;
- bear in mind that continued construction of hard engineered flood defences to protect development in defined areas of flood hazard is unlikely to be sustainable in the long term;
- acknowledge that government resources for flood and coastal defence projects are directed at protecting 'existing' developments and are not available to provide defences in anticipation of future development;
- that a sustainable approach to flooding involves the avoidance of development in flood hazard areas and, where possible or practical, the encouragement of managed retreat, the creation of wash-lands and flood plain restoration;
- that in areas of flood plains currently unobstructed, development should be wholly exceptional and limited to essential transport and utilities infrastructure
- recognise that it will be inappropriate to locate certain types of development such as schools, hospitals, residential development and emergency services within some areas defined as being of high flood hazard
- in areas of high flood hazard, only appropriate land allocation are made during the preparation of development plans.

3.4 *Technical Advice Note 15: Development and Flood Risk (July 2004)* - TAN 15 reinforces the advice outlined in PPW to take a precautionary approach and direct development away from areas at high risk of flooding where possible. The TAN also sets out a justification test for any development that has to be located within a high risk flood zone. Development Advice Maps (DAMs), published in conjunction with the TAN, designate different flood zones according to the flood risk associated with

them. All of Wales has been divided into three flood zones depending on an assessment of flood risk and are set out in the following table:

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Natural Resources Wales extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

Figure 2: Development Advice Maps Zones
Source: TAN15 (figure 1, page 5)

3.5 The precautionary framework identified in the TAN has identifies the vulnerability of different land uses to flooding different uses by their vulnerability. These have been subdivided into three categories as set out in the following table:

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

	parks, mineral extraction sites and associated processing facilities, excluding waste disposal sites.

Figure 3: Land use categories – vulnerability to flooding
Source: TAN15 (figure 2, page 7)

3.6 Section 6 of the TAN deals with 'Justifying the location of development'. Paragraph 6.2 of the TAN states that:

"New development should be directed away from zone C and towards suitable land in zone A, otherwise to zone B, where river or coastal flooding will be less of an issue. In zone C the tests outlined in sections 6 and 7 will be applied, recognising, however, that highly vulnerable development and Emergency Services in zone C2 should not be permitted. All other new development should only be permitted within zones C1 and C2 if determined by the planning authority to be justified in that location. Development, including transport infrastructure, will only be justified if it can be demonstrated that:-

*i. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement[1]; **or**,*
ii Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
and,
iii It concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); and,
iv The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable."

"([1] Regeneration initiatives will be comprehensive, multi-approach and form part of an integrated suite of initiatives which have been subject to public consultation. Local authority strategy will be the development plan for the area (deposit version as minimum)."

Section 7 (Assessing flooding consequences) of TAN 15 outlines further tests that need to be satisfied and is applicable to any development type in either C1/C2 or those parts of zone B where flooding has been identified as a material consideration to allow for localised problems**.** Where development can be justified under section 6 of TAN 15, assessment must be made to establish whether suitable mitigation measures can be incorporated within the design to ensure that the development is as safe as possible and there is:

- Minimal risk to life
- Minimal disruption to people living and working in the area
- Minimal potential damage to property
- Minimal impact of the proposed development on flood risk generally; and,
- Minimal disruption to the natural environment.

Further detailed advice on this issue is provided in Appendix 1 of TAN15.

3.7 **Gwynedd Local Planning Authority (LPA) area** – The adopted development plan for the area is the Gwynedd Unitary Development Plan (adopted 2008). The policies of the UDP were formulated to take account of the contents of TAN15. The policies contained within the UDP relevant to flood risk are:

- Policy B29 - Development on land at risk from flooding
- Policy B32 - Increasing surface water

3.8 **Anglesey LPA area -** The adopted development plans for the area are the Gwynedd Gwynedd Structure Plan (adopted 1993) and the Ynys Môn Local Plan (adopted 1996). Both these plans predate TAN 15. Policy 1 (General Policy) of the Local Plan refers to the need to take account of 'the increased danger of flooding', and policy 28 (refers specifically to 'Tidal inundation and River flooding'.

3.9 The Isle of Anglesey County Council resolved to stop work on the Ynys Môn UDP in December 2005. The last stage of the UDP process was the Inspector's Report along with the associated recommendations. The council received an Official Order from the Welsh Government confirming that the deposit plan of 2001, as amended by the Inspector's Report along with the associated recommendations can be given weight as a material consideration in dealing with current planning applications**.** The policies contained within the Stopped UDP (Unadopted) relevant to flood risk are:

- Infrastructure Policy SG2 - Development and flooding.
- Infrastructure Policy SG6 - Surface Water Run Off.

4. OTHER RELEVANT DOCUMENTS

4.1 **North West Wales Catchment Flood Management Plan (CFMP) -** The CFMP considers all types of inland flooding, from rivers, groundwater, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding), which is covered by Shoreline Management Plans (SMPs). Coverage of surface and groundwater is however limited due to a lack of available information.

4.2 The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. CFMPs helps to understand the scale and extent of flooding now and in the future, and should be used to inform spatial planning and decision making by local authorities.

4.3 The CFMP gives an overview of the current flood risk within the management plan. Within the Anglesey and Gwynedd JLDP area the sources of flood risk are:

River flooding	Flash flooding has occurred in Beaumaris, Caernarfon, and Llanberis
Tidally influenced river flooding	Particular risk in Pwllheli, Bangor, Porthmadog, Fairbourne, and Tywyn
Surface water flooding	Experienced in Bangor, Caernarfon and Pwllheli;
Sewer flooding	Has occurred in Llangefni, Pwllheli, Bangor, Caernarfon, and Porthmadog,
Groundwater flooding	Not considered to be significant source of flooding across the catchment although there may be local issues.

Figure 4: Sources of flood risk
Source: CFMP

4.4 CFMPs assess how flood risk is likely to change in the next 100 years. They do this at a strategic level and not at a detailed, local level. It is estimated that a 1% AEP (Annual Exceedance Probability) river flood event[1], could place approximately 4,500 properties at flood risk if the event occurred across the whole CFMP area. The CFMP has identified a number of key locations currently at risk in a 1% AEP flood. In the Anglesey and Gwynedd JLDP area these shown below:

Number of properties at risk	**Locations**
> 1,000	None
500 to 1,000	None
100 to 500	Bethesda, Llanberis, Porthmadog, Abergynolwyn Caernarfon and Fairbourne

[1] The probability of a flood event is the likelihood of a flood of that size occurring within a one year period. It is described as an annual exceedance probability (AEP) and is expressed as a percentage. For example, a 1% AEP flood event has a one per cent chance or 0.01 probability of occurring in any one year.

50 to 100	Bangor and Tywyn
25 to 50	Llanfairpwll and Pwllheli

Figure 5: Key locations currently at risk in a 1% AEP flood
Source: CFMP

4.5 The CFMP also gives an analysis of future flood risk and outlines key locations at risk in the future (year 2100) 1% AEP flood event. In the Anglesey and Gwynedd JLDP area these shown below:

Number of properties at risk	Locations
> 1,000	None
500 to 1,000	Porthmadog
100 to 500	Pwllheli, Bethesda, Caernarfon, Llanberis, , Abergynolwyn, Blaenau Ffestiniog, Dolgellau, Fairbourne and Tywyn
50 to 100	Bangor
25 to 50	Llanfairpwll and Llangefni

Figure 6: Key locations at risk in the future (year 2100)
Source: CFMP

4.6 To guide future direction for flood risk management the CFMP divides the North West Wales catchments into 11 distinct sub-areas and allocates one of six generic flood risk management policies (i.e. 'Policy Options'):

- Sub-area 1 – Anglesey (Policy Option 3)
- Sub-area 2 - Bangor and Caernarfon (Policy Option 3)
- Sub-area 3 - Lleyn Peninsula (Policy Option 2)
- Sub-area 4 – Pwllheli (Policy Option 4)
- Sub-area 5 – Snowdonia (Policy Option 3)
- Sub-area 6 – Porthmadog (Policy Option 5)
- Sub-area 7 - Coastal Lowlands (Policy Option 3)
- Sub-area 8 – Dolgellau (Policy Option 4)
- Sub-area 9 - Upper Dyfi and Upper Wnion (Policy Option 1)
- Sub-area 10 – Llanfairfechan (Policy Option 5)
- Sub-area 11 - Borth (Policy Option 3)

4.7 The approach that the CFMP outlines for the sub areas included within the JLDP are summarised in Appendix 2 to this study.

4.8 **West of Wales Shoreline Management Plan 2[2] -** The West of Wales SMP2 is developed for the coast between St Ann's Head, at the entrance to Milford Haven, through to Great Orme Head (see Map 2 below). The area takes into account the shoreline of the Isle of Anglesey and includes the islands of Skokholm, Skomer, Ramsey and Bardsey. The length of coast considered is in the order of 1,200km. This is one of a second generation of SMPs (SMP2) developed for the whole coast

[2] Both Anglesey County Council and Gwynedd Council have adopted West of Wales Shoreline Management Plan 2

of England and Wales. The SMP2 considers management of the coast over a longer timescale; over a period of 100 years, compared to the 50 year period covered by SMP1. The West of Wales SMP2 was made available for public consultation in January 2010 and has not at the preparation of this report been released in its final form.

Map 3 (West of Wales SMP2, map reproduced from the First Review of Shoreline Management Plan consultation documents, January 2010)

4.9 The prime purpose of the SMP2 is to develop policy in relation to the management of risk from flooding and coastal erosion, with respect to the shoreline and estuaries. However, in setting out a plan for managing this risk, the aim is to provide a sustainable framework within which other aspects of coast are managed.

4.10 The SMP is a non-statutory policy document for coastal defence management planning. It takes account of other existing planning initiatives and legislative requirements, and is intended to inform wider strategic planning. It does not set policy for anything other than coastal defence management. However, from this perspective, it aims to provide the context to, and consequence of, management decisions in other sectors of coastal management. Following the adoption of the SMP, the operating authorities develop strategy studies which identify the nature and type of works required for implementation which then lead to the scheme delivery (the design, construction and maintenance of the defences).

4.11 The SMP promotes management policies for a coastline into the 22nd Century that achieve long-term objectives without committing to unsustainable defence. It is, however, recognised that due to present day objectives and acceptance, wholesale changes to existing management practices may not be appropriate in the very short term. Consequently, the SMP provides a timeline for objectives, policy and management changes; i.e. a 'route map' for decision makers to move from the present situation towards the future.

4.12 The plan, therefore, considers objectives, policy setting and management requirements for 3 main epochs; from the present day, medium term and long term, corresponding broadly to time periods of 0 to 20 years, 20 to 50 years and 50 to 100 years respectively. There is a need to have a long-term sustainable vision, which may change with time, but the SMP must demonstrate that defence decisions made today are not detrimental to achievement of that vision. The main 'principles', 'objectives' and 'policies' of the SMP are summarised in the following figure:

Principles	Objectives	Generic shoreline management policies

• To contribute to sustainable communities and development.
• To minimise reliance on defence and increase the resilience of communities.
• To support an integrated approach to spatial planning, in particular recognising the
• interrelationships between:
  ○ Centres of development and surrounding communities.
  ○ Human activity and the natural and historical environment as being essential for community identity, well being and vitality and its significance for tourism and economic regeneration.
• To maintain and support the main centres of economic activity.
• To sustain the vitality and support adaptation of smaller
	• Set out risks from flooding and erosion to people and developed, historic and natural environment within the SMP2 study area
	• Identify opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion;
	• Identify the preferred policies for managing risks from floods and erosion over the next century;
	• Identify the consequences of putting the preferred policies into practice;
	• Set out procedures for monitoring how effective these policies are;
	• Inform others so that future land use, planning and development of the shoreline takes account of the risk and the preferred policies;
	• Discourage inappropriate development in areas where the flood and erosion risks are high; and
		• **No Active Intervention (NAI)**: where there is no investment in coastal defence or operations
		• **Hold the Line (HTL)**: by maintaining or changing the standard of protection. This policy should cover those situations where work or operations are carried out in front of the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on) to improve or maintain the standard of protection provided by the existing defence line.
		• **Managed Realignment (MR):** by allowing the shoreline to move backwards or forwards, with management to control or limit movement (such as reducing erosion or building new defences on the landward side of the original defences).

scale settlements. • To avoid damage to and seek opportunity to enhance the natural environment. • To support the cultural heritage and the use of the Welsh language. • To maintain or enhance the high quality landscape.To sustain sustainable accessibility in terms of maintaining national and regional connectivity.	• Meet international and national nature conservation legislation and aim to achieve the biodiversity objectives.	• **Advance the Line (ATL)**: by building new defences on the seaward side of the original defences. Using this policy should be limited to those policy units where significant land reclamation is considered.

Figure 7: Summary of the main 'principles', 'objectives' and 'policies' of the SMP

4.13 The SMP broadly divides the shoreline into seven Coastal Areas (labled A-G). Within each Coastal Area the detail of the Plan has been considered within **Policy Development Zones.** These policies can change over the three epochs of time to allow management of the coast to evolve. Also, in setting individual policies, it has to be recognised that these cannot be treated in isolation. The policy in one section of the coast may depend on how the adjacent sections of coast are proposed to be managed. The policy units (PU) are, therefore, grouped into **Management Areas** (MA). For each of the MA's the SMP lists the draft preferred policy response outlined Figure 7 above (i.e. No Active Intervention (NAI), Hold the Line (HTL), Managed Realignment (MR), Advance the Line (ATL) for the three epochs of time (2025/2055/2105)

4.14 Of relevance to the JLDP are those 'coastal' areas are D-G. These are:

- Coastal Area D - Sarn Gynfelyn to Trwyn Cilan
- Coastal Area E - Trwyn Cilan to Carreg Ddu
- Coastal Area F - Menai Strait and Conwy
- Coastal Area G - Ynys Mon (excluding the Menai Strait)

4.15 Section 5 of the SMP discusses the 'Implications of Preferred Plan' against the two baseline scenarios:

- No active intervention (NAI)
- With Present Management (WPM)

4.16 A summary of the scenarios are outlined in the following tables:

NO ACTIVE INTERVENTION (NAI)			
COMMUNITIES – POTENTIAL ECONOMIC DAMAGE TO PROPERTY		**TRANSPORT AND CRITICAL INFASTRUCTURE**	
Risk from erosion (number of properties)	**Most severely affected due to direct tidal flooding (number of properties)**	**Main routes at risk without defence or managed adaption**	**Main harbours at risk from flooding or potentially impacted by erosion and coastal change**
• Barmouth (40) Porthmadog area (110) • Criccieth (100) • Pwllheli & Abersoch (12) • Aberdaron (30)	• Fairbourne (400) • Pwllheli (1200) • Holy Island (350) • Beaumaris & Porthaethwy (270) • Barmouth (250) • Porthmadog (1650)	• The railway line between Dyfi Junction and Pwllheli: at the Dyfi, across the Dysynni, at Friog and across the Mawddach Estuary, at Harlech,	• Barmouth • Porthmadog • Pwllheli • Morfa Nefyn • Caernarfon • Y Felinheli • Holyhead

• North Llŷn (45) • Western Menai Strait (110) • Eastern Menai Strait (85) • Western Anglesey (40) • North & East Anglesey (61)	• Western Menai Strait (176) • Rhosneigr & Valley (250) • Traeth Coch area (35) • Cefni & Malltraeth area (140) • Bangor (330)	and across both the Dwyryd and Glaslyn Estuaries, along the Criccieth frontage and at Abererch • Airfield at Morfa Dinlle. • Coastal roads at Menai Straits. • Road system to and through Beaumaris. • Road and rail links along the north Wales coast and across Anglesey to Holyhead.	• Bangor • Eastern Menai Strait • Amlwch

Figure 8: 'Summary of No Active Intervention' SMP

PREFERRED PLAN		
COMMUNITIES		**TRANSPORT**
The mains areas where potential loss is anticipated over the next 100 years are set out below. NAI losses are shown in *italics* for comparison. ***(Note: Losses are estimated based on projected erosion over the next 100 years)***	**The most significant areas where properties may be lost due to increased risk of flooding or where there is greatest need for adaption**	**The key areas where decisions need to be taken with respect to the future of the transport net work**
• Barmouth (10, *40*) • Criccieth (2, *100*) • Aberdaron (5, *30*) • Western Menai Strait (11, *110*) • Western Anglesey (15, *40*) • Porthmadog area (4, *110*) • Pwllheli & Abersoch (6, *12*) • North Llyn (32, *45*) • Eastern Menai Strait (21, *85*) • North & East Anglesey (30, *61*)	• Pwllheli (epoch 2) • Dinas Dinlle & Morfa Dinlle (from epoch 2) • Beaumaris and Porthaethwy (epoch 3) • Fairbourne (from epoch 2) • Porth Dinllaen & Morfa Nefyn (epoch 2) • Porth Llechog, Moelfre & Traeth Coch (epoch 3) • Bangor (epoch 3) There would continue to be significant flood risk to: • Caernarfon and Y Felinheli • Porthmadog • Valley & areas of Holy island	• Railway line between Dyfi Junction and Pwllheli • Road system to and through Beaumaris • Road and rail links along the north Wales coast and across Anglesey to Holyhead.

Figure 9: 'Summary of Preferred Plan' SMP

4.17 **Preliminary Flood Risk Assessments (PFRA) -** The purpose the PFRA is to provide an assessment of potential flood risks for which the Lead Local Flood Authority (LLFA), has responsibility. These include the risk of flooding from surface water, ground water, ordinary watercourses and small reservoirs. They do not consider flooding from main rivers, the sea or large raised reservoirs, except where these impact on other sources of flooding. The objective of PFRAs are to identify local Flood Risk Areas to inform the later stages of the Regulations and the Flood and Water Management Act 2010, and to support any local flood risk management strategy. For the JLDP area the LLFA are Gwynedd and Isle of Anglesey Councils, both of which have produced separate PFRAs. Both PFRAs have sections on:

- Past flood risk
- Future flood risk
- Review of indicative flood risk areas

- Identification of flood risk areas

4.18 *Past flood risk* - Both Councils hold records of past flooding incidents. For the purpose of both reports, a locally significant event is defined as one where 5 or more residential properties are flooded. Where works have been undertaken to alleviate flooding problems or where an incident does not meet the criteria of significance, that particular incident does not form part of the Reports. The summary of locations with which remain at significant risk and those not considered significant for both Anglesey and Gwynedd from the PFRA (i.e. within the JLDP area) are listed in Figure 10 below.

PAST FLOODING (Surface water run off (SWR) – Surface water surcharging from sewer system (SWSS))					
Significant harmful consequences				**Not considered significant**	
Anglesey	**Type**	**Gwynedd**	**Type**	**Anglesey**	**Gwynedd**
Llangefni Church St, Bridge St, High St.	SWR	The Rock, Barmouth	SWR	Beaumaris	Cae Sarn Estate, Groeslon
Llangefni Ffordd Dolafon	SWR	Bod Hyfryd, Waunfawr	SWR	Mill Lane & Llanfaes Beaumaris	Ciltrefnus, Bethesda
Gaerwen Lon Groes	SWSS	Pwllheli	SWSS	Llanfairpwll	Idris St, Lower Corris
Rhostrehwfa Lon Cae Garw	SWR	Y Maes, Pwllheli	SWSS	Dwyran	Marconi Lane, Tywyn
Llangefni Bridge Street	SWSS	Nefyn	SWSS	Newborough	Viaduct Gardens, Barmouth
Moelfre Nant Bychan Estate	SWSS	Fairbourne	SWSS	Llandegfan Mill Lodge Carreg Felin Pont Llandegfan	Penrhos Rd, Bangor
Newborough Ucheldre Estate	SWR	Bangor	SWSS	Dwyran Lon Rhuddgaer	Groeslon
Menai Bridge Lon Gamfa Lon Waen Penlon	SWR	Tywyn	SWSS	Llangaffo Tai Rhos	Morfa Nefyn
Bodorgan A4080	SWSS	Abersoch	SWSS		Ceilwart, Barmouth
Menai Bridge High Street Cadnant road	SWR	Bethel	SWSS		Gallt y Foel, Deiniolen
Llangoed	SWR				Tan y Coed, Llanrug
Llansadwrn	SWR				Saron/Tre Gof, Bethel
Benllech	SWR				Y Ffor
Llanerch-y-medd	SWR				Rhiwlas
					Llanberis
					Caernarfon

Figure 10: Summary of past flooding

4.19 *Future flood risk* – both Gwynedd and Anglesey PFRAs use a GIS mapping system to detail those areas of their respective areas to be locally at risk of flooding in the future. Both PFRAs emphasise that flooding from ordinary watercourse and surface water flow will not necessarily be confined to these areas and flooding may occur anywhere. This GIS database is available on Gwynedd Council's corporate GIS system for use in the preparation of the JLDP

4.20 *Review of indicative flood risk areas* - The Natural Resources Wales has not identified any indicative Flood Risk Areas for Anglesey or Gwynedd, that is areas satisfying the Welsh Assembly Government's criteria of more than 5,000 people considered to be at risk of flooding. The information provided by the EA has been reviewed and no changes to indicative Flood Risk Areas have been identified.

4.21 *Identification of Flood Risk Areas* - No Flood Risk Areas have been identified for Anglesey or Gwynedd.

4.22 **Anglesey Local Flood Risk Management Strategy** (LFRMS) – **(Final Draft Strategy Document February 2013) –** The LFRMS highlights the steps that are to be taken to improve knowledge of flood risk on the island, to work better with organisations and the public towards reducing those risks whilst aiming to balance the need of communities, the economy and the environment. This Strategy will highlight the steps that are to be taken to ensure this happens.

4.23 Ten Objectives for Isle of Anglesey County Council are:

1. To improve the understanding of local flood (surface water, groundwater and ordinary watercourses) and coastal risks;
2. Increasing individual and community awareness and preparedness for flood and coastal erosion events and the impacts of climate change on flood risk;
3. To work together (both FRMA, stakeholders and public) to reduce flood and coastal risks, sharing data and resources to the greatest benefit;
4. To reduce the impact and consequences for individuals, communities, businesses and the environment from flooding and coastal erosion;
5. To ensure that planning decisions are properly informed by flooding issues and the impact future planning may have on flood risk management and long term developments;
6. Take a sustainable approach to flood risk management balancing economic, environmental and social benefits;
7. Increase approaches that work sympathetically with natural processes;
8. Ensure the development of skills required to implement effective and innovative flood risk management measures;
9. Encourage maintenance of privately owned flood defences and ordinary watercourses, and minimise unnecessary constrictions in watercourses; and
10. Work together with other Flood Risk Authorities to reduce the loading of combined sewers.

4.24 **Gwynedd Council Local Flood Risk Management Strategy** (Formally adopted by Gwynedd Council on the 20/03/2013) **-** This Strategy will provide the information to enable the local delivery of reducing local flood risk, in partnership with the people of Gwynedd and those organisations tasked with providing services and support to them. The Strategy details the roles and responsibilities of the organisations in Gwynedd which contribute to managing flood risk and explains the need for the public to protect themselves from the consequences of flooding.

4.25 Gwynedd Council has based this Local Strategy upon eight sub-objectives:

The Objectives		Sub-objectives
1. Reducing the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion	**1**	Provide strategic leadership and direction at a local level
	2	Develop policies for effective land use management and enhanced development control procedures where appropriate.
	3	Establish regular maintenance schedules for flood and coastal erosion risk management assets.
2. Raising awareness of and engaging people in the response to flood and coastal erosion risk	**4**	Ensure that by 2026 everyone who lives in a flood risk area understands the flood risk they are subject to, the consequences of this risk and how to live with that risk
3. Providing an effective and sustained response to flood and coastal erosion events	**5**	Ensure the preparation and testing of Emergency Plans
	6	Respond to events in a timely and appropriate manner
	7	Facilitate recovery from flooding within the shortest possible timescales
4. Prioritising investment in the most at risk communities	**8**	Increase the use of alternative sources of funding for flood and coastal erosion risk management

5. TYPES OF AND KEY SOURCES OF FLOODING, HISTORICAL AND CONSEQUENCES OF FLOODING

5.1 *Types* - The main flood sources present within the JLDP area are:

- **Fluvial / Tidal flooding –** these can be defined as follows**:**

Fluvial flooding **-** occurs when a watercourse cannot cope with the amount of water draining into it e.g. after a period of heavy rain or prolonged wet weather.

Tidal flooding - occurs as a result of extreme tidal levels or storm surges and wave action raises the sea level to inundate land normally above the high tide level Problems can also occur in estuary areas as a result of high tides and/or large amounts of water in rivers.

- **Surface/ Sewer water/ groundwater flooding –** These can be defined as follows:

  Surface water flooding - occurs when local drainage systems cannot adequately cope with heavy rainfall.

  Sewer flooding - occurs when the sewer system overwhelmed by heavy surface water flooding, becomes blocked or is of inadequate capacity. This type of flooding can contaminate or pollute land, property and rivers with raw sewerage.

  Groundwater flooding - occurs when water levels in the ground rise above ground level after prolonged rainfall.

  These form of flooding have the potential to cause substantial impact on the environment and on local communities. Consequently, as stated in section 4.1 of this study, the Flood and Water Management 2010 Act introduces, amongst other measures, the requirements for:

  - Local authorities to develop, maintain, apply and monitor a strategy for local flood risk management in their areas. These local strategies must include the risk of flooding from surface water, watercourse and groundwater flooding.
  - the use of Sustainable Drainage Systems (SUDS) for surface water drainage in all new housing and business development is required by the Act.

  SuDS is a generic term is to describe a number of different approaches that can be used to manage surface water as close to its source as possible in a way that `mimics the natural environment in a more sustainable way than conventional piped drainage system. SuDS seek to manage surface water as close its source as possible and therefore act as a natural drainage system. TAN 15 states that SuDS can perform an important role in managing run-off from a site and should be implemented, wherever they

will be effective, in all new development proposals, irrespective of the zone in which they are located.

Appendix 4 of TAN15 provides relatively detailed information and advice with regard to the use and implementation of SuDS as part of a proposed development site's surface water management scheme and outlines a range of sustainable drainage options that should be considered, including:

- preventive measures – e.g. rain-water recycling, good-practice design and maintenance;
- filter strips and swales – vegetated landscape features with smooth surfaces and a gentle downhill gradient to drain water evenly off impermeable surfaces, mimicking natural drainage patterns;
- filter drains and permeable and porous pavements – permeable surfaces to allow rainwater and run-off to infiltrate into permeable material placed below ground to store water prior to discharge;
- infiltration devices - below-ground or surface structures to drain water directly into the ground (soakaways, infiltration trenches, swales with infiltration and infiltration basins), which may be used at source or the run-off may be conveyed to the infiltration area in a pipe or swale; and
- basins and ponds – structures designed to hold water when it rains; basins are free from water in dry weather, ponds contain water at all times and are designed to hold more when it rains; examples include retention basins, balancing/attenuation ponds, flood storage reservoirs, lagoons, retention ponds and wetlands/reed beds.

SuDS options should be considered at the early stages in a development's design process. The appropriate type(s) SuDS option for a given situation will be dependant on the topography and geology of that particular site and its surroundings. Steeper slopes will accentuate the impact of surface water run-off, whilst impervious soils and rocks will impede the natural drainage of rainfall. Therefore, careful consideration of the site characteristics is required to ensure the suitability of the chosen drainage system..

5.2 *Climate change* - In the future climate change will have an the impact on the intensity and frequency of fluvial and tidal flooding in the JLDP area. It is predicted that climate change will bring milder wetter winters that are characterised by periods of long duration rainfall. In contrast, frequent and short duration, high-intensity rainfall linked with longer drier summers is predicted. These scenarios are likely to cause increased flooding from fluvial, surface water and sewer sources. In addition, the effects of climate change on sea level will increase the likelihood of coastal and tidal flooding in low lying areas. TAN 15 notes that the latest Climate Change scenarios for the United Kingdom 2002 produced for the UK Climate Impacts Programme (UKCIP), "predicts that by the 2080's winter precipitation may increase by up to 30%. Heavy winter precipitation is likely to become more frequent, with the precipitation intensities that are currently experienced around once every two years becoming possibly between 5% and 20% higher. Relative sea levels will continue to rise around most of the UK's shoreline, and with this extreme sea levels will be experienced more frequently." *(paragraph 2.5, TAN 15).*

5.3 *Historical flooding events within the JLDP area* - records of historic flooding provide a useful account of events but generally are incomplete and are anecdotal. Examination of the data on the British Hydrological Society Chronology of British Hydrological Events[3] web site reveals only one significant fluvial flooding event, namely:

Year	Month	Quotation	River basin	Entry date	
	1907	3	1907 March 17 Rainfall observer at Blaenau Festiniog noted, p[8], "Heavy flood"	065 - Glaslyn Group	4/7/99

Figure 11: Historical flooding events within the JLDP area (Source: British Hydrological Society Chronology of British Hydrological Events

5.4 Further information on historical flooding events are provided in Figures 4 and 10 paragraphs 4.3 and 4.18 of this SFCA.

5.5 *Consequences of flooding* - flooding can have a significant impact on people's lives. Those members of the community which are of greatest risks from the impacts of flooding are the elderly, the sick and the socially deprived who are less able to prepare for, respond to, and find it difficult to recover from floods.

5.6 Flooding can also affect communities in different ways, it can:

- cause significant damage to property and infrastructure,
- can have a major impact on the economy of the area when shops, businesses, community and tourism facilities and agricultural land are flooded;
- could result in major disruption to key infrastructure services flooding, including emergency services buildings, electricity sub-stations and sewage treatment works;
- devastating affect on the natural environment, polluted waters flooding important habitats or salt water habitats being flooded with freshwater;
- Can cause damage could also be caused to listed buildings by floodwaters.

[3] The site is a public repository for hydrological facts of the type that come from texts rather than tables. The data relates to events up until 1935 only.

6. DATA ON 'FLOOD RISK' WITHIN THE JLDP STUDY AREA

6.1 Three GIS based data sets were used to gain an understanding of the areas of land that are risk within the JLDP area. These were:

- Natural Resources Wales's Flood Map[4];
- Welsh Government's TAN15 Development Advice Maps[5]; and
- The Natural Resources Wales's Areas Susceptible to Surface Water Flooding Map.

6.2 **Flood Map –** these show areas that could be affected by flooding from rivers and, or the sea. It also shows flood defences and the areas that benefit from certain defences. The Map is regularly updated and new versions released every three months. The Flood Map includes the following layers of information:

- Areas of land at risk of flooding Zone 2 - best estimate of the areas of land having between 1% and 0.1% chance of flooding each year from rivers and between 0.5% and 0.1% chance of flooding from the sea 0.1% in any year (i.e. 1 in 1000).
- Areas of land at risk of flooding Zone 3 - best estimate of the areas of land with a 1% (1 in 100), or greater, chance of flooding each year from rivers, or with a 0.5% (1in 200) chance, or greater, of flooding each year from the sea.
- Flood Defences (e.g. embankments and walls, as well as land designated and operated to store flood water)- shows all flood defences built in the last five years to protect against river floods with a 1per cent (1 in 100) chance of happening each year, or floods from the sea with a 0.5 per cent (1 in 200) chance of happening each year, together with some, but not all, older defences and defences which protect against smaller floods.
- Flood Storage Areas - areas that act as a balancing reservoir, storage basin or balancing pond. Their purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. These areas may also delay the timing of a flood peak so that its volume is discharged over a longer time interval.
- Areas Benefiting from Flood Defences – areas that benefit from the flood defences shown, in the event of a river flood with a 1 per cent (1 in 100) chance of happening each year, or a flood from the sea with a 0.5 per cent (1 in 200) chance of happening each year. If the defences were not there, these areas would be flooded.
- Historic flood map - shows the maximum extent of all recorded individual Historic Flood Events Outlines from river, the sea and groundwater springs and shows areas of land that have previously been subject to flooding

[4] 'Flood zone' maps for fluvial (river) flooding is only carried out for catchments greater than 3km2. There will therefore inevitably be watercourses which are less than 3km2 which have a flood risk associated with them. The flood map is produced using an 'un-defended' scenario – i.e. any flood defences are stripped out – this is in order to consider a worst case scenario. In reality, the pattern of flooding in a defended area is likely to be different and will be dictated by factors such as overtopping or breach locations. Similarly, the maps do not take account of possible blockages / failures of structures such as bridges which again could affect flooding patterns. Furthermore, 'flood zone' maps do not take into account any allowances for climate change and associated sea level rises.

[5] Development Advice Maps zone C is based on the former Environment Agency's (now part of NRW) Flood Zone 2 maps. The FZ maps are updated on a quarterly basis if new hydraulic modelling information has been carried out or a better understanding of the flood mechanisms have been undertook. The DAMs were last updated in 2015.

- Main rivers are watercourses shown on the statutory main river maps held by the Natural Resources Wales and the Welsh Assembly Government. They can include any structure or appliance for controlling or regulating the flow of water into, in or out of the channel. The Natural Resources Wales has permissive powers to carry out works of Maintenance and improvement on these rivers.

6.3 **TAN 15 Development Advice Maps (DAMs) –** The maps identify three development advice zones - A, B and C, zone C being split into two – C1 & C2, which are attributed to different planning actions which are set out in more detail in section 3.2 of this topic paper.

6.4 **Surface Water Flooding Maps -** the Natural Resources Wales have produced two sets of maps which illustrate surface water flooding, these are:

- **Areas Susceptible to Surface Water Flooding** - shows the areas that are susceptible to surface water flooding, with three bandings, indicating "Less" to "More". The maps show a single rainfall event with a 1 in 200 chance of occurring in any year.
- **Flood Map for Surface Water** - The Map shows areas where surface water would be expected to flow or pond on two rainfall events - a 1 in 30, and a 1 in 200 chance of occurring in any year. These maps have not been used as part of this study but will be considered when making decisions on site specific allocations.

Both data sets are not suitable for use at an individual property scale and only provide an indication of the broad areas likely to be at risk of surface water flooding. Also since both of the maps are indicative, they should not be used as the sole evidence for assessing risk or for any specific planning decision without further supporting studies or evidence, for example historic surface water records**.**

6.5 Appendix 3 this study includes maps of each of the settlements contained within the study area (i.e. those settlements with a strategic function). Each settlement has a set of three maps illustrating the three data sets outlined under 6.1. These maps ~~will~~ have been used in identifying appropriate sites for allocation within the JLDP.

7. FLOODING - ISSUES TO BE CONSIDERED IN THE PREPARATION OF THE JLDP

7.1 The main considerations for the JLDP are set out in section 10 of TAN 15 and can be summarised as follows:

- Flooding (particularly river and coastal) is a strategic issue and will require collaboration with adjoining local authorities (par. 10.2).
- The need to consider the specific objectives and requirements of Catchment Flood Management Plans and Shoreline Management Plans (par. 10.3).
- DAMs should be used to identify whether flooding is a strategic issue and if it is likely to influence the overall strategy of the development plan (par. 10.4).
- Site specific policies and proposals for development and flood risk should be included within the Plan, where appropriate (par. 10.4).
- Any allocations made on land located within zone C will have to be appropriately justified (i.e. section 6 of TAN 15), the consequences are deemed to be acceptable and can be effectively managed (i.e. section 6 of TAN 15) (par. 10.5 & 10.6).
- Allocating land within zone C needs to be fully explained and justified. Alternately this may be achieved by including zone C on the proposals map, if appropriate. A proposed allocation should not be made if the consequences of a flooding event cannot be effectively managed (par.10.5).
- Any allocation within a flood risk area will require a broad level assessment of the consequences of flooding occurring on that site (par 10.6).
- An individual site's annotation on the proposals map should include annotation of flooding as a constraint and specific policy requirements pertaining to the development of that site (including requiring the developer to undertake a detailed technical assessment in accordance with Appendix 1, TAN15) (par. 10.7).
- Sites located in zone C2 should not be allocated for highly vulnerable development (par. 10.8).
- The consideration of any allocations in zone B should involve consultation with the Natural Resources Wales to ascertain whether flood risk is a significant constraint on the land (par. 10.10).
- Plans must include policies which promote the use in appropriate locations of sustainable drainage systems to control surface water as near to its source as possible (par. 10.11).
- Plans should advise early consultation with the relevant drainage authority to achieve the best possible outcome and ensure that any systems can be subsequently adopted by the relevant body (par. 10.11).

8. SETTLEMENT ANALYSIS – FLOODING ISSUES

8.1 This section gives a brief summary of the main flooding issues to each of those settlements noted in section 2 of this study as having a significant strategic function within the JLDP area. The sources of information that feed into this section include data from the Catchment Flood Management Plans (CFMP), the Shoreline Management Plan and the Preliminary Flood Risk Assessments. Much of the information contained in these documents is based on anecdotal evidence and local knowledge. The summary should be read in conjunction with the Maps[6], included in Appendix 3.

8.2 In general groundwater flooding is not considered to be significant source of flooding across the JLDP area although there may be local issues.

8.2 Advice from Dŵr Cymru Welsh Water (DCWW) has been sought for each settlement to provide a brief background to any recorded reported flooding incidents that are held. DCWW emphasise that these are usually isolated incidents and will not affect the whole settlement. They also emphasise that these should no be regarded as absolute blockers.

8.3 The Natural Resources Wales and Gwynedd Consultancy were also consulted on in respect of any localised flooding issues which should be considered as part of this study.

[6] There are three sets of maps for each settlement. The maps include the most up to date data from the Natural Resources Wales's Flood Map, TAN15 Development Advice Maps and The Natural Resources Wales's Areas Susceptible to Surface Water Flooding Map. The information contained on these maps are explained in under section 6.2 of this study.

Anglesey

Settlement	Geographical issues	Literature review of flooding issues, including comments received from the Natural Resources Wales	Issues for the JLDP
Amlwch	• The Afon Wen joins with the Afon Goch runs north east through the settlement to the sea.	• The CFMP identifies Amlwch as one of the small towns /villages where property and infrastructure are at risk from flood risk.	• Implications for development within Zone C2 land.
Holyhead	• A waterway to the north part of Holyhead identified on the Natural Resources Wales's Flood Map as a main river runs from west to east out to the sea • DCWWW undertaking investment to resolve sewer flooding in the area around Market Square.	• Historic fluvial flooding has occurred in both the Cae Rhos Estate and Graiglwyd estate and surface water flooding has also been observed on Kingsland Road.	• No major implications. • Natural Resources Wales - Advise that development proposals must not overload the receiving watercourse/surface water sewer
Llangefni	• The Afon Cefni runs north to south through Llangefni • The Afon Clai joins the Afon Cefni in the middle of the built up area of Llangefni.	• Historic surface water flooding with significant harmful consequences at Church Street, Bridge Street High Street and Ffordd Dolafon • Historic surface water surcharging from sewer system with significant harmful consequences at Bridge Street • At risk from a future 1% AEP flood (CFMP) • The CFMP identifies Llangefni as one of the small towns /villages where property and infrastructure are at risk from flood risk.	• Fluvial flooding issues along the Afon Cefni. • Implications for development within Zone C2 land along the Afon Cefni.
Beaumaris	• No main river as identified on the Natural Resources Wales's Flood Map in the vicinity of Beaumaris • DCWWW are undertaking investment to resolve sewer flooding in the area around Castle Street.	• Has suffered from flash flooding. • Past flooding (surface water run off/surface water surcharge from sewers at Mills Lane and Llanfaes (not considered significant). According to the Natural Resources Wales historic fluvial flooding associated with the Mill land area of Beaumaris rather than surface water. • Surface water flooding has occurred in the High Street/Allt Goch and Castle Square areas. • SMP2 – Listed under the SMP's preferred plan as one the most significant areas where properties may be lost due to increased risk of flooding or where is greatest need for adaption. • Listed under the SMP's preferred plan as one the	• Flooding issues along the coastal area of the settlement. • Implications for development within Zone C2 land along the coast. • Potential surface water issues to the north and south of the settlement.

		key areas where decisions need to be taken in respect the road system running through the settlement most significant areas where properties may be lost due to increased risk of flooding or where is greatest need for adaption. • The CFMP identifies Beaumaris as one of the small towns /villages where property and infrastructure are at risk from flood risk.	
Benllech	• The Afon Marchogion runs west to north east through Benllech to the sea	• Historic surface water flooding with significant harmful consequences	• Implications for development within Zone C2 land along the Afon y Marchogion.
Bodedern	•		• No major implications.
Cemaes	• The Afon Wygyr runs south to north through Cemaes to the sea . • The Foel Fawr watercourse runs north east out to the sea	-	• Implications for development within the Zone C2 land along the Afon Wygyr. • Part of the settlement near Trwyn y Penrhyn within Zone B
Gaerwen	• No main river as identified on the Natural Resources Wales's Flood Map in the vicinity of the built up area of Gaerwen • DCWWW are undertaking investment to resolve sewer flooding in the area around Lon Groes.	• Historic surface water surcharging from sewer system with significant harmful consequences Lôn Groes • Historic fluvial flooding associated with the watercourse to the rear of Ty Croes/Church adjacent to the A5.	• No major implications.
Llanfairpwll	• The Afon Rhŷd-Eilian runs north to south west of the built up area of Llanfairpwll	• Currently (& future) risk from a 1% AEP flood (CFMP) • Past flooding (surface water run off/surface water surcharge from sewers (not considered significant) • Natural Resources Wales - Have the drainage issues on Hen Lon Fyfnia/Stad Wern Gethin been addressed? There was instances of surface water flooding in the area.	• No major implications.
Menai Bridge	• The Afon Cadnant runs north to south east of the built up area of Menai Bridge to the sea	• Historic surface water flooding with significant harmful consequences at Lôn Gamfa , Lôn Waen Penlon, High Street and Cadnant Road. • The CFMP identifies Menai Bridge as one of the small towns /villages where property and infrastructure are at risk from flood risk	• No major implications.
Pentraeth	• The Afon Nodwydd		• Implications for

	runs from north east to south west through Pentraeth	-	development within the Zone C2 land along the Afon Nodwydd
Rhosneigr	• The Afon Crigyll to the west of Rhosneigr runs north to south west out to the sea. • The Maelog Lake outfall runs north to south west out to the sea.	-	• No major implications.
Valley/Y Fali	• To the north of Valley the Afon Alaw runs north to south west out to the sea. • Thw Afon Cleifiog to the east of Valley runs north to south out to the sea.	-	Implications for development within the Zone C1 land.

Gwynedd

Settlement	**Geographical description**	**Literature review of flooding issues, including comments received from the Natural Resources Wales**	**Issues for the JLDP**
Bangor	• The Afon Adda runs south west to north east through Bangor out to the sea. The section of the river running through the built up area of Bangor has been culverted. This benefited from a Flood Alleviation scheme in 2008	• Has suffered from tidal influenced flooding • Surface water flooding (Historic) • Historic surface water surcharging from sewer system with significant harmful consequences • Past flooding (surface water run off/surface water surcharge from sewers at Penrhos Road (not considered significant) • DC are aware of reported flooding incidents in areas around Ffordd Tyn Clwt. • Currently (& future) risk from a 1% AEP flood (CFMP) • Flood risk as a result of a complex interaction of flooding sources. Extreme flood events could occur at anytime and could have serious consequences. • SMP2 – Listed under the SMP's preferred plan as one the most significant areas where properties may be lost due to increased risk of flooding or where is greatest need for adaption.	• Implications for development within the Zone C2 land along the route of Afon Alaw and Hirael Bay area.
Blaenau Ffestiniog		• At risk from a future 1% AEP flood (Afon Bowydd)(CFMP). However, in the event of a blockage at the culvert inlet flooding could affect properties outside this area.	• Implications for development within Zone C1 (town centre) and Zone C2. • Surface water flooding could be a significant issue.
Caernarfon	• The Afon Seiont North to the eastern edge of Caernarfon runs	• Has suffered from flash flooding. • Surface water flooding (Historic)	• Implications for development within Zone C1 along the Afon

	south to north out to the sea.	• Sewer flooding (Historic) • Past flooding (surface water run off/surface water surcharge from sewers (not considered significant) • The Afon Cadnant flows in culvert beneath the town and has caused flooding in area of the town in the past. Flooding patterns shown in the flood map could be modified as a result of a blockage within or at the culvert inlet. • Currently (& future) risk from a 1% AEP flood (CFMP) • Flood risk as a result of a complex interaction of flooding sources. Extreme flood events could occur at anytime and could have serious consequences. • SMP2 – even under the preferred plan there would continue be significant flood risk)	Cadnant and Afon Seiont.
Porthmadog	• The Afon Glaslyn runs north to south through Porthmadog out to the sea. • Part of the town is within an Internal Drainage District (Glaslyn/Pensyflo g IDD).	• Has suffered from tidal influenced flooding • Sewer flooding • Currently (& future) risk from a 1% AEP flood (CFMP) • Flooding takes the form of tidally influenced river flooding, tide locking of the Cyt outfall, tidal flooding in coastal areas on the River Glaslyn and surface water and sewer flooding. • Approximately 480 properties are currently at risk from the 1% AEP river flood event, increasing to around 500 in the future. Properties and infrastructure in Porthmadog are all at risk from flooding. • Porthmadog is dependent on defences to prevent regular inundation from the sea. This is a heavily managed area, with a complex interaction of defenses, flood sources and environmental features. In the future, sea level rise, increased storminess and potential additional development would considerably increase the flood risks. • SMP2 – Listed under the SMP's preferred plan as one the main areas where potential loss from erosion is anticipated over the next 100 years. • SMP2 – even under the preferred plan there would continue be significant flood risk. • There have been recent improvements to the flood defences in the area – both as a result of the bypass and an Natural Resources Wales project to improve the Cyt	• Major implications for future development with the majority of the town falling within Zones B, C1 or C2. Consideration should be given to whether Porthmadog should continue to be a centre for major development within the new LDP.

		tidal doors.	
Pwllheli	• Afon Rhyd Hir runs west to east through Pwllheli and discharges into Pwllhlei harbour. • The Afon Erch rtunning east to west also discharges into Pwllheli harbour.	• Has suffered from tidal influenced flooding • Surface water flooding • Historic surface water surcharging from sewer system with significant harmful consequences at Y Maes • Currently (& future) risk from a 1% AEP flood (CFMP) • Tidal influence on the outfall of the Afon Rhyd Hir and Afon Penrhos can restrict river outflows and result in overtopping upstream. Pwllheli has a high number of historical sewer flooding incidents and surface water flooding is a problem. • The main A499 trunk road is at risk of flooding. Significant flood risk management measures are already in place to manage river and tidal flooding. • In the future, sea level rise and expected increased storminess and wave action could potentially significantly increase the risk of flooding from the sea. • SMP2 – Listed under the SMP's preferred plan as one the main areas where potential loss from erosion is anticipated over the next 100 years. • SMP2 – Listed under the SMP's preferred plan as one the most significant areas where properties may be lost due to increased risk of flooding or where is greatest need for adaption.	• Major implications for future development with the majority of the town falling within Zones B or C1. Consideration should be given to whether Pwllheli should continue to be a centre for major development within the new LDP.
Abersoch	• Afon Soch runs west to east through Abersoch and discharges into Abersoch harbour.	• Historic surface water surcharging from sewer system with significant harmful consequences. • Potential to suffer property flooding	• Implications for development within Zone C1 and Zone C2
Barmouth		• Historic surface water flooding with significant harmful consequences at The Rock • Past flooding (surface water run off/surface water surcharge from sewers at Ceilwart and Viaduct Gardens (not considered significant) • DC are aware of reported flooding incidents in areas around Park Road. • There is a history of flooding associated with the Heol y Llan area. • SMP2 – Listed under the SMP's preferred plan as one the main areas where potential loss from erosion is anticipated over the next 100 years.	• Implications for development within Zone C1 and Zone C2. • Susceptibility to surface water flooding could be an issue.
Bethesda	• The Afon Ogwen	• Currently (& future) risk from	• Implications for

	runs south to north along the western edge of Bethesda	a 1% AEP flood (CFMP) • At risk from localised surface water and rapid response flooding from rivers and streams. • Past flooding (surface water run off/surface water surcharge from sewers at Ciltrefnus (not considered significant)	development within Zone C2.
Criccieth	• DCWWW are undertaking investment to resolve sewer flooding in the area around Lon Felin..	• Fluvial flooding not included in the floodmap (catchment less than 3km2) however at least 3 separate culverted systems are present which could pose a flood risk – particularly in the event of a blockage. • SMP2 – Listed under the SMP's preferred plan as one the main areas where potential loss from erosion is anticipated over the next 100 years.	• No major implications.
Llanberis	• The Padarn lake is located immediately to the north east of Llanberis	• Has suffered from flash flooding. • Flooding in November 2012 from the River Goch • Past flooding (surface water run off/surface water surcharge from sewers (not considered significant) • Currently (& future) risk from a 1% AEP flood (CFMP) • At risk from localised surface water and rapid response flooding from rivers and streams	• Implications for development within Zone C2. • Susceptibility to surface water flooding could be an issue.
Llanrug	• The Afon Rhythallt to the north of Llanrug runs east to west.	-	No major implications.
Nefyn	• No main river as identified on the Natural Resources Wales's Flood Map in the vicinity of Nefyn. • DCWWW are undertaking investment to resolve sewer flooding in the area around Stryd y Ffynnon.	• Historic surface water surcharging from sewer system with significant harmful consequences at Bridge Street	
Penrhyndeudraeth		• Historic flooding associated with the Penrhyn Cyt and tributary.	
Penygroes	• The Afon Llyfnwy to the south of Penygroes runs east to west.	• There may have been historic flooding on/adjacent to the allocation near Cae Capel Bach from the watercourse but Natural Resources Wales has no details/dates.	
Tywyn		• Historic surface water surcharging from sewer system with significant harmful consequences • Past flooding (surface water run off/surface water surcharge from sewers at Marconi Lane (not considered significant)	

		• DC are aware of reported flooding incidents in areas around Idris Villas. • Has suffered from tidal influenced flooding • Currently (& future) risk from a 1% AEP flood (CFMP) • Future risk is expected to increase due to sea level rise and increased storminess and wave action	

9. CONCLUSIONS AND THE WAY FORWARD

9.1 Flooding is an issue which is a central consideration to the LDP process since future development should be guided to land located outside flood-risk areas. Within the JLDP area, flooding from both rivers and the sea pose a particular threat to existing communities and will also affect the future pattern of growth of settlements. Whilst flood risk management is not a task that can be addressed solely through the LDP process, the plan can assist greatly in steering vulnerable development away from areas affected by flooding.

9.2 The aim of Stage One of this SFCA was to collect all the data available on flooding within the Anglesey and Gwynedd, which would then provide an overview of flooding and in particular flooding risk issues prevalent within the JLDP area. However, it must be recognised that this data is constantly updated and consequently the most up-to-date maps and data will be used in site selection.

9.3 In circumstances where the JLDP proposes to allocate development on sites which can not satisfy the justification test outlined in section 6 of TAN 15, these sites may be subject to a Stage Two Strategic Flood Consequence Assessment (SCFA). During the Deposit Plan consultation period, an objection was received to the fact that Former Crossville Site in Beach Road Bangor, which was was allocated for housing purposes, was within a C2 flood zone. Consequently, Gwynedd Consultancy (YGC) were commissioned to undertake a Stage 2 SFCA. The conclusion of the study was that the site does not comply with the requirements of TAN15 and the allocation should be removed from the plan and a suitable alternative found in its place in order to ensure internal consistency of the plan and to conform to National Policy Guidance. A copy of this study is available as a separate Backround Paper.

9.2 In accordance with the findings of the Stage 2 SFCA it is now proposed that the Former Crossville Site in Bangor should not be allocated for housing. Consequently a Stage 3 SCFA will not be required. The deletion of the allocation can be found within the Focussed Changes document as Focussed Change NF77 and NF122.

9.4 YGC were also commissioned by the Anglesey and Gwynedd Joint Planning Policy Unit (JPPU) to ascertain whether there may be any potential development sites for housing in the Porthmadog/Tremadog. area with regards to flood risk. After analysing the flood maps and following a meeting between NRW officers, YGC officers and the JPPU it was agreed that no suitable locations were identified as potential land for housing within the JLDP. A copy of this study (Porthmadog - Strategic Flood Risk Assessment) is available as a separate Backround Paper.

APPENDIX 1: Extracts from relevant development plan policies

Gwynedd UDP

POLICY B29 - DEVELOPMENT ON LAND AT RISK FROM FLOODING

Proposals for development that is highly vulnerable[1] or proposals for emergency services on a site forming part of an area categorised as zone C2 (areas of the floodplain without significant flood defence infrastructure) will be refused. New development should be directed away from zone C and towards suitable land in zone A, or otherwise zone B. The tests outlined in TAN15 will be applied to development within zone C. Proposals for a less vulnerable development[2] in zone C2 (areas of the floodplain without significant flood defence infrastructure) or any new development proposal in zone C1 (areas of the floodplain which are developed and served by significant infrastructure, including flood defences) will be refused unless it can be clearly demonstrated that:

1. ***its location in zone C is necessary to assist, or be part of, a Local Authority and other key partners' regeneration initiative or a local authority strategy required to sustain an existing settlement, or***
2. ***its location in zone C is necessary to contribute to key employment objectives supported by the Local Authority, and other key partners, to sustain an existing settlement or region, and***
3. ***it concurs with the aims of PPW and meets the definition of previously developed land, and***
4. ***the potential consequences of a flooding event for the particular type of development have been found to be acceptable in relation to the tests set out in TAN15***

Development proposals (including raising ground levels) will be approved in other areas provided that they do not present an unacceptable risk of flooding either on or off the site, or cause significant harm to flood management or maintenance schemes.

3.6.5 ***Explanation -*** *Development on a site within an area identified as being at risk from flooding may itself be at risk, exacerbate existing flooding problems or create new flooding problems on land or property elsewhere by reducing the floodplain's storage capacity or obstructing the water flow. Flood prevention measures can reduce the danger of flooding, but it can never be eradicated. Where detailed information regarding flood risk is not available, the onus will be on the developer to undertake and pay for detailed technical investigations in accordance with the requirements of TAN 15 Development and Flood Risk in order to assess the degree of flooding and to ensure that any unacceptable development (including raising ground levels) is not located in the area that is at risk from flooding. Where necessary, developers will be expected to provide details of hydraulic investigations in order to assess the obligations of the proposed development. The Environment Agency will be consulted regarding every application that is likely to be affected by flooding.*

3.6.6 *If, exceptionally, development is approved developers will be required to show that full consideration has been given to the possibility of flooding in its design, e.g. more than one floor so that its occupants and any furniture etc can be moved to somewhere safe; locating parking spaces and access points in locations that facilitate use during floods, creation of specific flood routes that facilitate the dispersal of flood water. No development will be approved until any necessary mitigation works have been implemented to the satisfaction of the Local Planning Authority in consultation with the Environment Agency and a formal agreement signed with the Local Planning Authority regarding the future maintenance of any flood protection or mitigation structures. If additional or new flood defences are required, these will be provided at the developer's cost as well as measures to mitigate its impact and any long term inspections and management. Development that will, despite mitigating*

measures, still be at risk from flooding that will endanger lives and cause substantial damage to property will be refused.

[1] Every type of residential development, (including hotels and caravan parks), public buildings (for example schools, libraries, hospitals, leisure centres), industrial development that is particularly at risk (e.g. power stations, chemical works, waste incineration plants) and waste disposal sites.
[2] General industry, employment, commercial and retailing, public infrastructure and facilities, mineral extraction sites and associated processing facilities, apart from waste disposal sites."

POLICY B32 - INCREASING SURFACE WATER
Proposals that do not include flood minimisation or mitigation measures that will reduce the volume and rate at which run off reaches rivers and other watercourses will be refused.

When a development is approved planning conditions or agreements will be used to ensure that the necessary flood minimisation or mitigation measures are implemented, in accordance with submitted details which were approved

3.6.12 Explanation - *A new development can increase the surface area of impermeable land. In turn, this can result in a far greater volume of water being directed through drains and sewers to watercourses for instance. This will affect the natural recharge of groundwater, wasting a valuable resource and increasing the risk of pollution (e.g. through polluted urban surface run-off and overflow from a combined sewer), and can increase river flows. Increased river flows can cause physical damage to the banks and bed of watercourses, and can increase the risk of flooding.*

3.6.13 *Wherever practical, surface water should be disposed of as close to the source as possible. Flood minimisation facilities or mitigation measures may be a prerequisite to development if possible risks are identified. Consideration should be given to the use of softer engineering structures collectively referred to as Sustainable Urban Drainage Systems (SUDS). SUDS typically include swales, ponds, infiltration basins and porous surfaces and should be considered in place of conventional drainage methods where appropriate. Environment Agency Wales can provide advice on SUDS design and reference may be made to their document Sustainable Urban Drainage Systems – An Introduction. The Local Planning Authority will expect the developer to provide evidence that funding is available and that maintaining flood minimisation facilities or mitigation measures will prove practical in the long term".*

YNYS MÔN UDP (STOPPED)

"Infrastructure Policy SG2 - Development and flooding.

SG2. Development (including the raising of land) will only be permitted where:

(a) it would not result in risk to human life and damage to property within the Areas of Indicative Flood Risk defined on the proposal Maps; and/or

(b) it would result in flooding, including tidal inundation, either on or off site, or adversely affect flood management or maintenance schemes.

In areas of flood plain currently unobstructed, where water flows in time s of flood, built development will only be permitted wholly exceptionally and will be limited to essential transport and infrastructure.

Reasoned Justification

17.10 Development proposals within areas of flood risk are not only at risk of flooding but may also exacerbate existing or create new flooding problems on other land or property through

reductions in floodplain storage capacity or by impeding flood flows. Flood alleviation measures can only reduce the risk of flooding, they can never eliminate the risk. ***For these reasons, development within land liable to flood will not be permitted unless it can be justified in that location, even though it is likely to be at risk of flooding.*** *Where detailed information in respect of flood risk is not available, developers will be required to carry out detailed technical investigations to evaluate the extent of the flood risk and ensure that no unacceptable development, including the raising of land occurs within the flood risk area identified.* ***In particular situations, flood alleviation and mitigation measures, including design provisions, may be acceptable as means of overcoming specific flooding concerns. Such measures would also need to be acceptable in terms of the environment and local amenity****. The information shown on the proposals map is indicative and detailed enquiries should be referred to the Environment Agency.*

Infrastructure Policy SG6 - Surface Water Run Off.

SG6. Proposals for development which would result in an unacceptable adverse impact on the water environment due to additional surface water run-off will not be permitted. Proposals for development which include disposal of surface run off water by means of soakaway will only be considered subject to criteria.

Proposals for development which include disposal of surface water run off by means of soakaway will be evaluated in terms of satisfactory soil properties, geotechnology hydrogeology reviewed alongside the hydraulic design of the soakaway.

Reasoned Justification

17.22 Wherever practicable surface water should be disposed of as close to the source as possible. Where potential risks are identified, appropriate flow attenuation facilities or mitigation measures may be a prerequisite for development. Consideration should be given to the use of softer engineering structures collectively referred to as Sustainable Urban Drainage Systems (SUDS). SUDS is a concept that focuses decisions about drainage design, construction and maintenance on the quality of the receiving environment and people. SUDS are physical structures built to receive surface water runoff, and typically include swales, ponds, infiltration basins and porous surfaces, and should be considered as alternatives to conventional drainage where appropriate. The Environment Agency Wales can provide guidance on the design of SUDS and have produced a document entitled "Protecting the Quality of our Environment, Sustainable Urban Drainage Systems - an Introduction". Where disposal of surface water by means of soakaway is necessitated the criteria for design should be in accordance with Building Research Establishment Digest 365 or subsequent superseding publications.

17.23 The Council will require the developer to demonstrate, both financially and practically, how the long term maintenance of any attenuation facilities or mitigation measures will be achieved including the maintenance of swales, ponds or similar features."

APPENDIX 2: Summary of the CFMP 'Policy Options' for each of the sub areas included within the JLDP.

Sub-area	Issues	Preferred policy	Vision	Actions (i.e of relevance to the JLDP)
1 – Anglesey	• Across the island there is localised river flooding and some evidence of surface water and sewer flooding. Tidally influenced flooding of Malltraeth Marsh from the Afon Cefni can be extensive. • Approximately 520 properties are currently at risk from the 1% AEP flood event, increasing to around 580 in the future. • Property and infrastructure are at risk in a number of small towns and villages including Amlwch, Llangefni, Beaumaris and Menai Bridge. The A5 and A55 Trunk roads are also at flood risk.	Policy Option 3 - Areas of low to moderate flood risk where EAW are generally managing existing flood risk effectively	• Ensure EAW actions are appropriate and proportionate to the risks, now and in the future. • EAW will continue to maintain their defenses, but it may not be justifiable to replace them or to increase their height in the future. • Increased emphasis on actions to manage the consequences of flooding	• Encourage and support to produce local long term plans to manage all sources of flooding, particularly at Llangefni, Llanfairpwll, Benllech and Amlwch. • Review the current flood risk management actions in the Malltraeth Marsh IDD area • Encourage and support an assessment by partners of potential flood risk from reservoirs on Anglesey.
2 - Bangor and Caernarfon	• Localised run-off with rapid onset of river flooding can occur in both Bangor and Caernarfon. • There is historic sewer and surface water flooding in Bangor and Caernarfon. Approximately 230 properties are currently at risk from the 1% AEP flood event, increasing to around 250 in the future. Properties and infrastructure are affected in Bangor and Caernarfon. • Flood risk in Bangor and Caernarfon is the result of a complex interaction of flooding sources. Extreme flood events could occur at anytime and could have very serious consequences.	Policy Option 3 - Areas of low to moderate flood risk where EAW are generally managing existing flood risk effectively	• Ensure EAW actions are appropriate and proportionate to the risks, now and in the future. • Increased emphasis on actions to manage the consequences of flooding	• Encourage and support partners to carry out studies to develop a more detailed understanding of the flood risk from all sources in Bangor and Caernarfon. • Encourage and support our partners to produce local long term plans to manage all sources of flooding. These should consider the future options and investment needs of the culvert systems.
3 - Lleyn Peninsula	• Approximately 320 properties are currently at risk from the 1% AEP flood event, increasing to around 370 in the future. • Flooding is characterised by localised areas of river and surface water flooding. The current flood risk is generally low and is not expected to increase significantly in the future, relative to other locations. • This is a large geographical area of dispersed properties and communities and therefore flood risk. Flood risk management activity is currently disproportionately high relative to the broad level of risk.	Policy Option 2 - Areas of low to moderate flood risk where EAW can generally reduce existing flood risk management actions	• To reduce the overall level of flood risk management activity over time. • It may not be justifiable to continue to maintain our defences, to replace them or to increase their height in the future. • Increased emphasis on actions to manage the consequences of flooding	• Support opportunities to store water or manage run-off to provide flood risk and environmental benefits, e.g. in the upper catchments. • Work with partners to investigate options for river restoration on the Afon Erch where increasing attenuation of floodwaters could contribute to flood alleviation downstream. • Encourage and support studies by partners to identify surface water and sewer flooding issues and management options
4 - Pwllheli	• Tidal influence on the outfall of the Afon Rhyd Hir and Afon Penrhos can restrict river outflows and result in overtopping upstream. Pwllheli has a high number of historical sewer flooding incidents and surface water flooding is a problem. • Approximately 40 properties are currently at risk from the 1% AEP flood event, increasing to around 170 in the future. The main A499 trunk road is at risk of flooding. Significant flood risk management measures are already in place to manage river and tidal flooding. • In the future, sea level rise and expected increased storminess and wave action could potentially significantly increase the risk of flooding from the sea.	Policy Option 4 - Areas of low, moderate or high flood risk where EAW are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change	• Will continue to maintain our defences, but it may not be justifiable to increase their height in the future. • Will seek a broader range of integrated actions to manage both current and future flood risks. • Increased emphasis on actions to manage the consequences of flooding from all sources.	• Encourage and support partners to produce local long term plans to manage all sources of flooding at Pwllheli. • Work with partners to investigate river restoration options on the Afon Rhyd Hir where increasing attenuation of floodwaters could contribute to flood alleviationa at Pwllheli. • Investigate options to improve flood warning from the Afon Rhyd Hir.

Sub-area	Issues	Preferred policy	Vision	Actions (i.e of relevance to the JLDP)
5 - Snowdonia	• Localised surface water and rapid response flooding from rivers and streams. This affects towns and villages in the foothills, such as Llanberis, Waunfawr, and Bethesda. Snowmelt in winter can contribute to flooding. Localised sewer flooding is present. • Approximately 1,570 properties are currently at risk from the 1% AEP flood event, increasing to around 1,780 in the future.	Policy Option 3 - Areas of low to moderate flood risk where EAW are generally managing existing flood risk effectively	• Ensure EAW actions are appropriate and proportionate to the risks, now and in the future. • EAW will continue to maintain our defences, but it may not be justifiable to replace them or to increase their height in the future. • Increased emphasis on actions to manage the consequences of flooding	• Encourage and support our partners to produce local long term plans to manage all sources of flooding, particularly at Llanberis, Bethesda, Blaenau Ffestiniog, Machynlleth and Abergynolwyn.
6- Porthmadog	• Flooding takes the form of tidally influenced river flooding, tide locking of the Cyt outfall, tidal flooding in coastal areas on the River Glaslyn and surface water and sewer flooding. • Approximately 480 properties are currently at risk from the 1% AEP river flood event, increasing to around 500 in the future. Properties and infrastructure in Porthmadog are all at risk from flooding. • Porthmadog is dependent on defences to prevent regular inundation from the sea. This is a heavily managed area, with a complex interaction of defences, flood sources and environmental features. In the future, sea level rise, increased storminess and potential additional development would considerably increase the flood risks.	Policy Option 5 - Areas of moderate to high flood risk where EAW can generally take further action to reduce flood risk.	• Will continue to maintain our defences, but it may not be justifiable or acceptable to increase their height in the future. • Seek a complementary set of flood risk management actions by all partners at a local community level.	• Encourage and support partners to produce local long term plans to manage all sources of flooding at Porthmadog. • Investigate options for installing demountable or temporary defences through Porthmadog to reduce the likelihood of flooding.
7 – Coastal Lowlands	• The onset of flooding is rapid in Fairbourne, Llanbedr and Tal-y-Bont. Surface water flooding is more predominant in the mid-sectionof the area due to run-off from the mountains. Sewer flooding is a local issue in some of the urban areas. • Approximately 280 properties are currently at risk from the 1% AEP flood event, increasing to around 300 in the future. Property and infrastructure in the urban areas along the coast are at risk of flooding. Caravan parks and camping sites on the coast are also at risk. Flood risk management activity is currently disproportionately high, relative to the overall level of risk. This is partly due to the maintenance activity in the IDD areas. • Future risk to coastal communities, such as Fairbourne and Tywyn and coastal caravan and campsites, is expected to increase due to sea level rise and increased storminess and wave action.	Policy Option 3 - Areas of low to moderate flood risk where EAW are generally managing existing flood risk effectively	• Ensure EAW actions are appropriate and proportionate to the risks, now and in the future. • EAW will continue to maintain their defences, but it may not be justifiable to replace them or to increase their height in the future. • Increased emphasis on actions to manage the consequences of flooding	• Encourage and support our partners to produce local long term plans to manage all sources of flooding, particularly at Tywyn and Fairbourne. These plans should include an assessment of the consequences of flooding, including from overtopping of defences, and actions to manage these. They should consider future options and investment needs for defences, emergency planning and response, and development control issues. • Review and rationalise the current flood risk management actions in the IDD areas.
9 - Upper Dyfi and Upper Wnion	• There is little flood risk to property or infrastructure. Approximately 160 properties are at risk from the 1% AEP flood event in the present and future. • The risk is generally low and is dispersed amongst individual properties and hamlets. In the future climate change is expected to have little impact on the overall level of flood risk. • Some potential that land management changes could result in both flood risk management and wider environmental benefits either locally or downstream, e.g. in areas of Snowdonia.	Policy Option 1 – areas of little or no flood risk where we will continue to monitor and advise.	• A flood warning service appropriate to this rural area is currently provided. EAW do not currently carry out any other planned flood risk management activities. • Vision is to continue with this approach into the future and not to carry out any significant planned flood risk management activity.	• EAW will continue to monitor and advise.

APPENDIX 3: GIS data on 'flood risk' within the JLDP study area

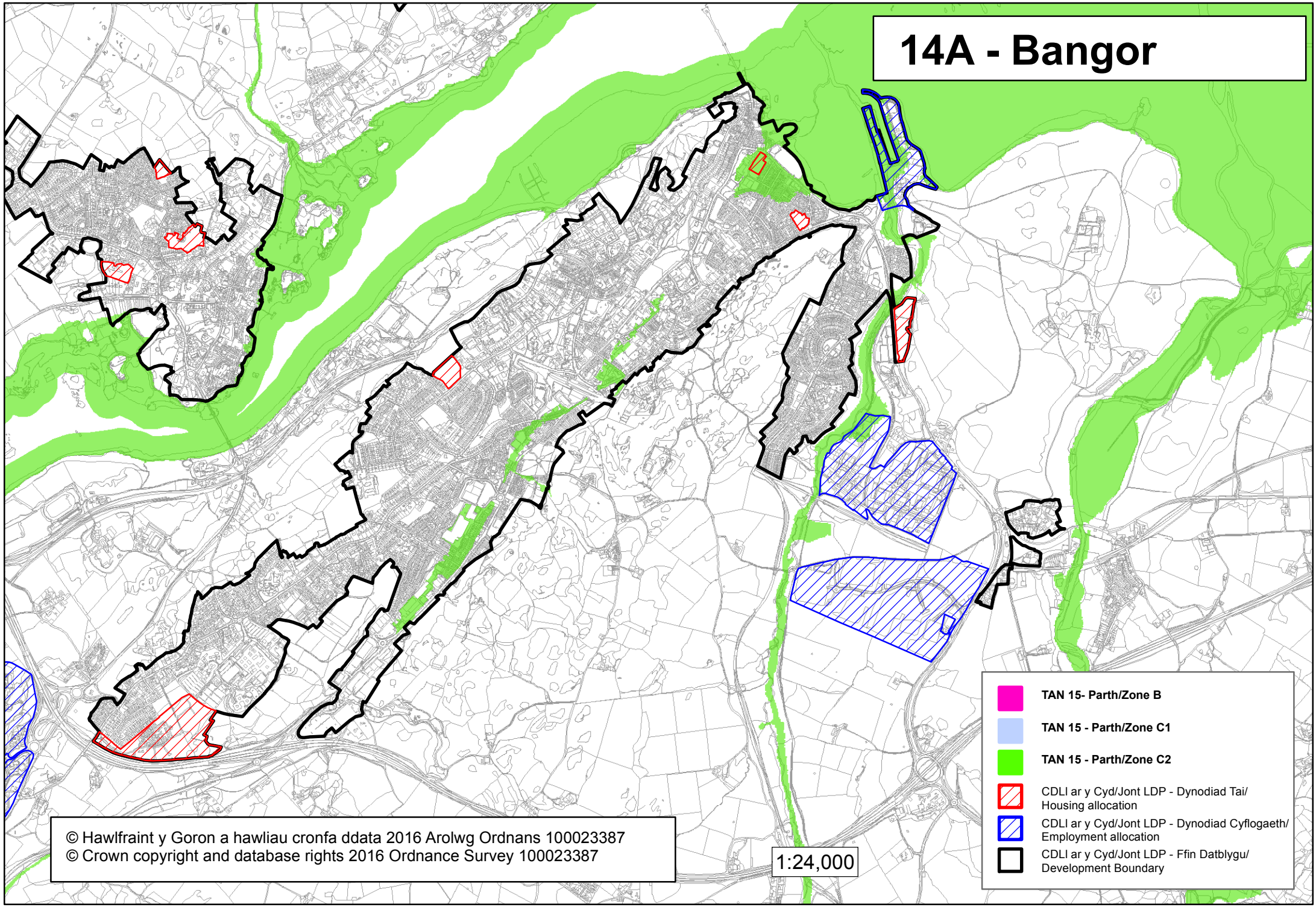
A - Welsh Government's TAN15 Development Advice Maps;
B - Natural Resources Wales's Flood Map and
C - The Natural Resources Wales's Areas Susceptible to Surface Water Flooding Map.

YNYS MÔN

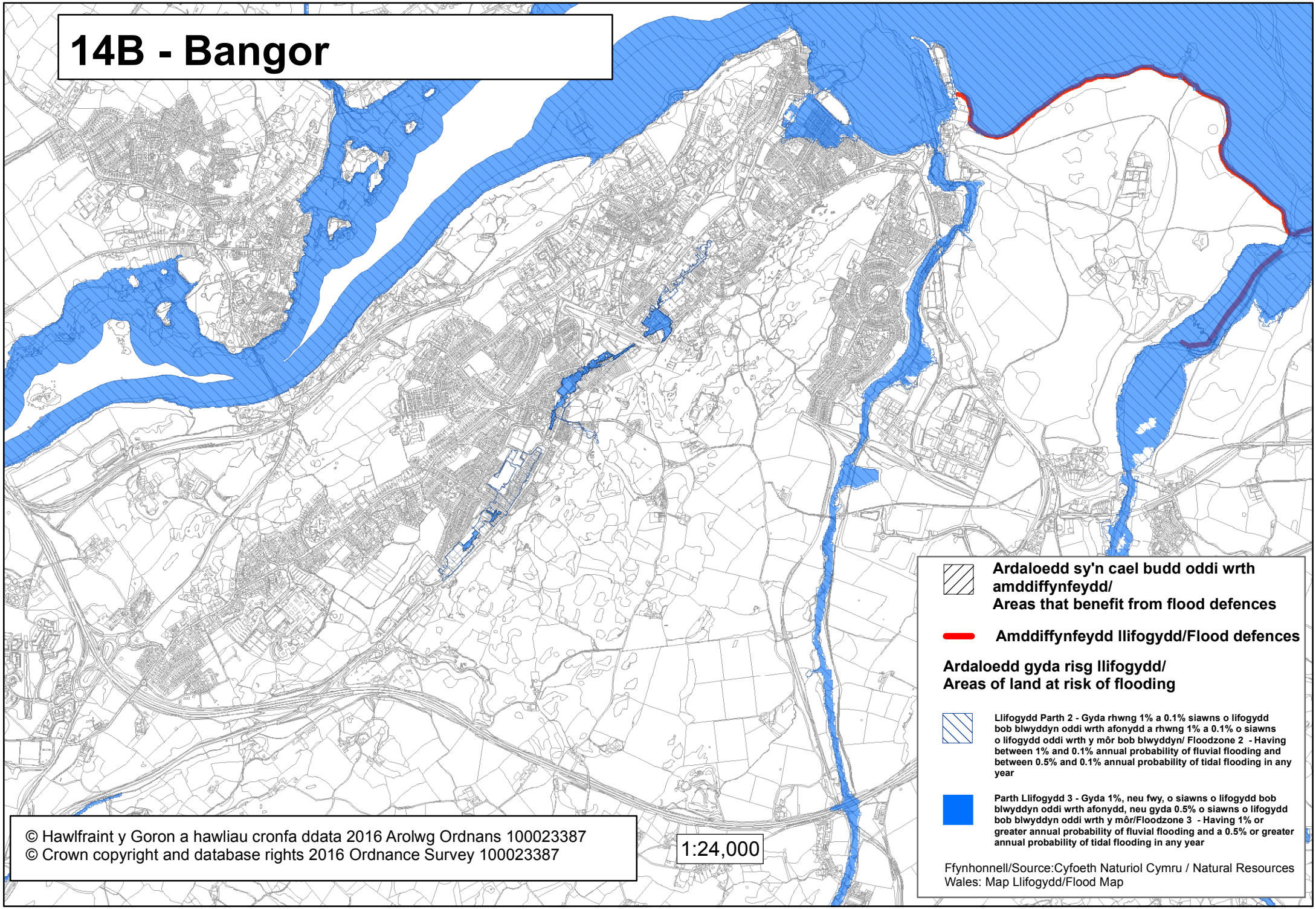
1. Amlwch
2. Caergybi/Holyhead
3. Llangefni
4. Biwmaris/Beaumaris
5. Benllech
6. Bodedern
7. Cemaes
8. Gaerwen
9. Llanfairpwll
10. Pentraeth
11. Porthaethwy/Menai Bridge
12. Rhosneigr
13. Valley

GWYNEDD

14. Bangor
15. Blaenau Ffestiniog
16. Caernarfon
17. Porthmadog
18. Pwllheli
19. Abersoch
20. Abermaw/Barmouth
21. Bethesda
22. Criccieth
23. Llanberis
24. Llanrug
25. Nefyn
26. Penrhyndeudraeth
27. Penygroes
28. Tywyn



14B - Bangor



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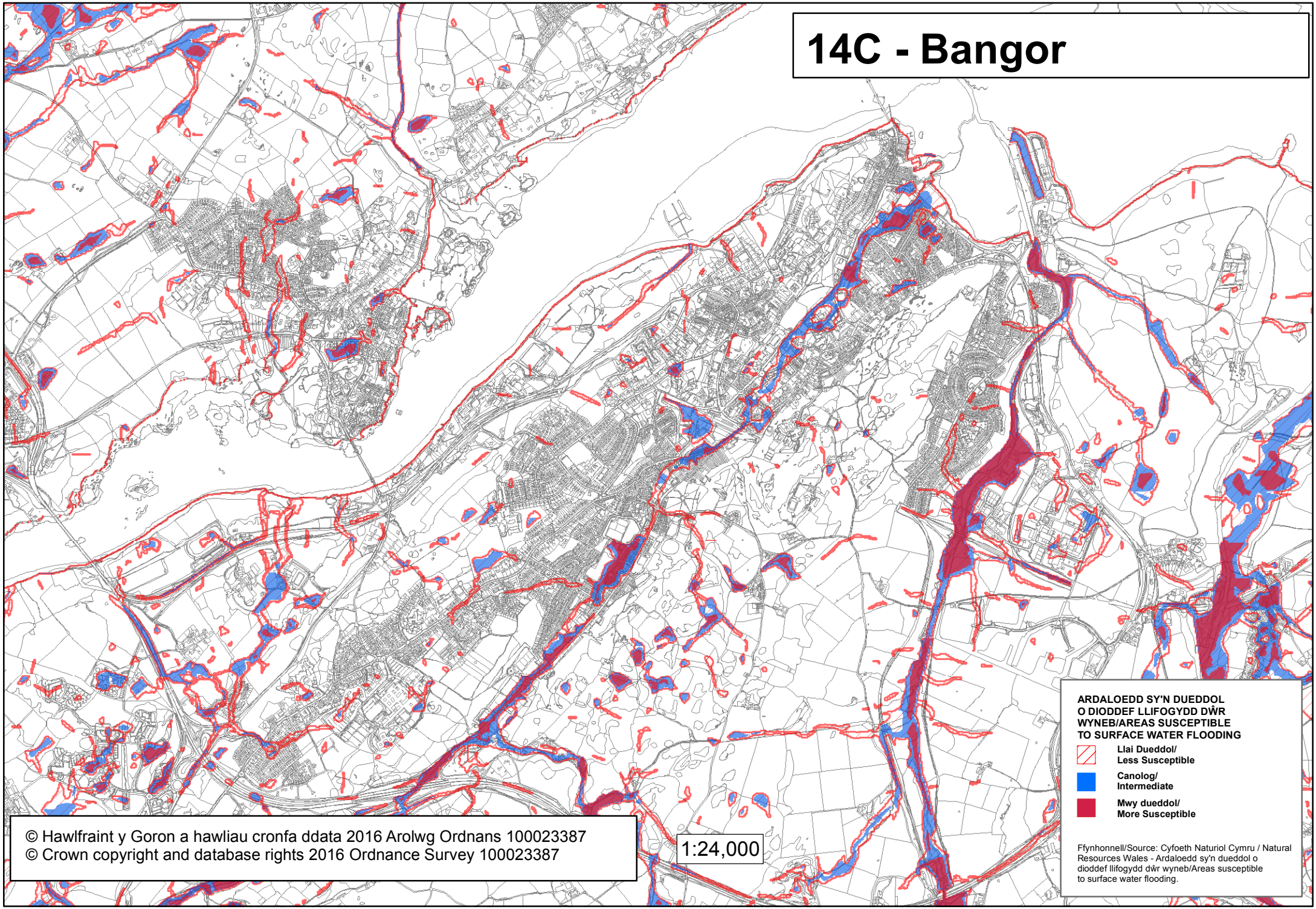
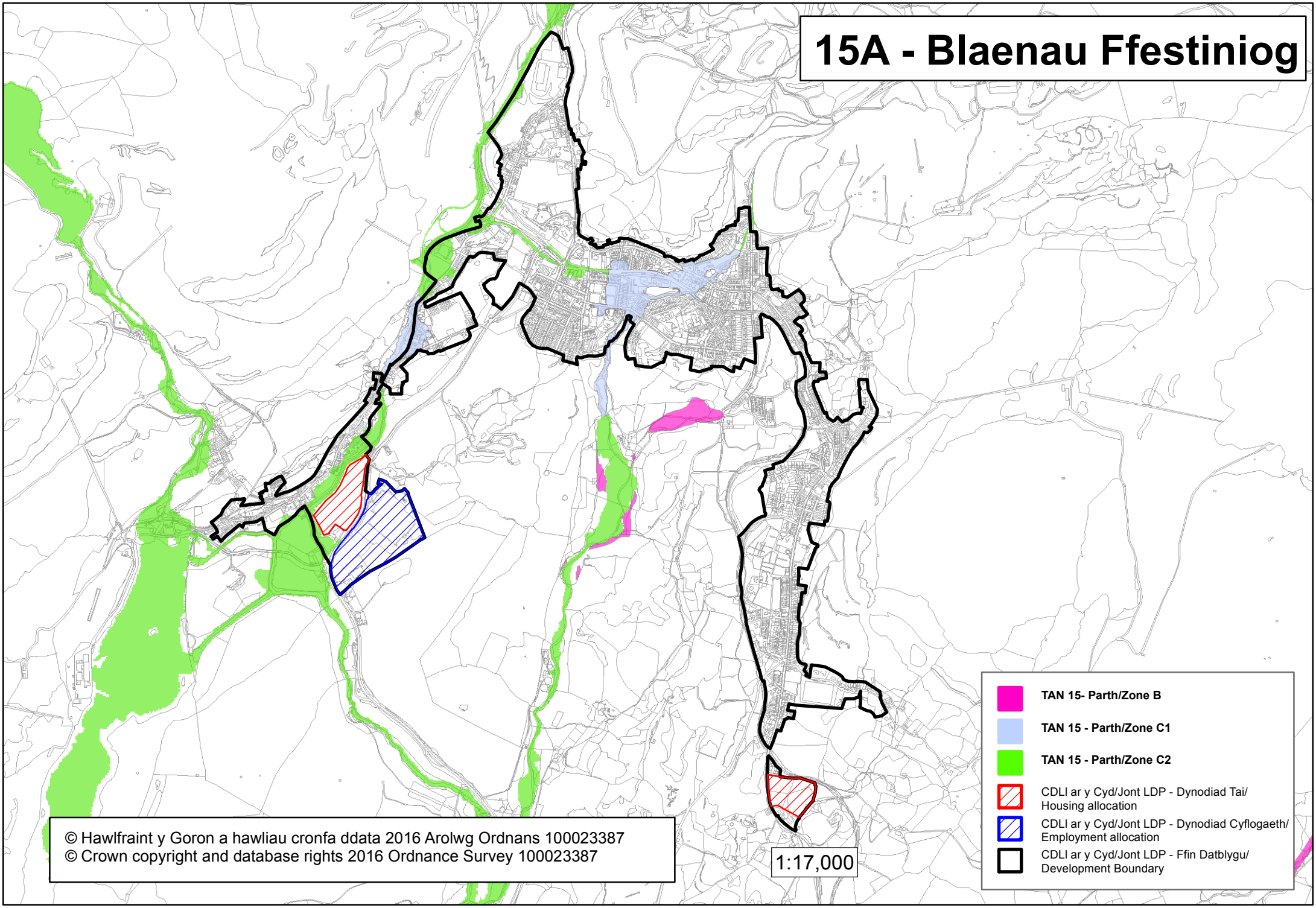
14C - Bangor



15A - Blaenau Ffestiniog



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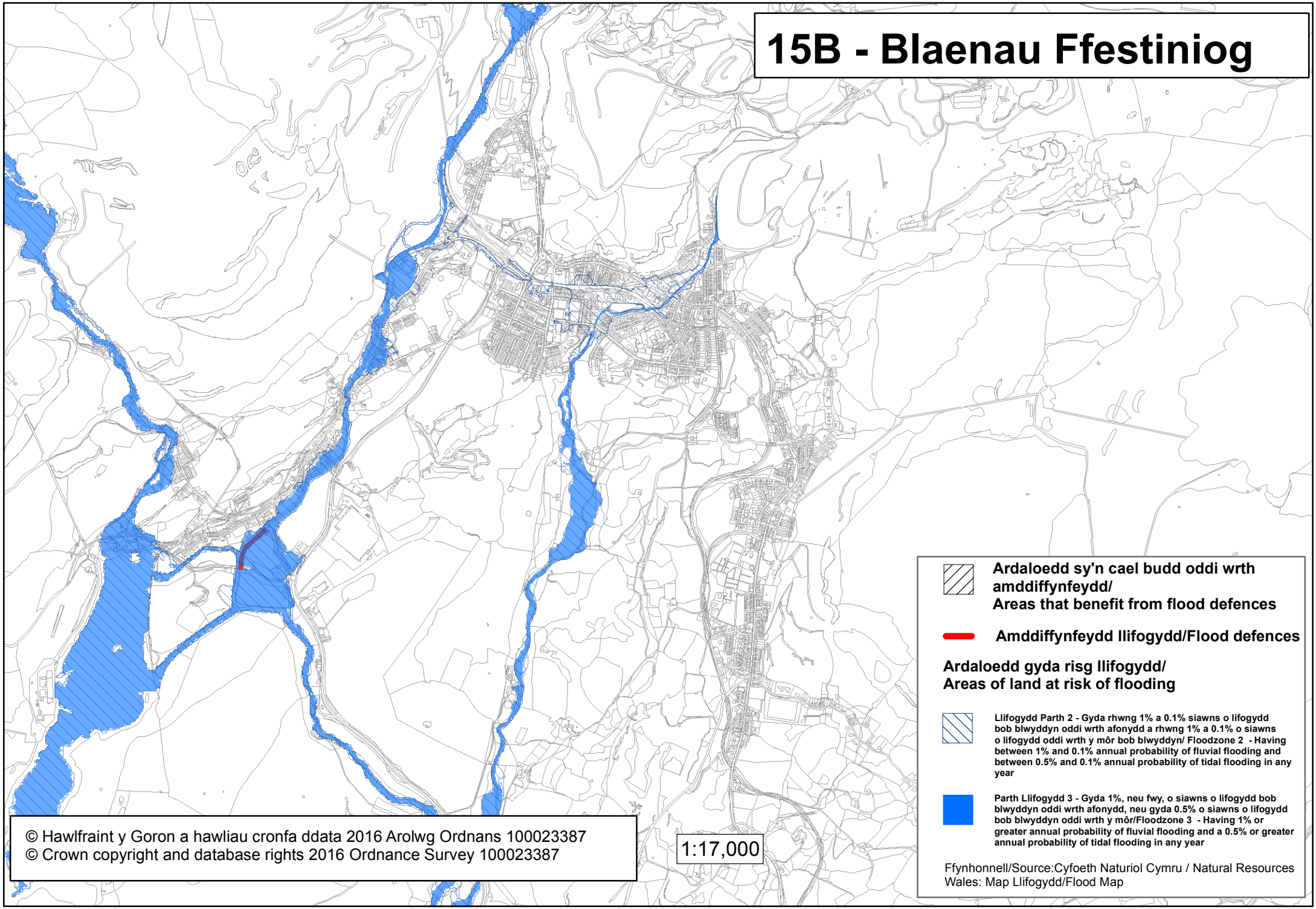

Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

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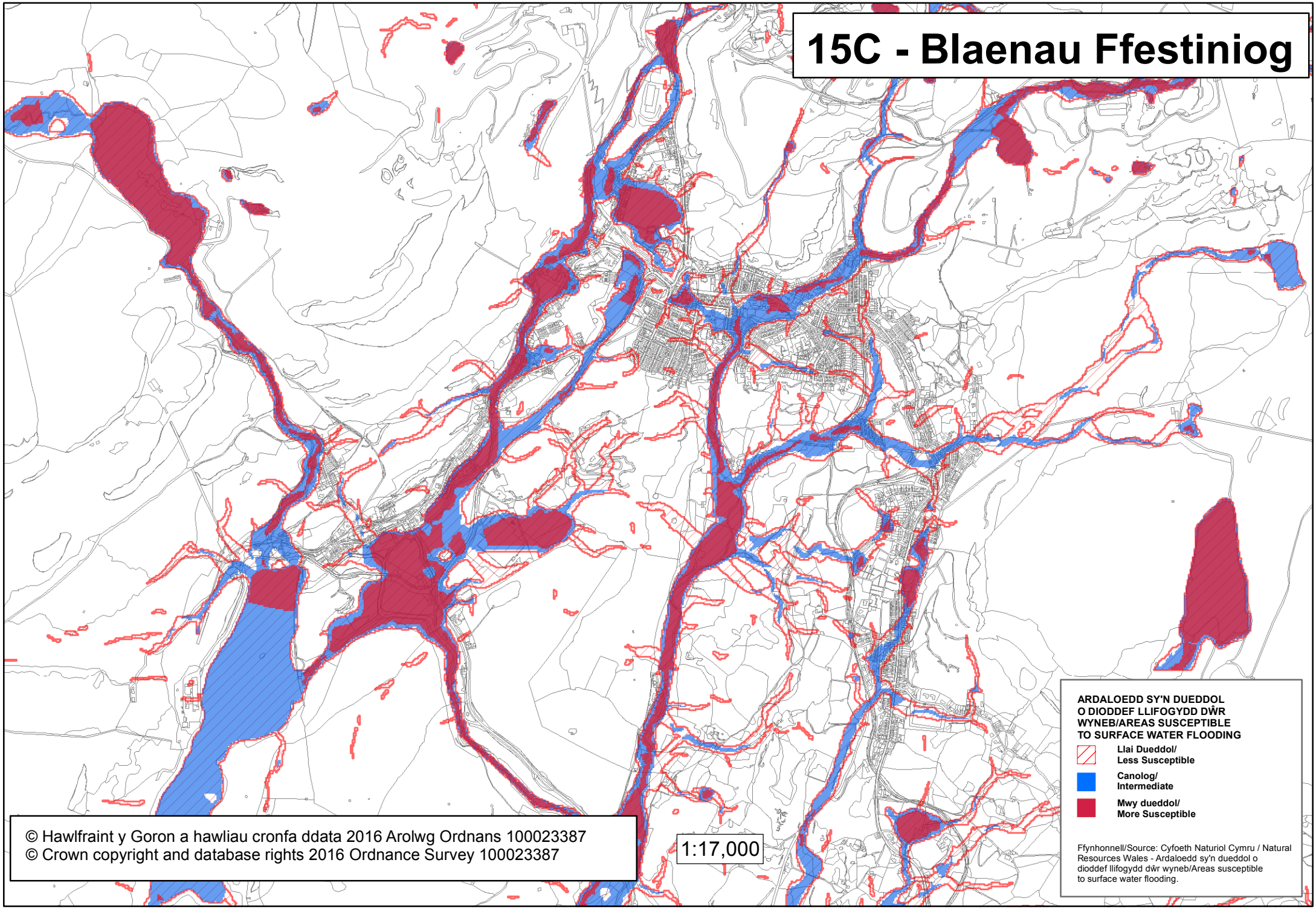
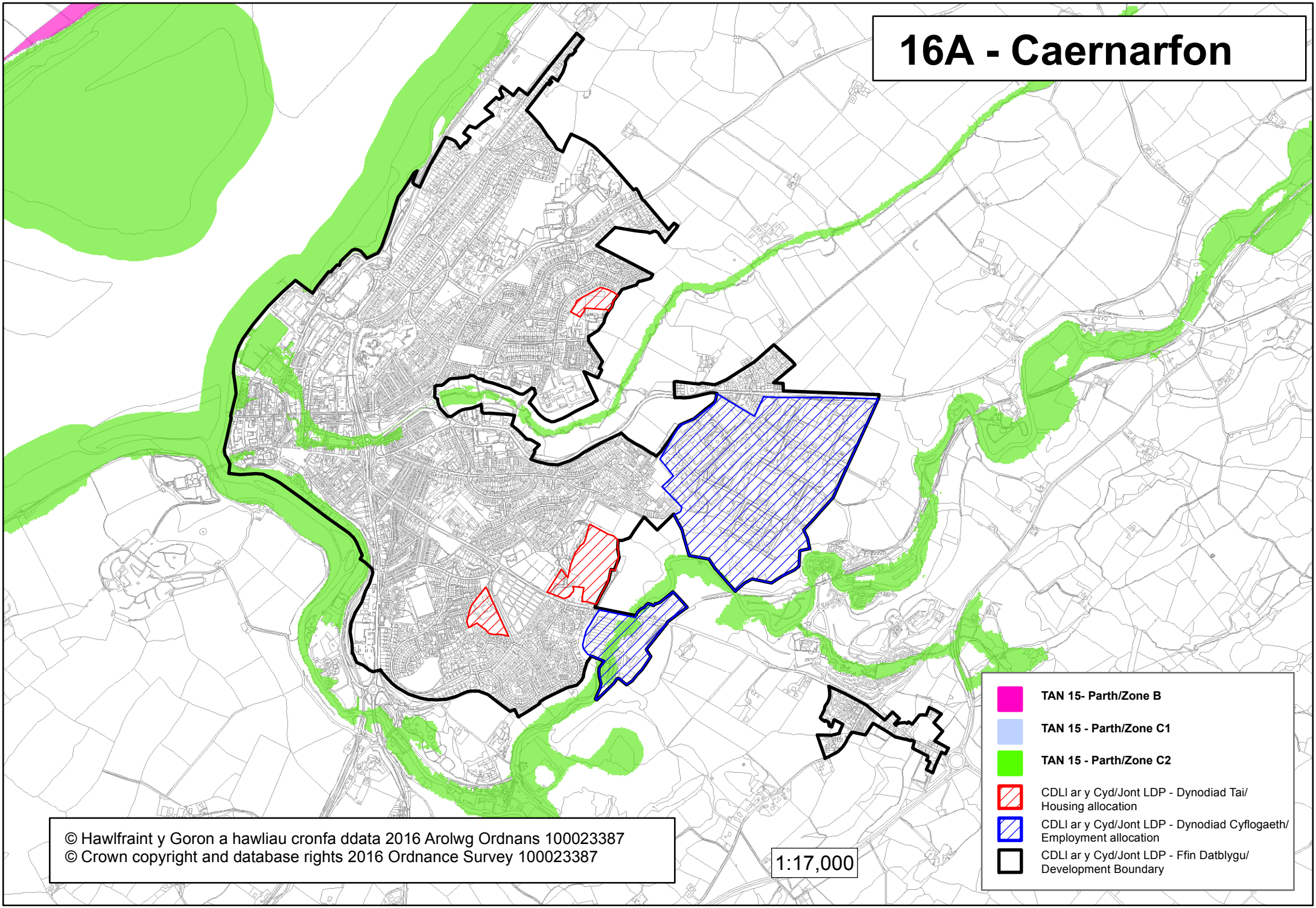
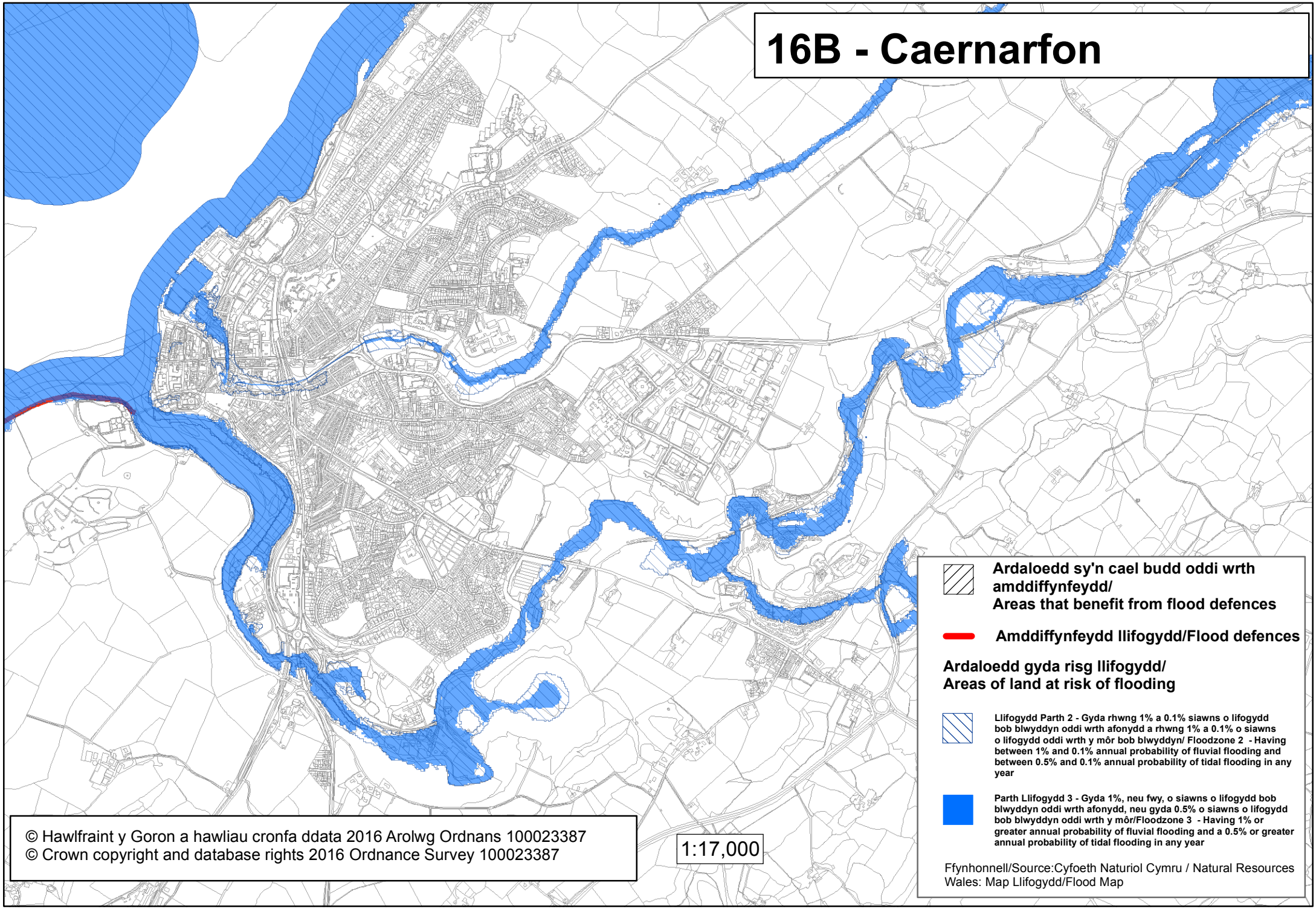
15C - Blaenau Ffestiniog



16A - Caernarfon



16B - Caernarfon



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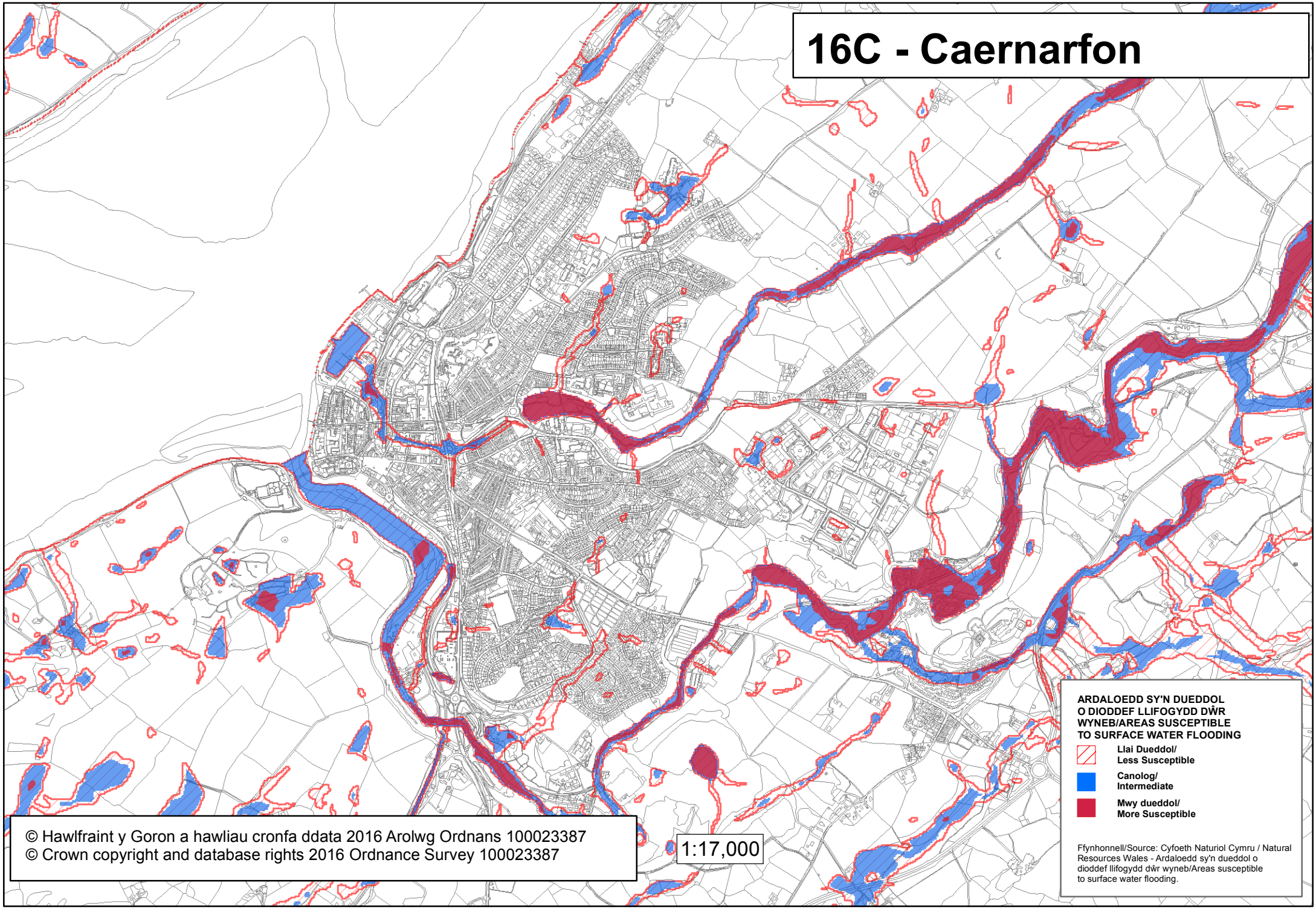
16C - Caernarfon



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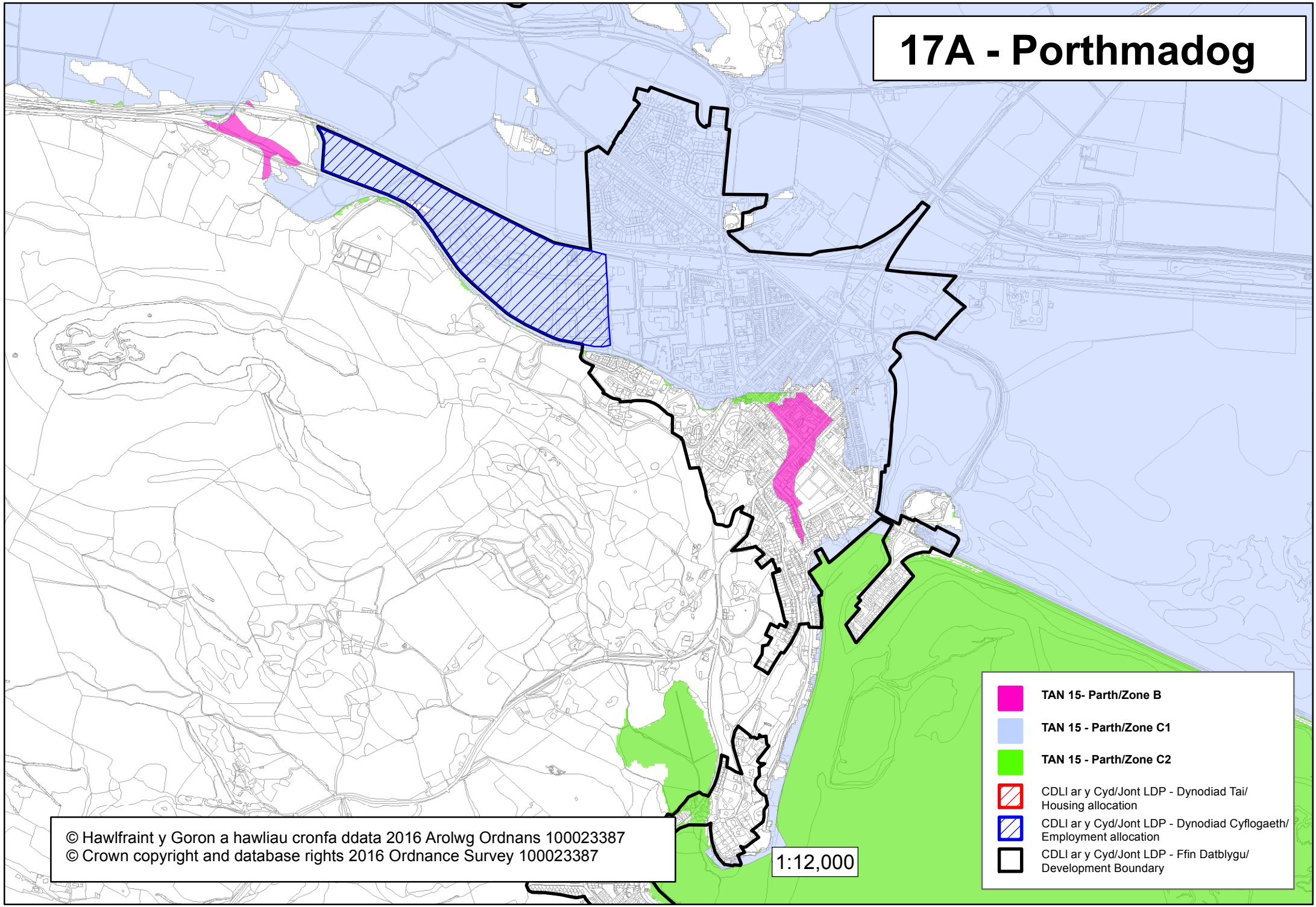
17A - Porthmadog
TAN 15- Parth/Zone B
TAN 15 - Parth/Zone C1
TAN 15 - Parth/Zone C2
CDLI ar y Cyd/Jont LDP - Dynodiad Tai/ Housing allocation
CDLI ar y Cyd/Jont LDP - Dynodiad Cyflogaeth/ Employment allocation
CDLI ar y Cyd/Jont LDP - Ffin Datblygu/ Development Boundary
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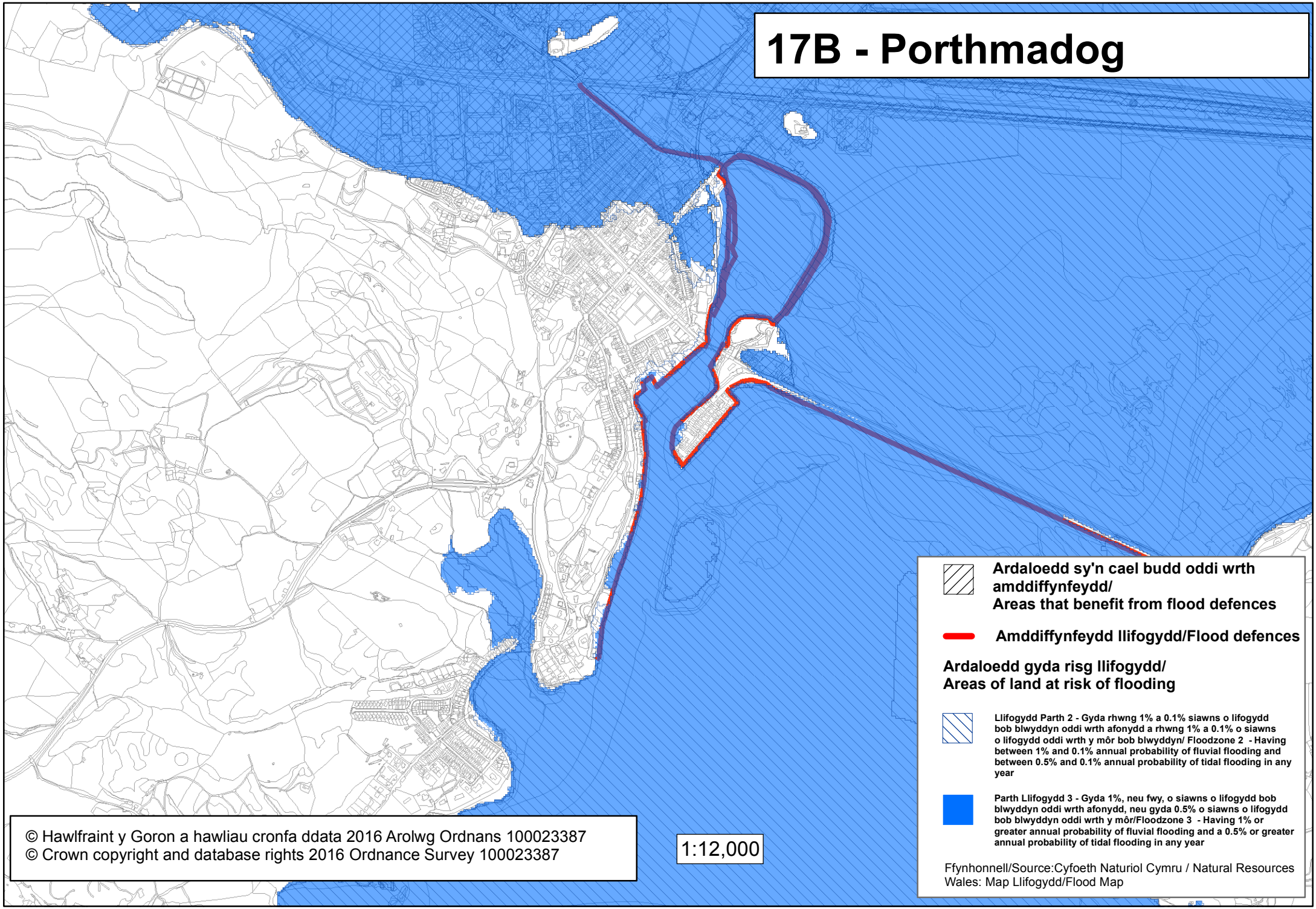
17B - Porthmadog



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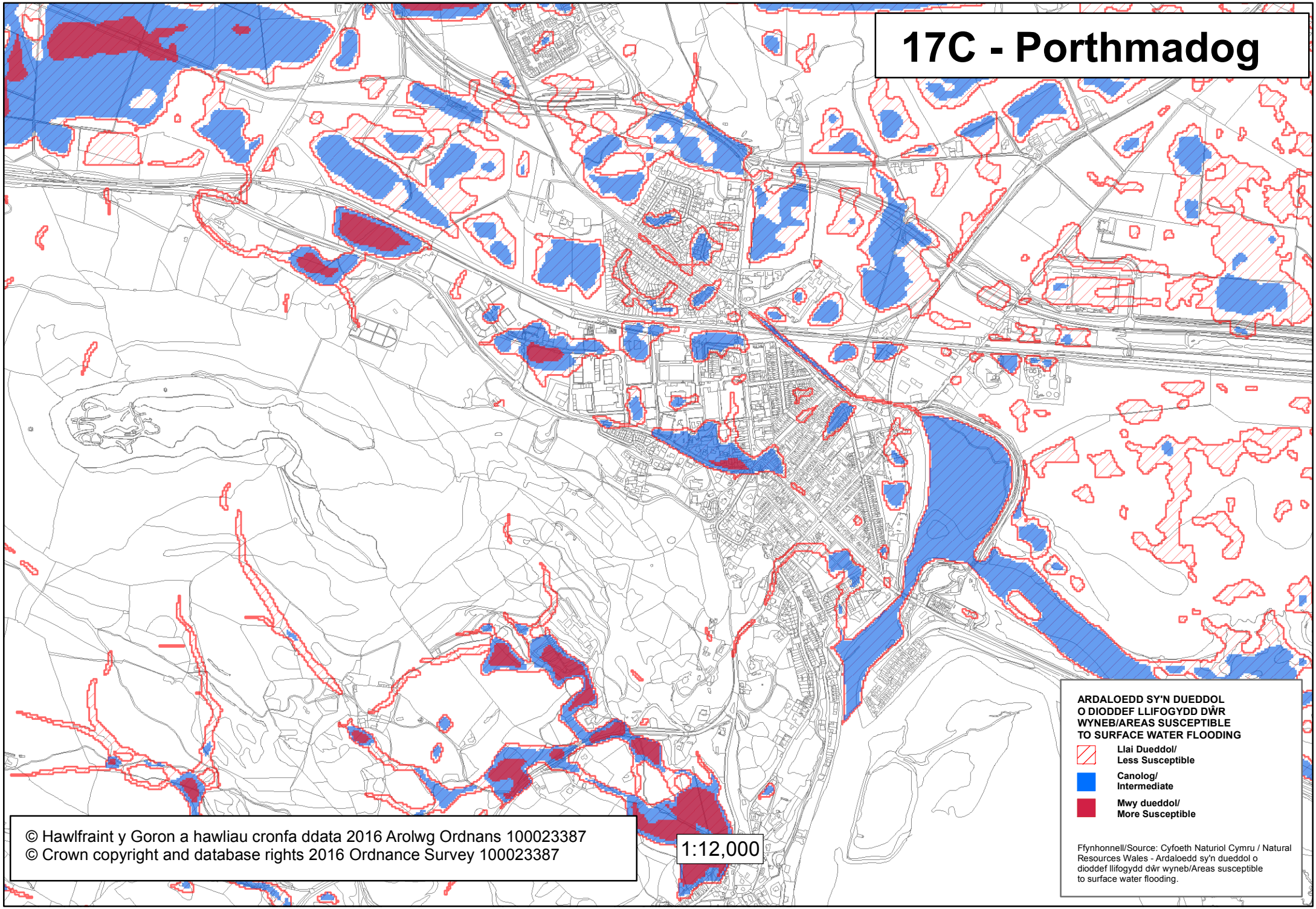
17C - Porthmadog



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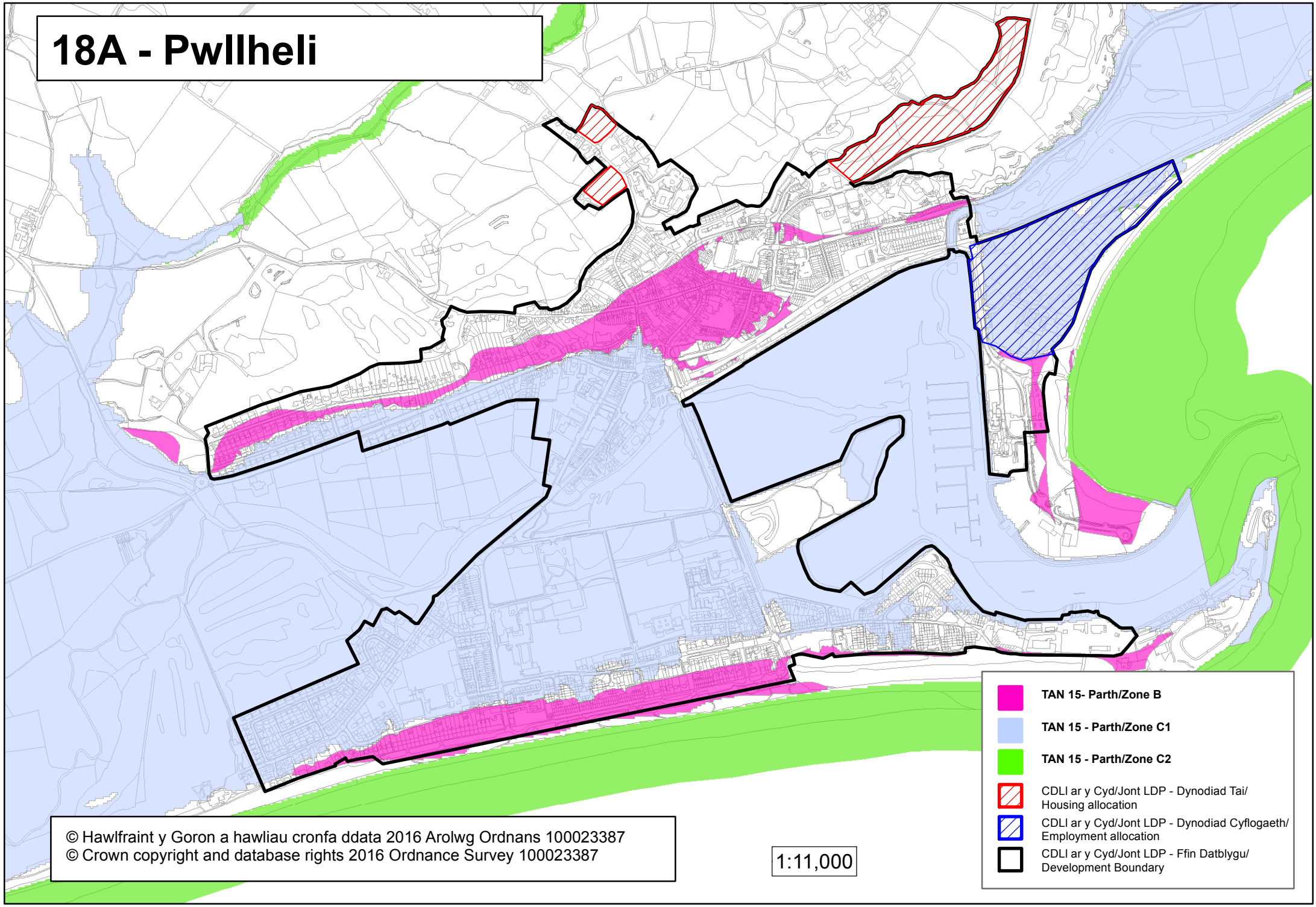
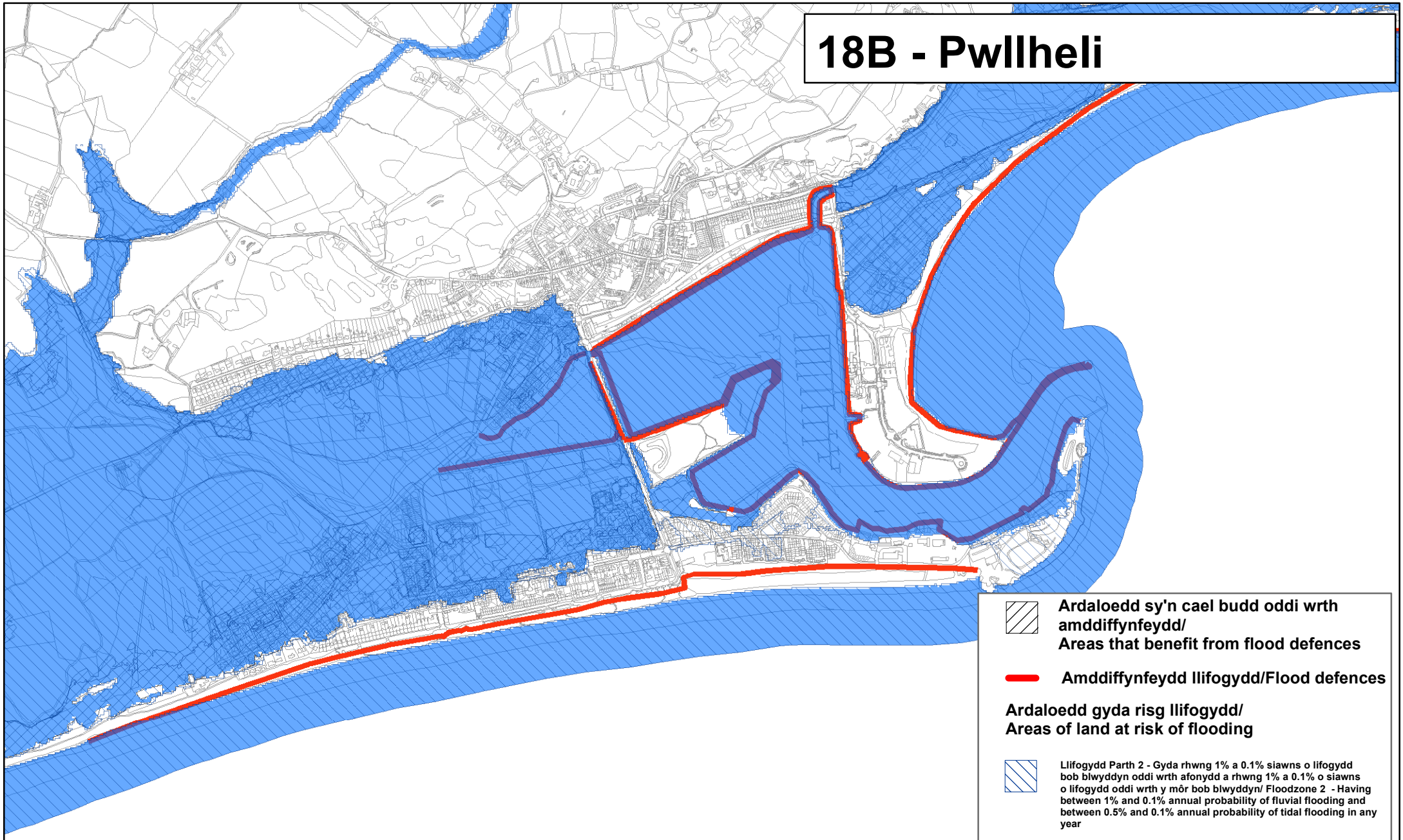
18A - Pwllheli



1:11,000

18B - Pwllheli



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

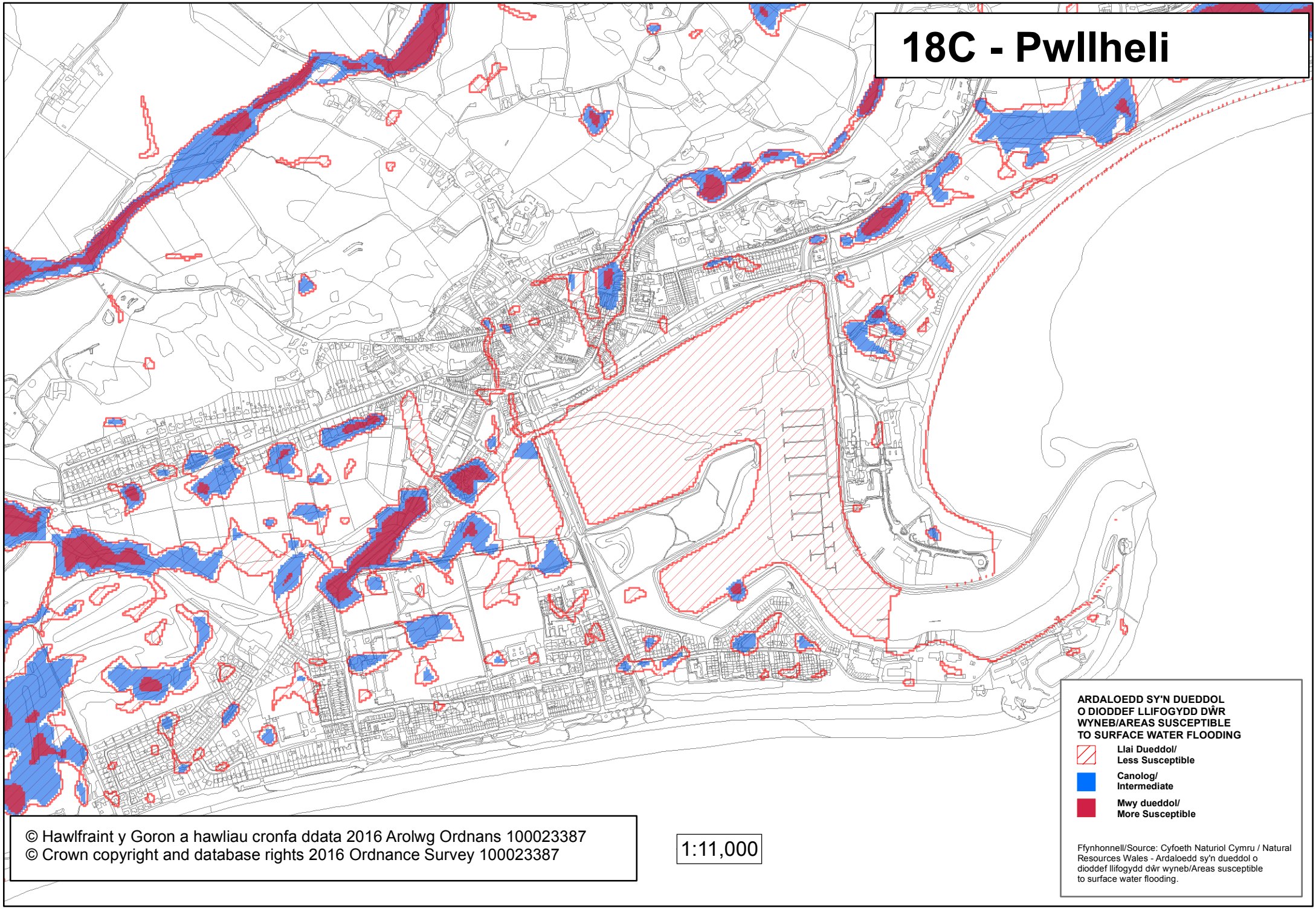
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:14,000

18C - Pwllheli



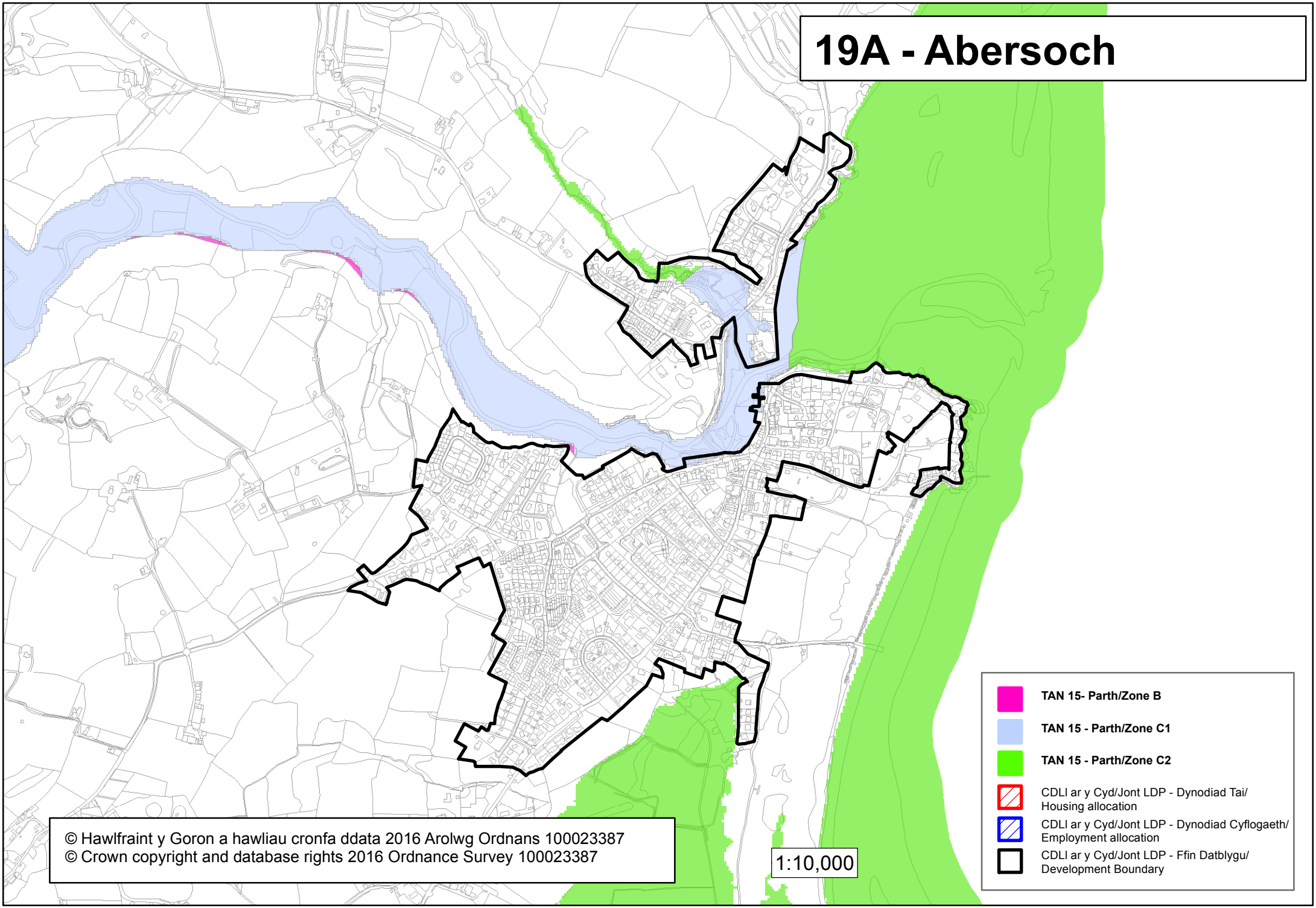
ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- Llai Dueddol/ Less Susceptible
- Canolog/ Intermediate
- Mwy dueddol/ More Susceptible

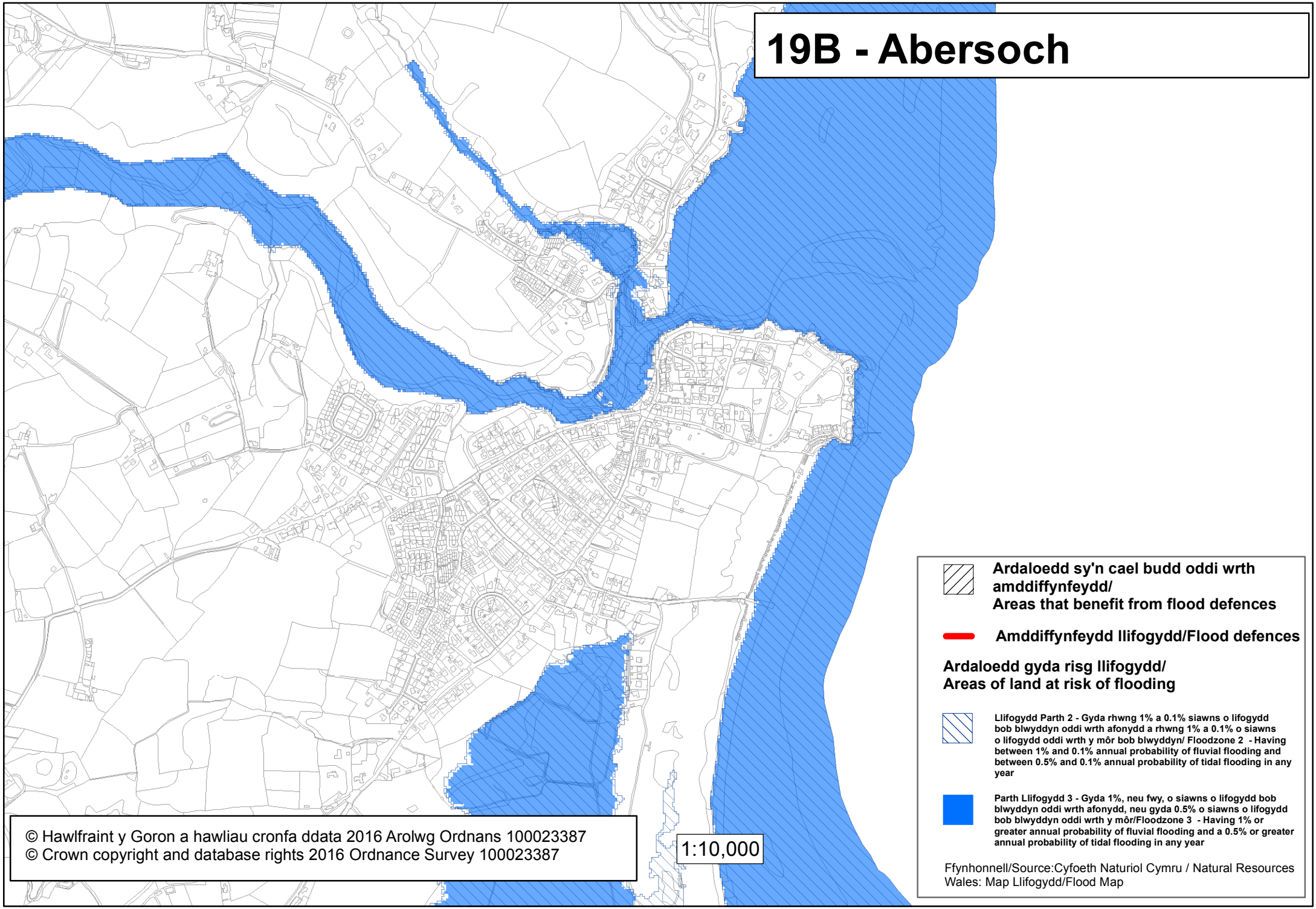
Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

1:11,000

19A - Abersoch



19B - Abersoch



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

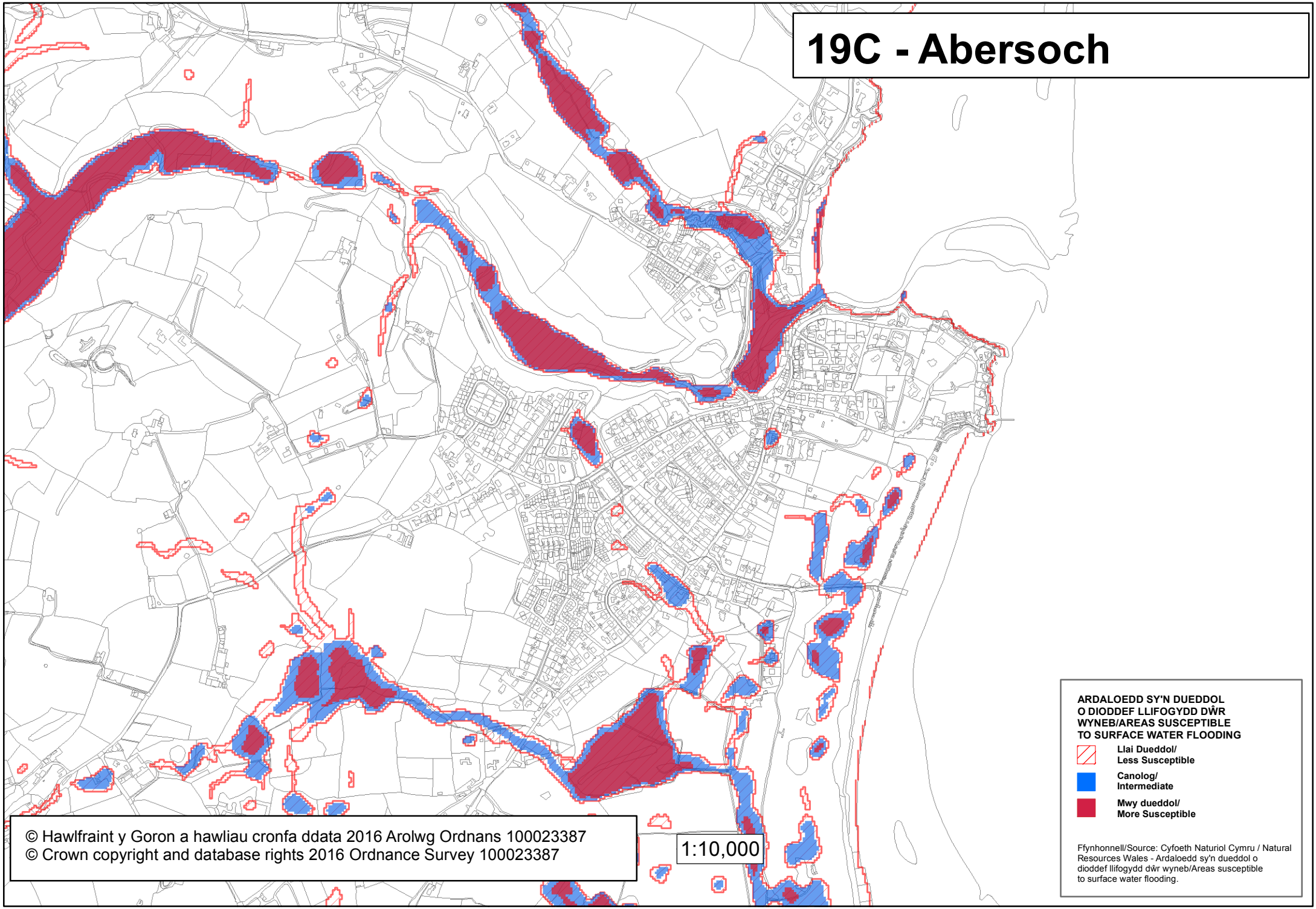
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:10,000

19C - Abersoch



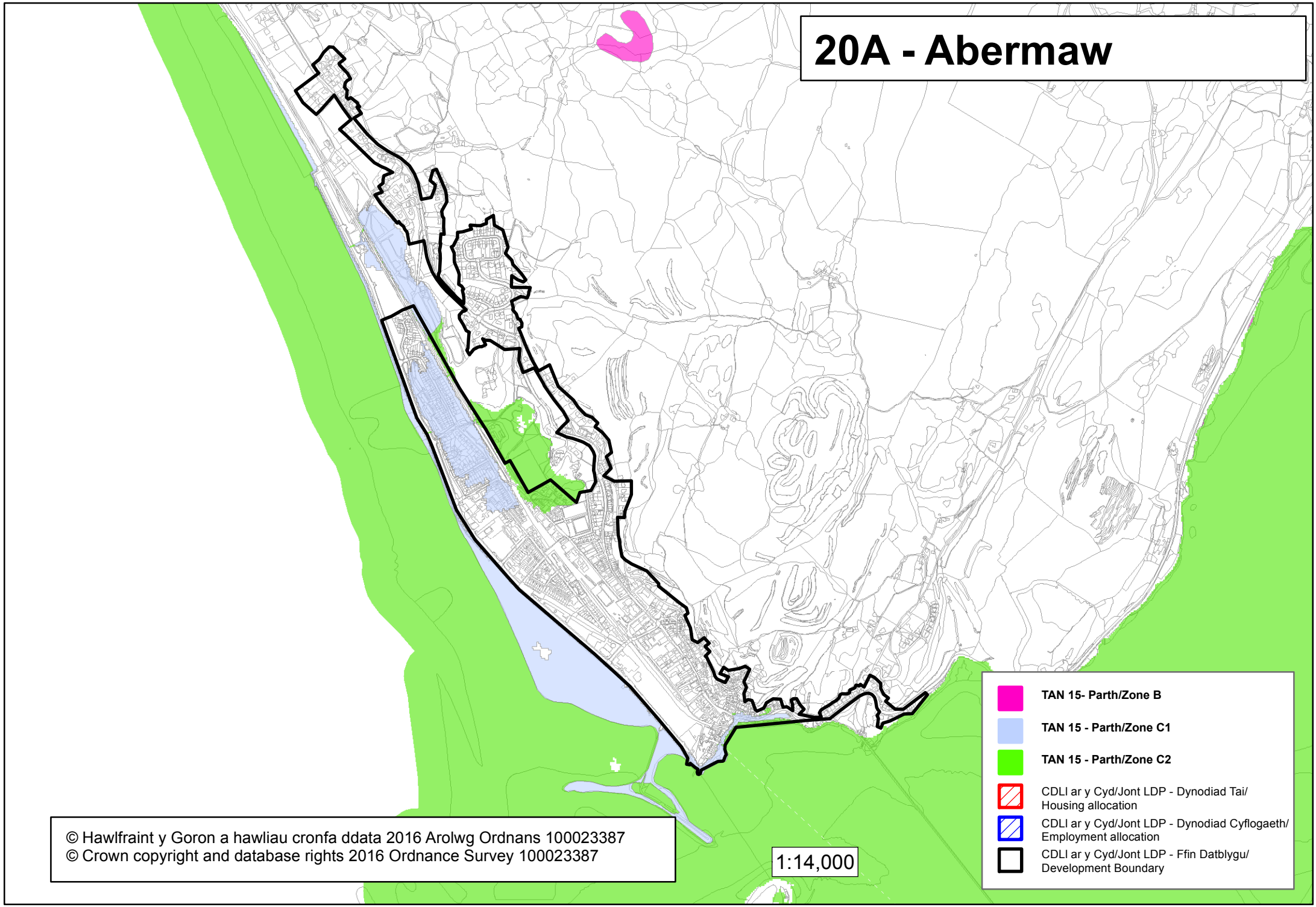
1:10,000

ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

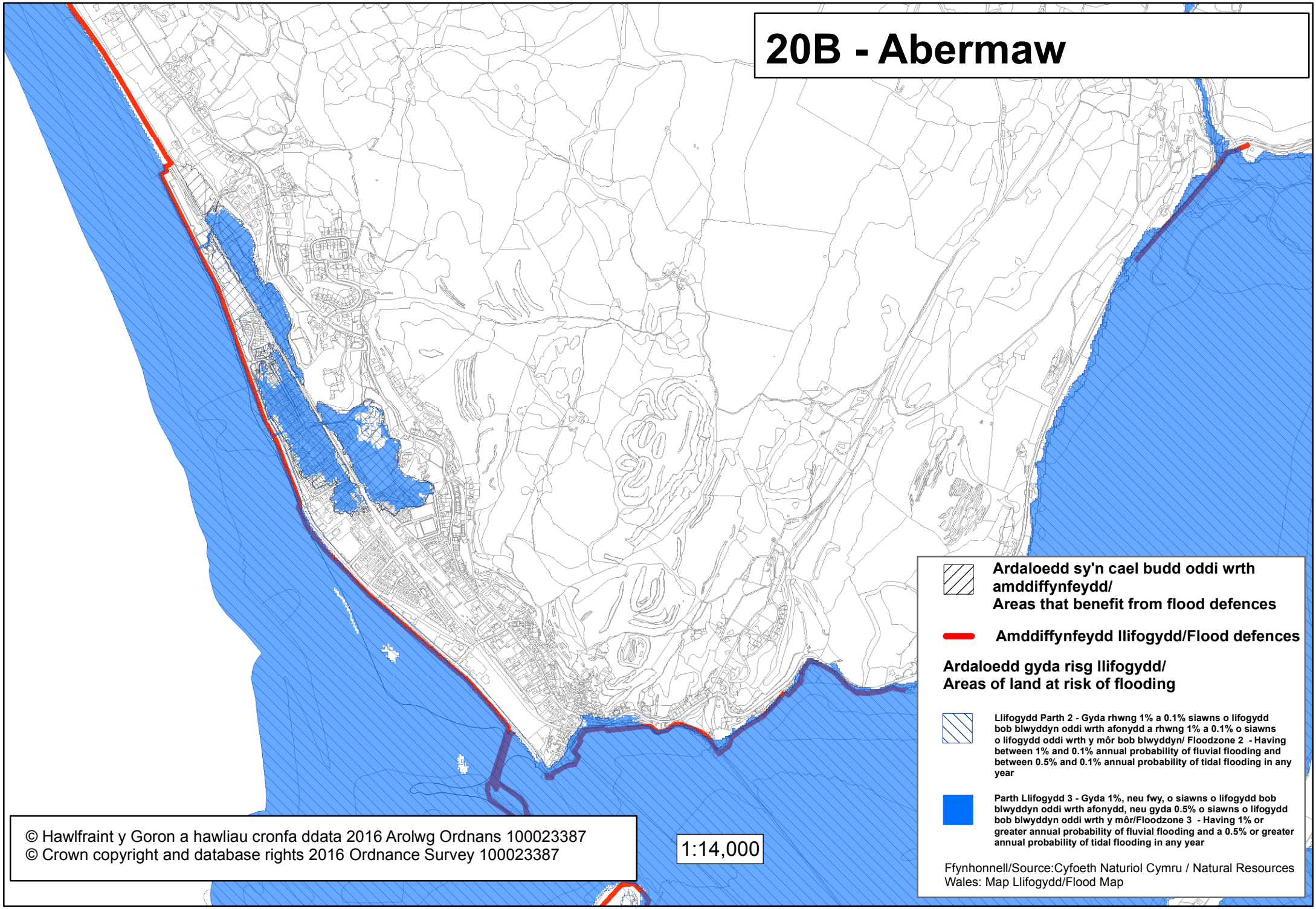
- **Llai Dueddol/ Less Susceptible**
- **Canolog/ Intermediate**
- **Mwy dueddol/ More Susceptible**

Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

20A - Abermaw



20B - Abermaw



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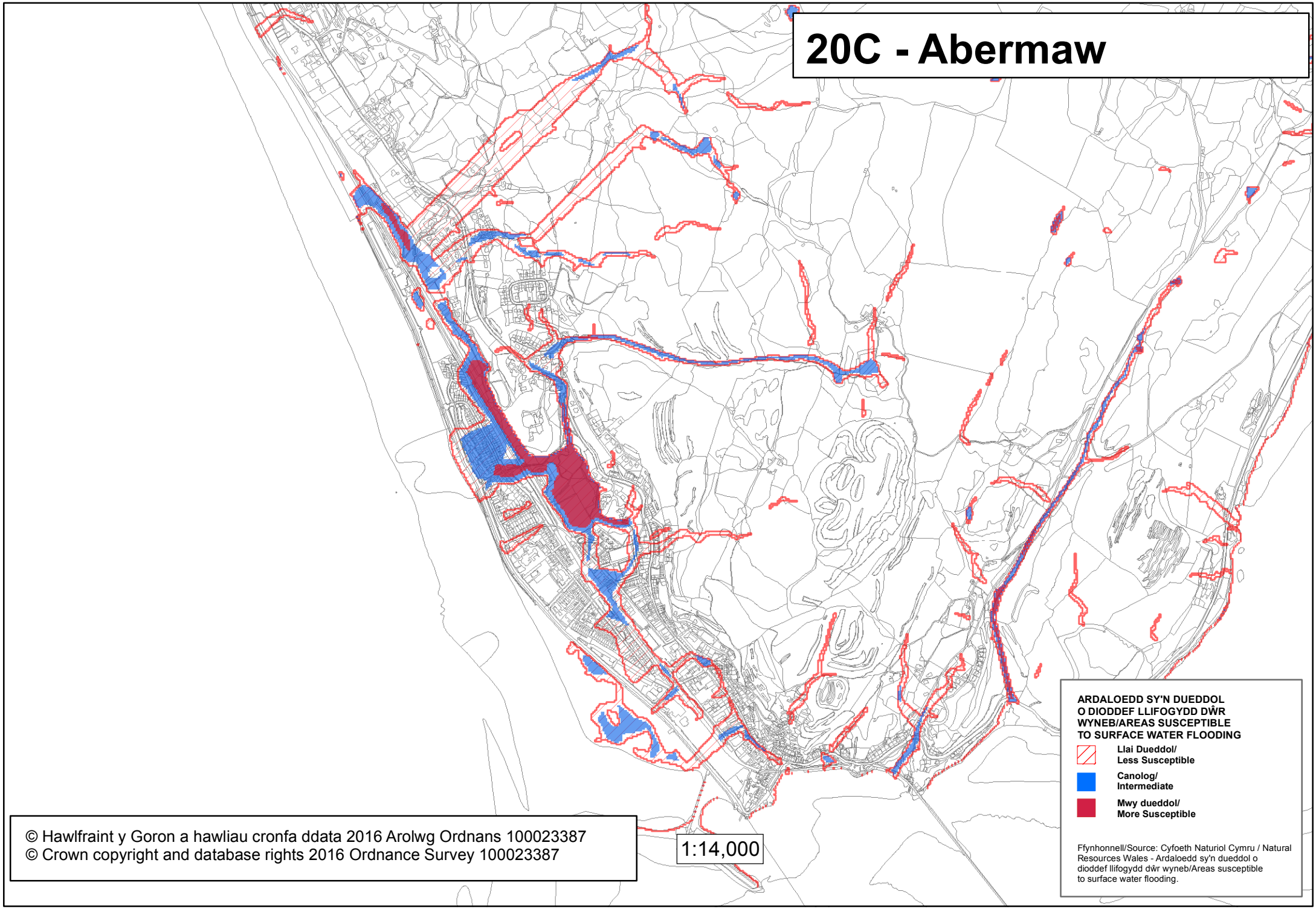
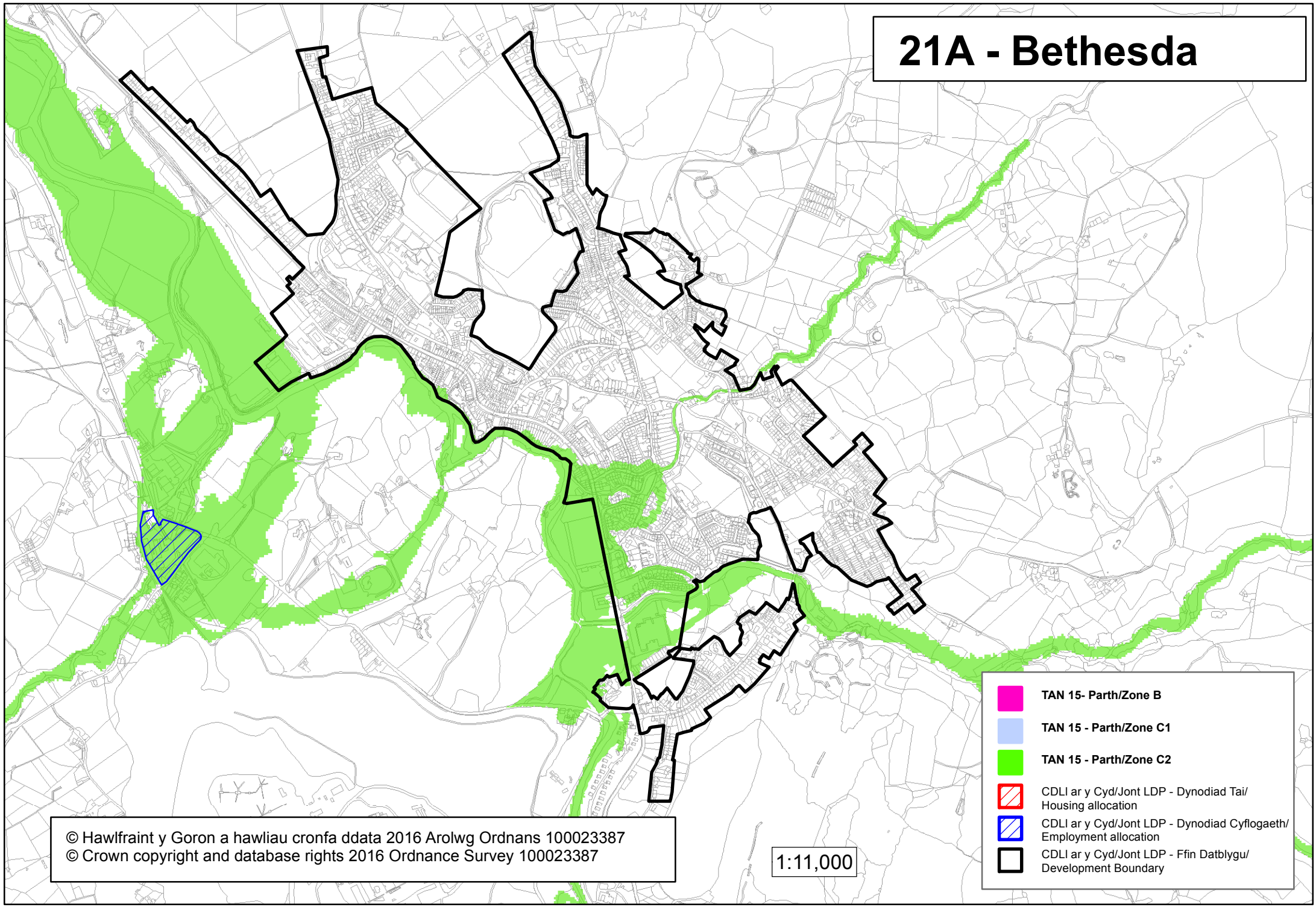
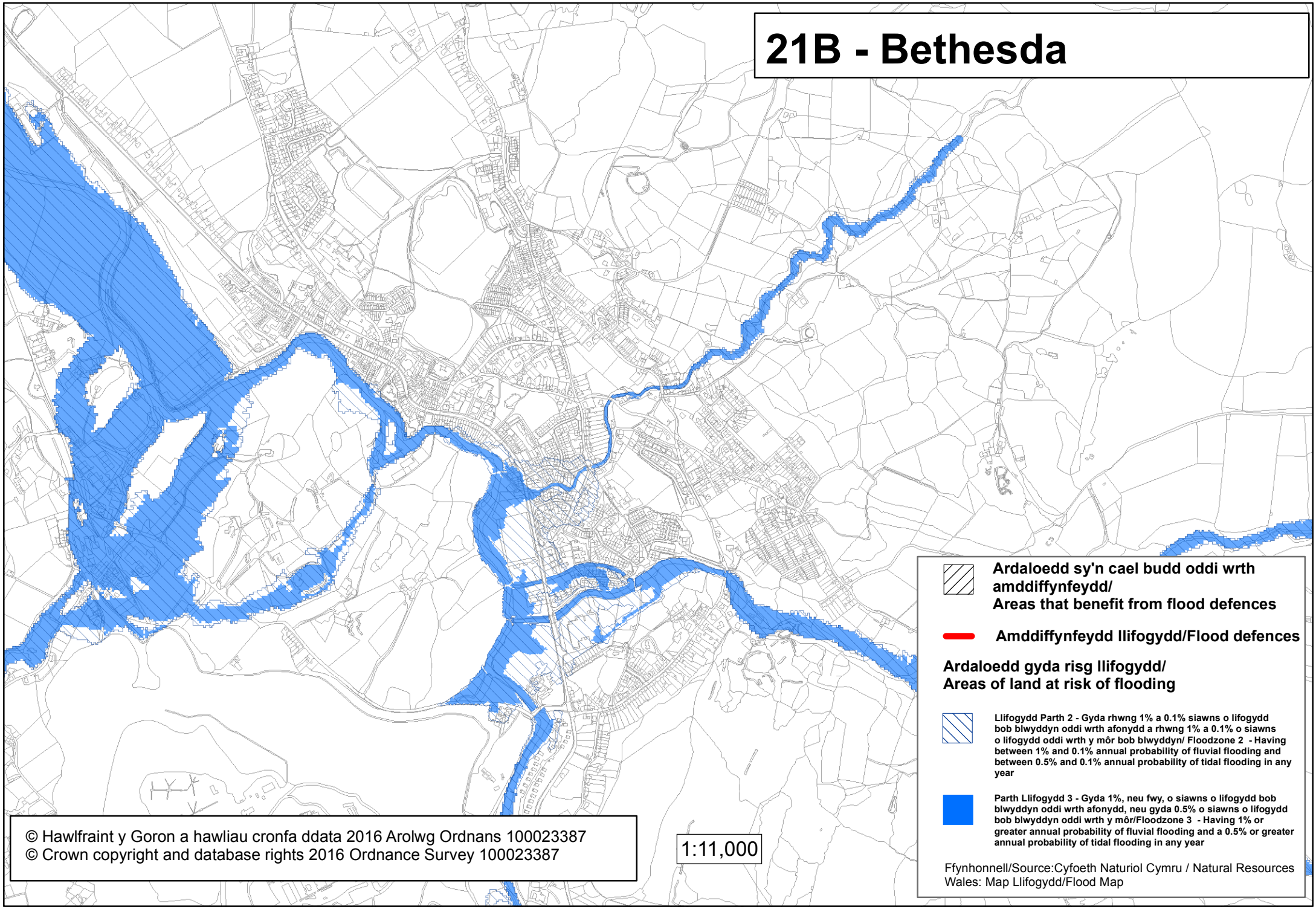
20C - Abermaw



21A - Bethesda

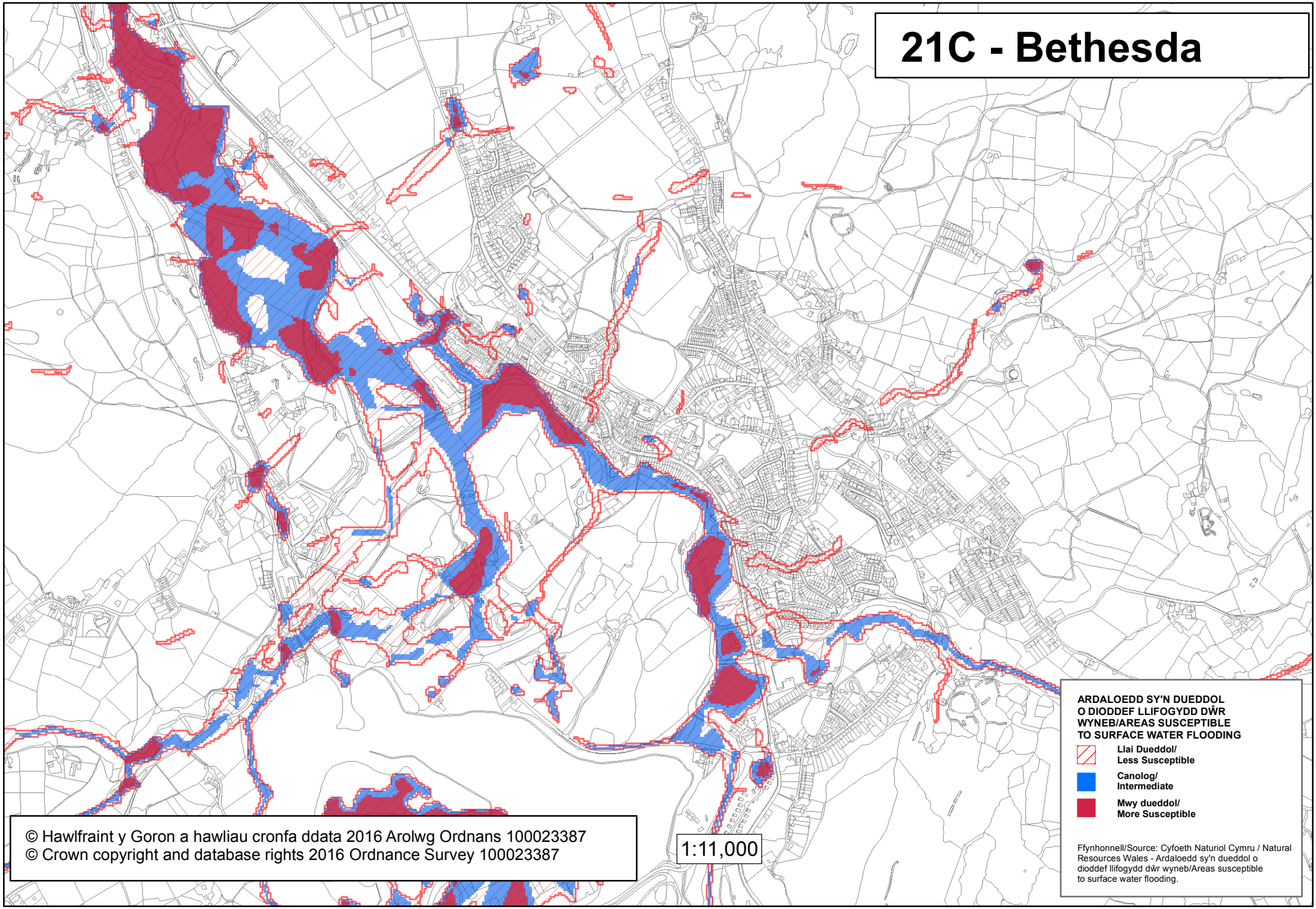


21B - Bethesda



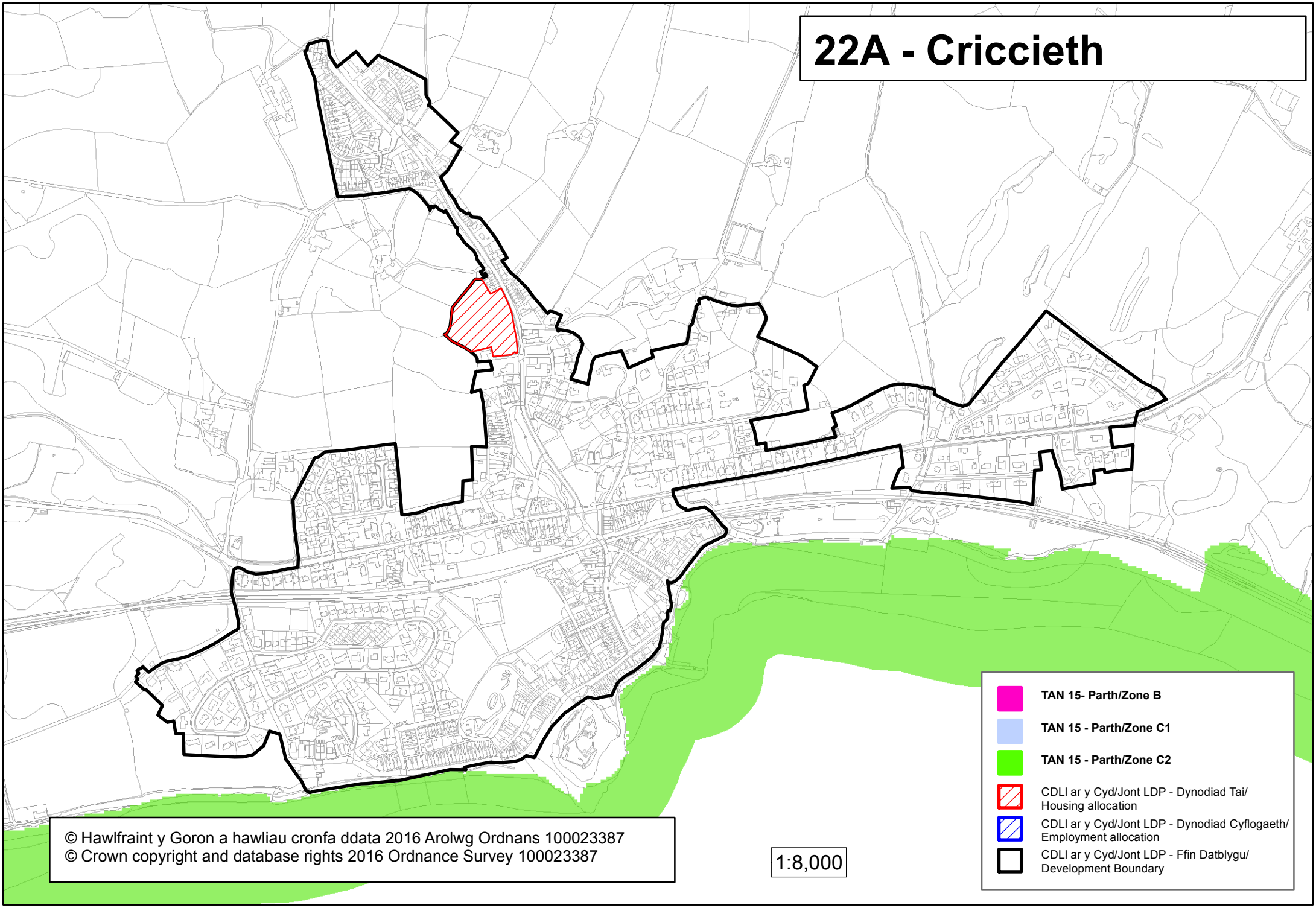
1:11,000

21C - Bethesda



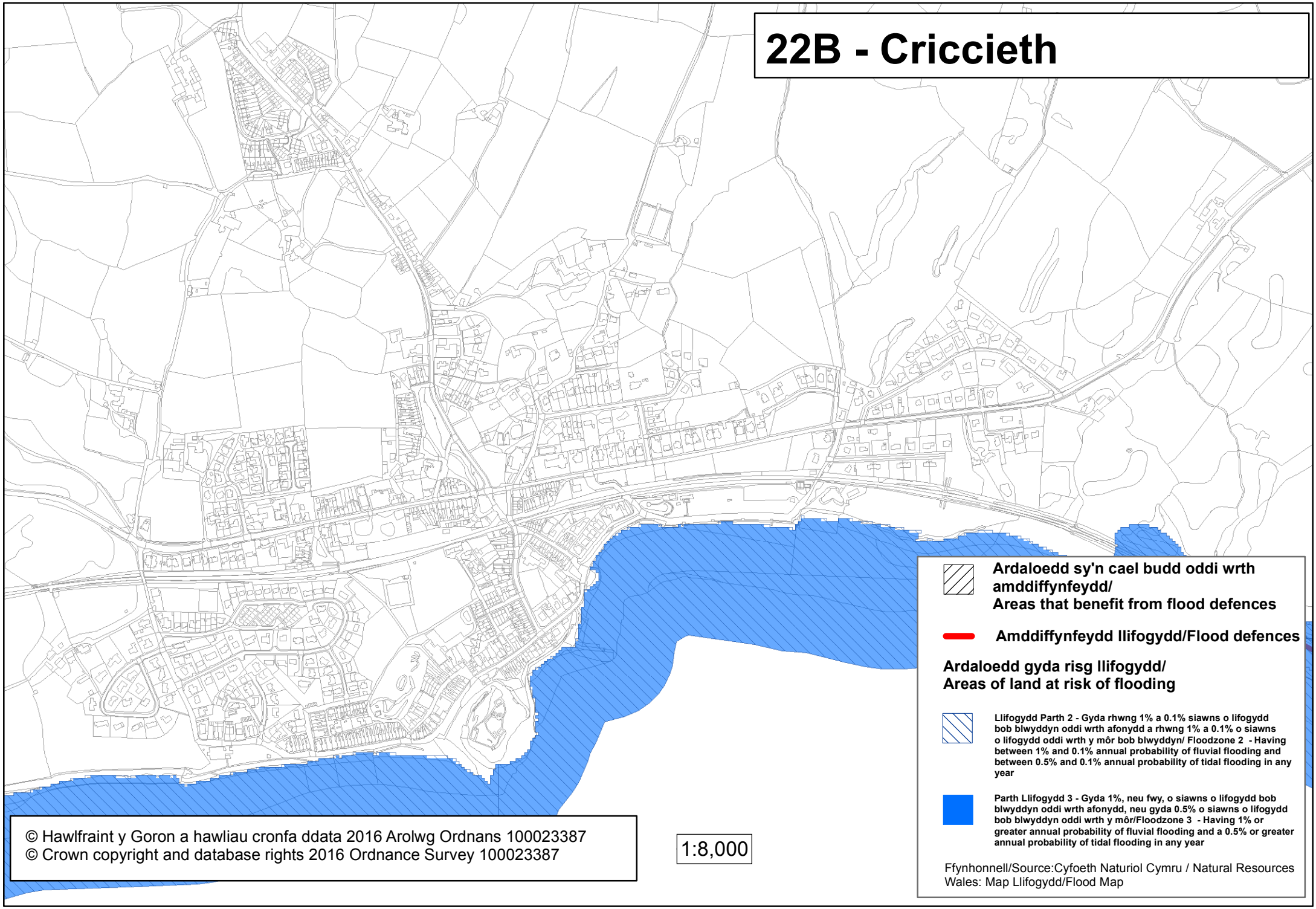
1:11,000

22A - Criccieth



1:8,000

22B - Criccieth



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

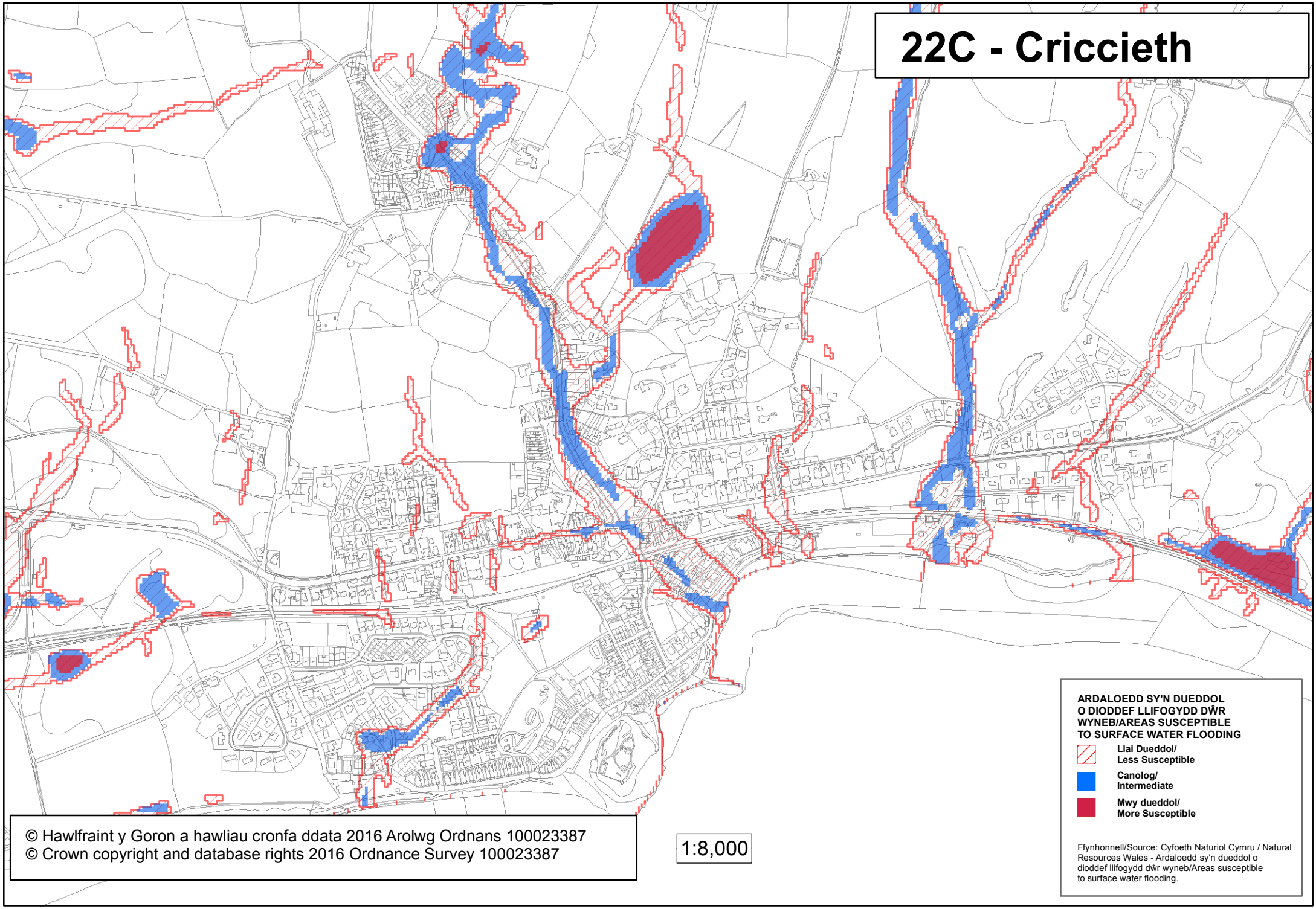
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

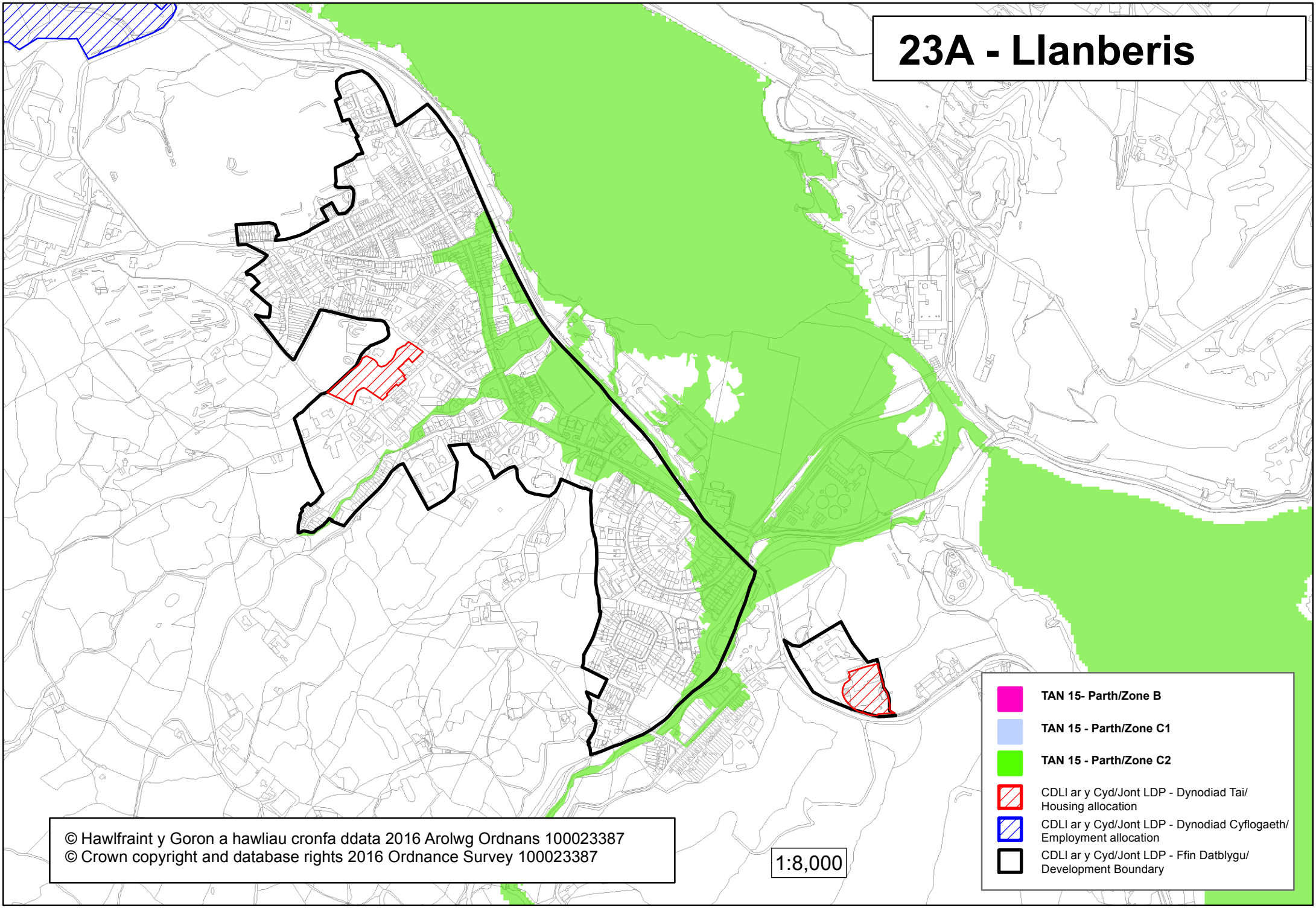
1:8,000

22C - Criccieth

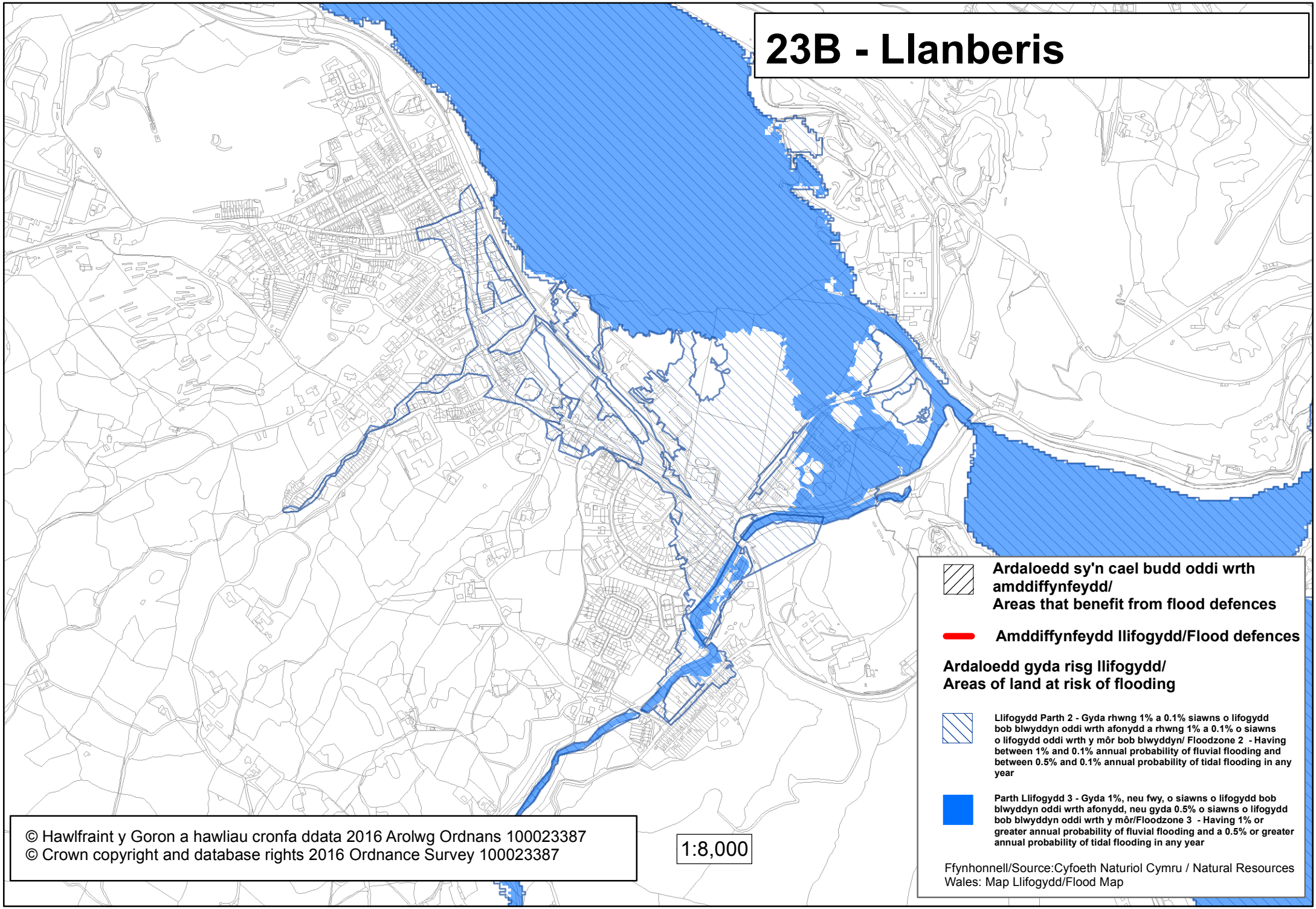


1:8,000

23A - Llanberis



23B - Llanberis



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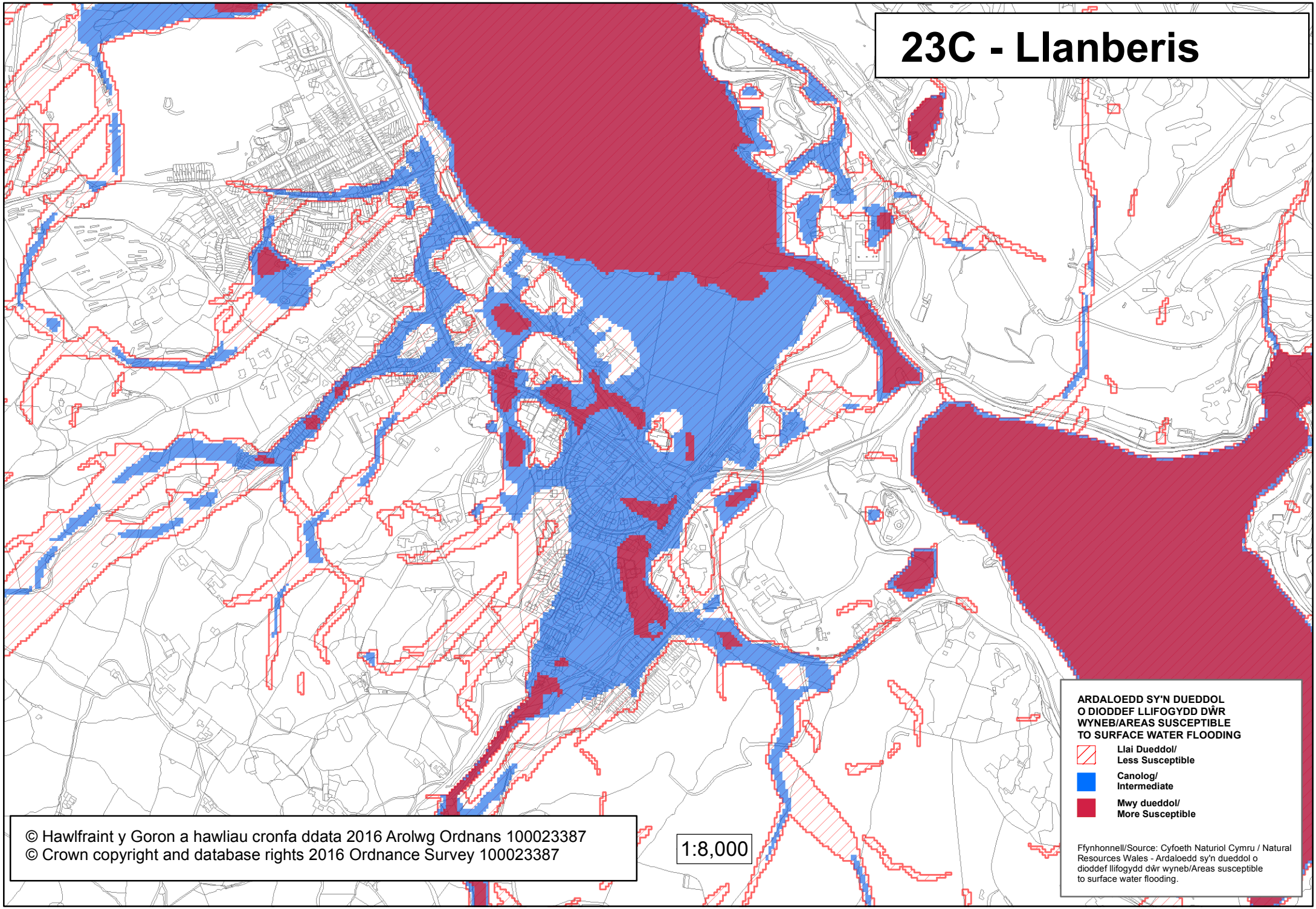
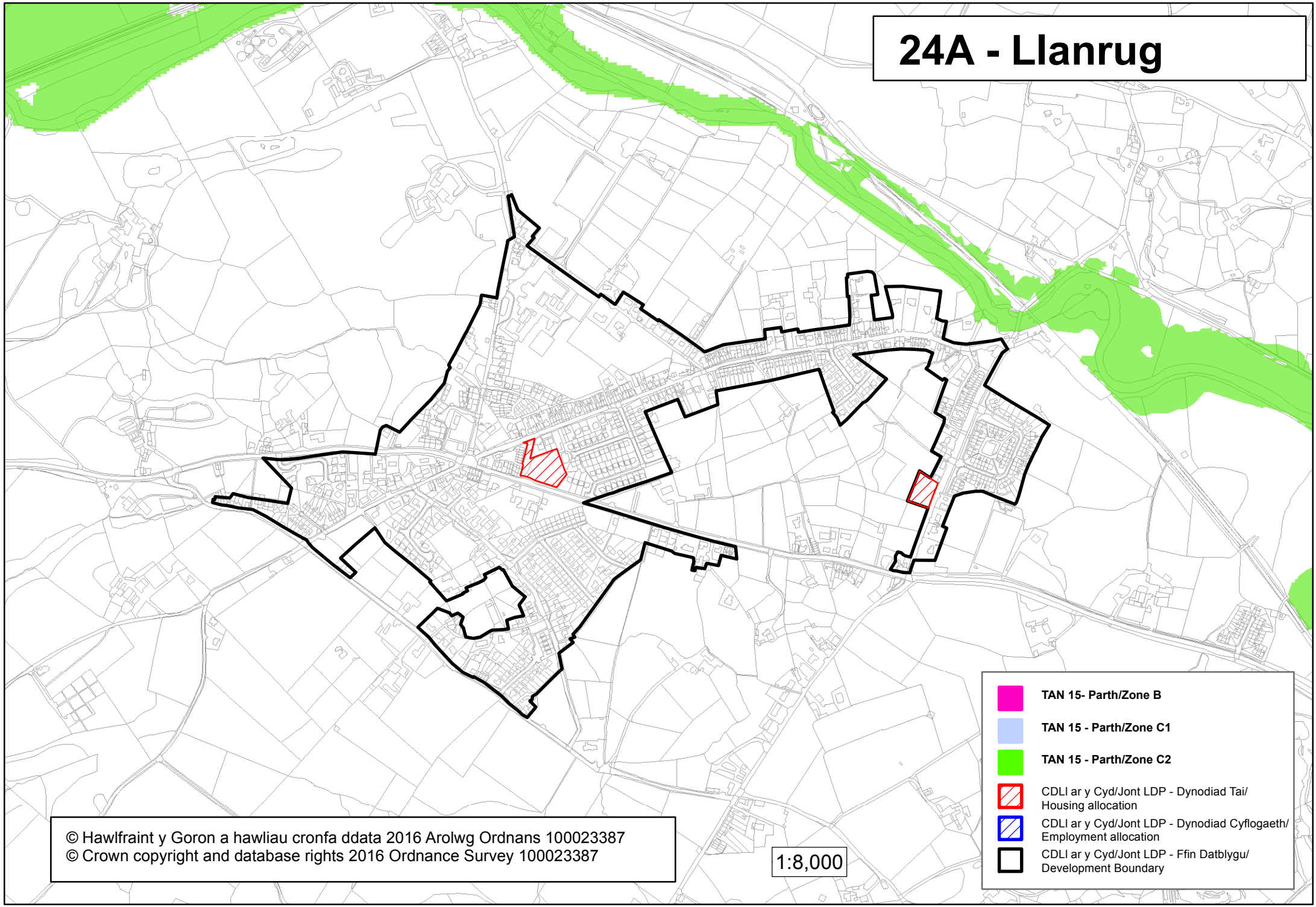
23C - Llanberis

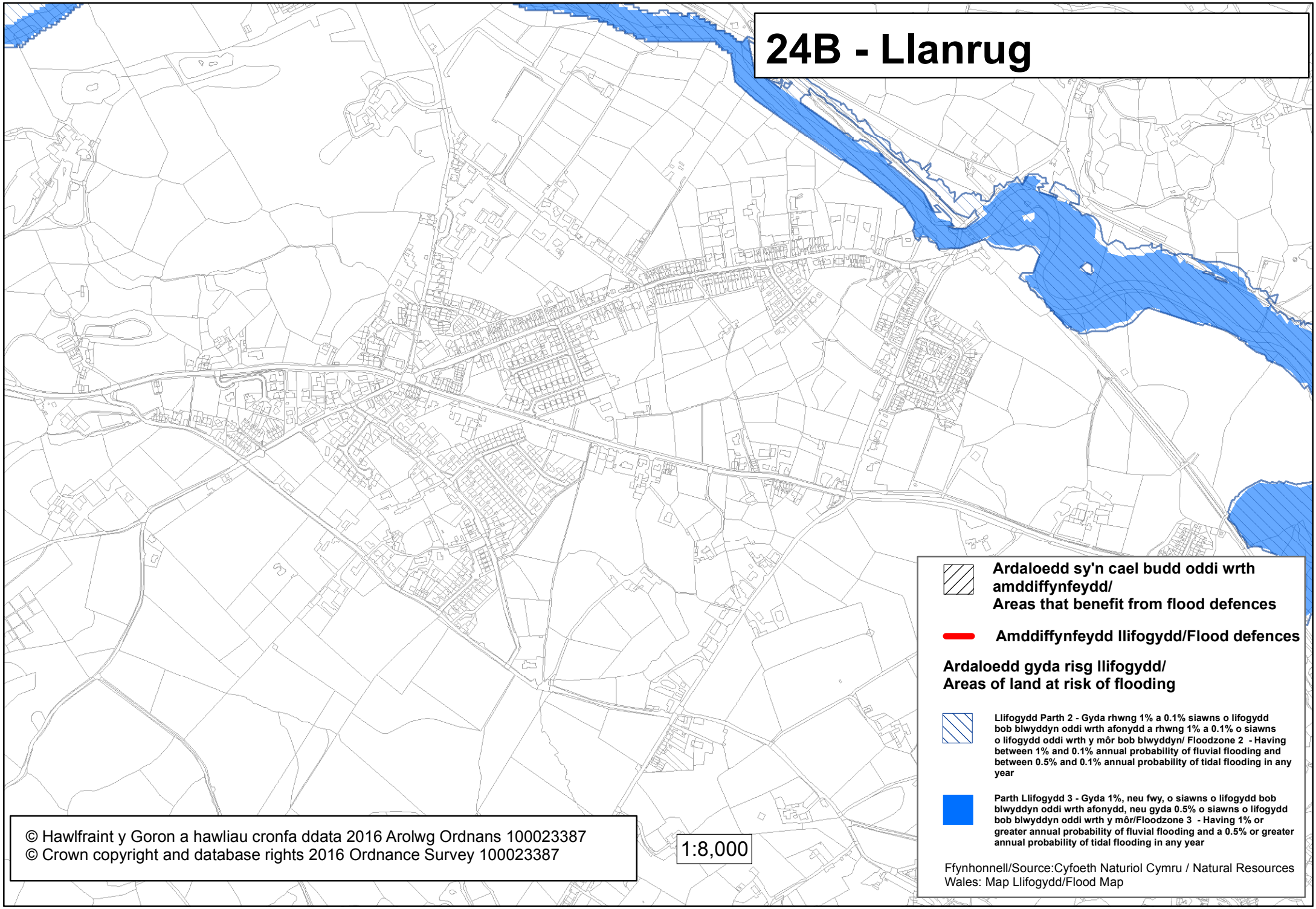


1:8,000

24A - Llanrug

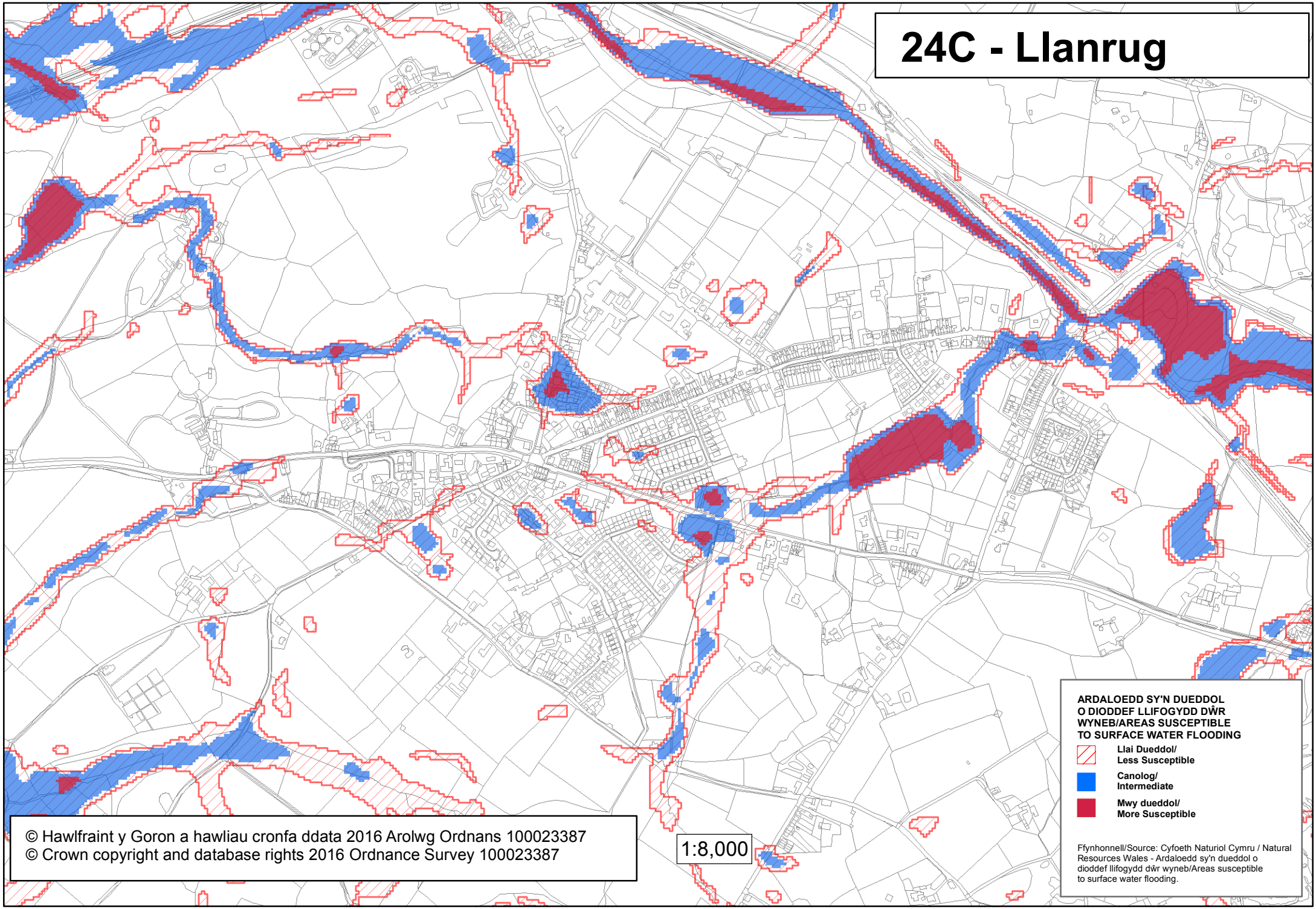


24B - Llanrug



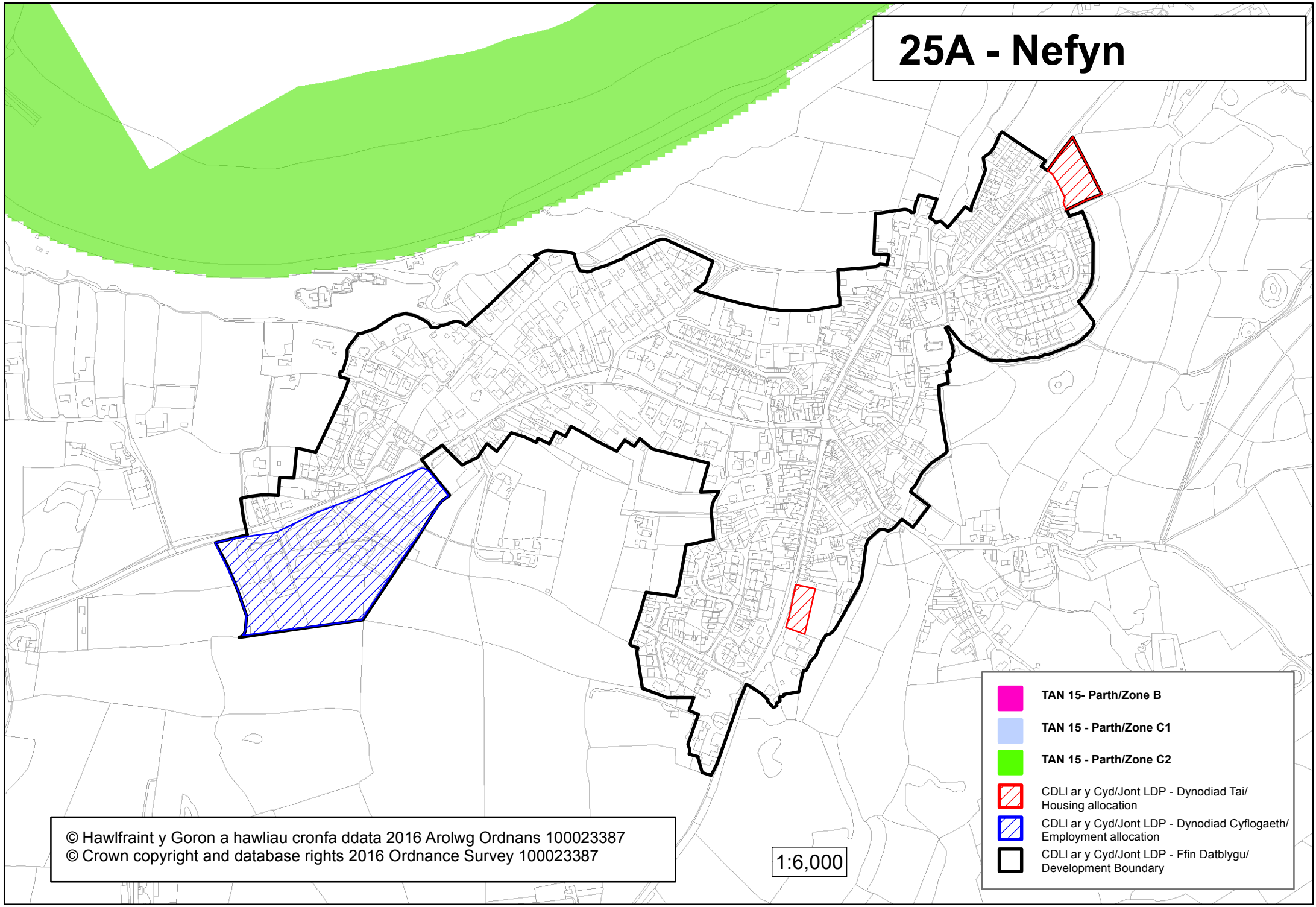
1:8,000

24C - Llanrug

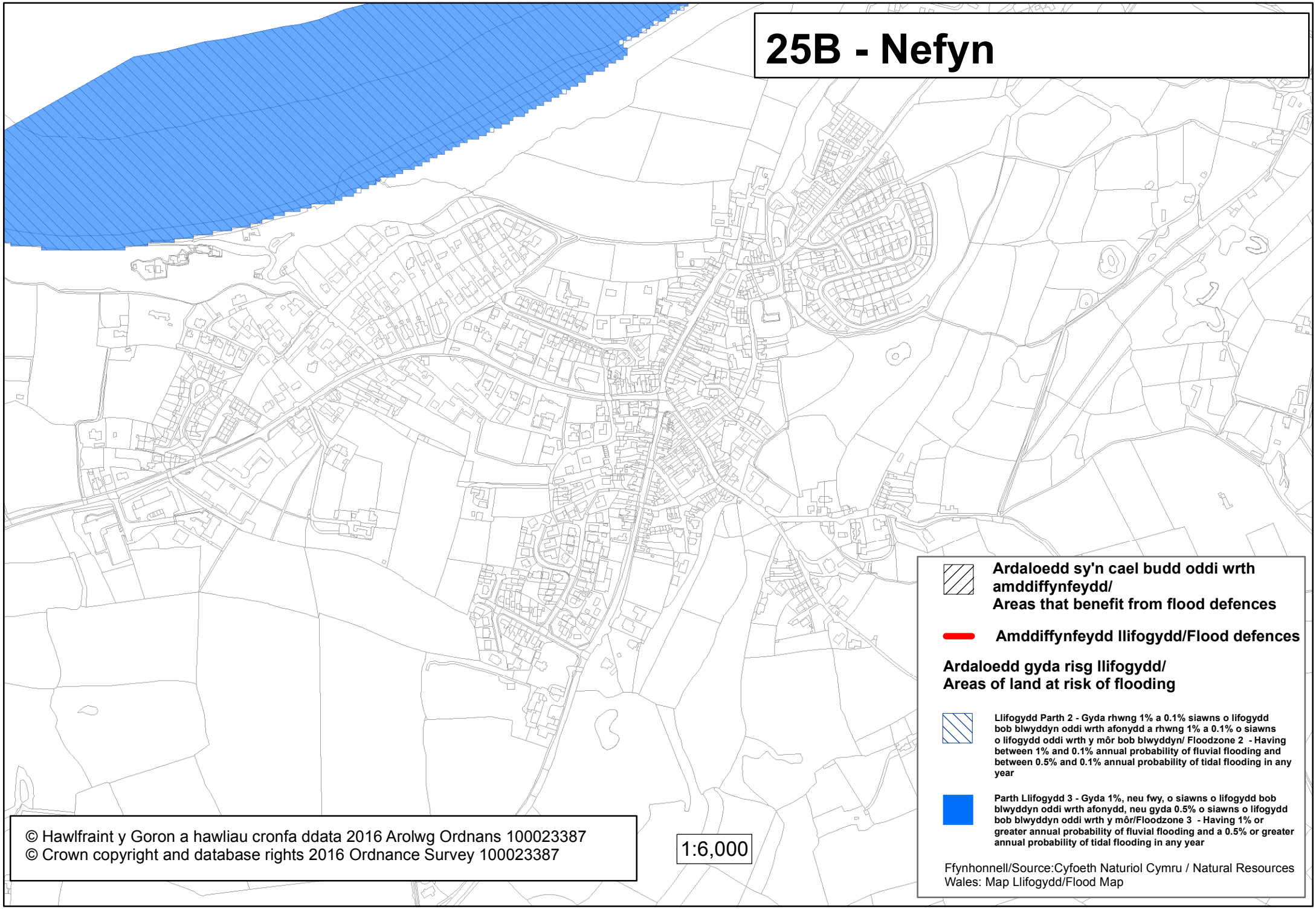


1:8,000

25A - Nefyn



25B - Nefyn



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

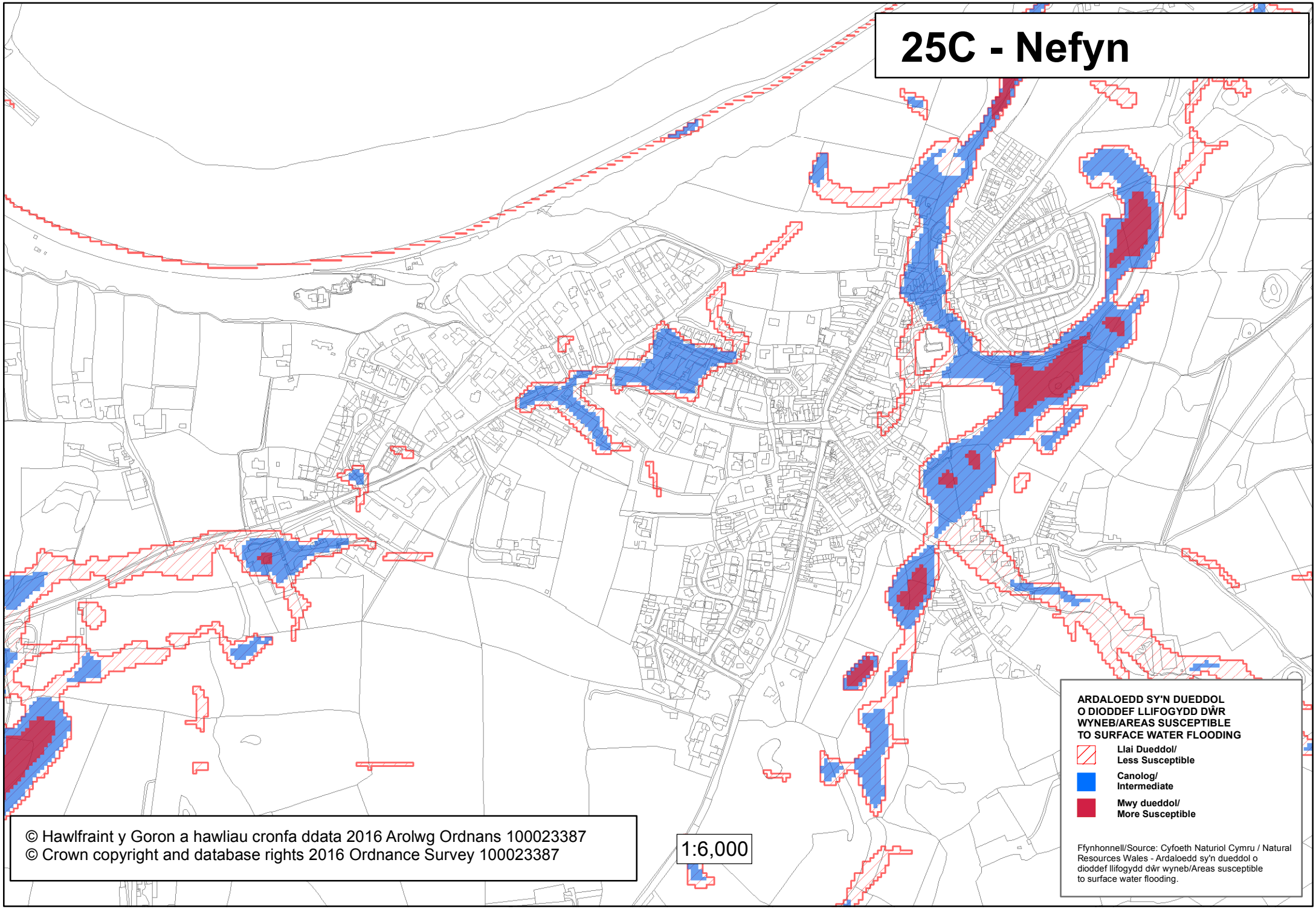
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

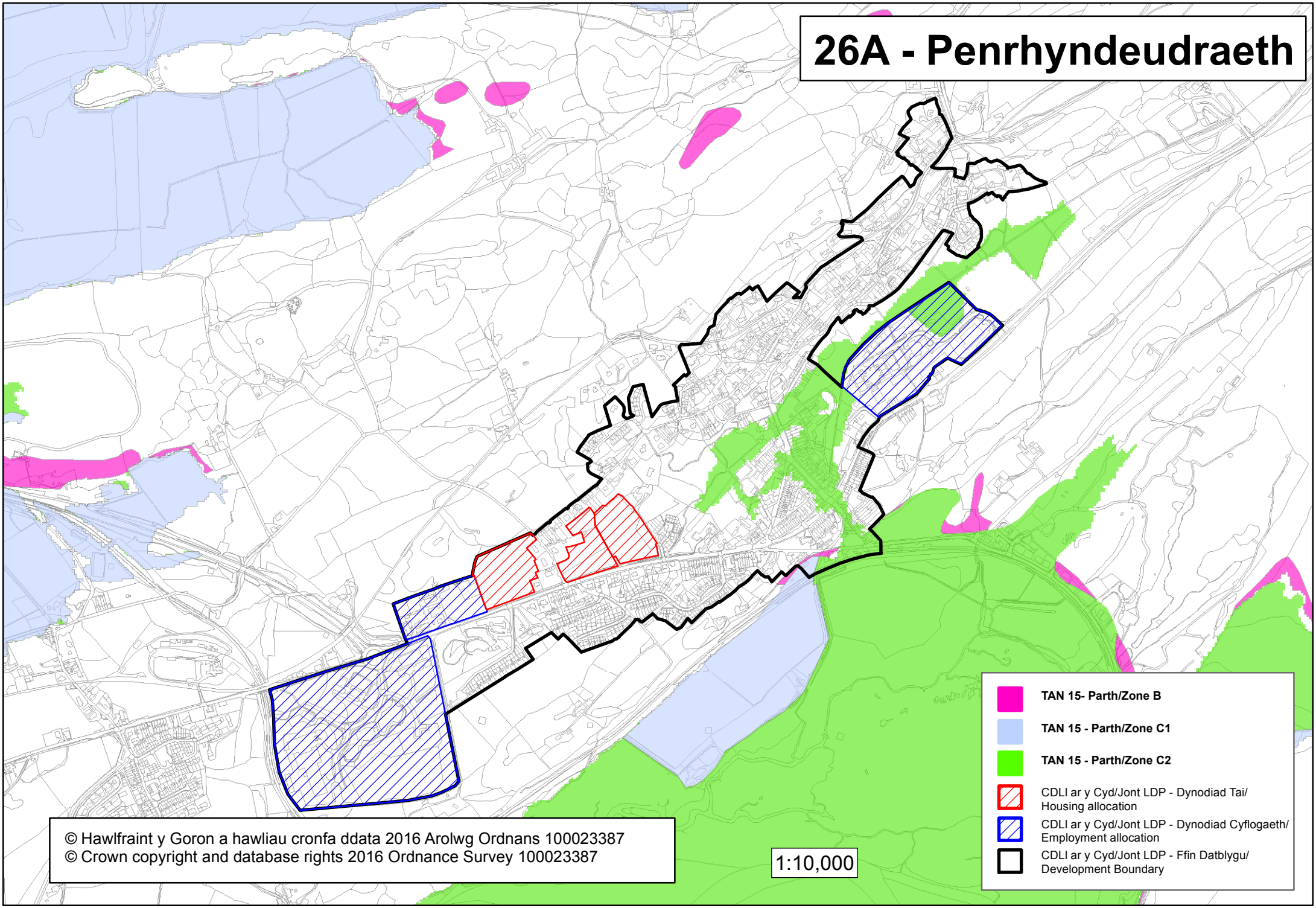
1:6,000

25C - Nefyn

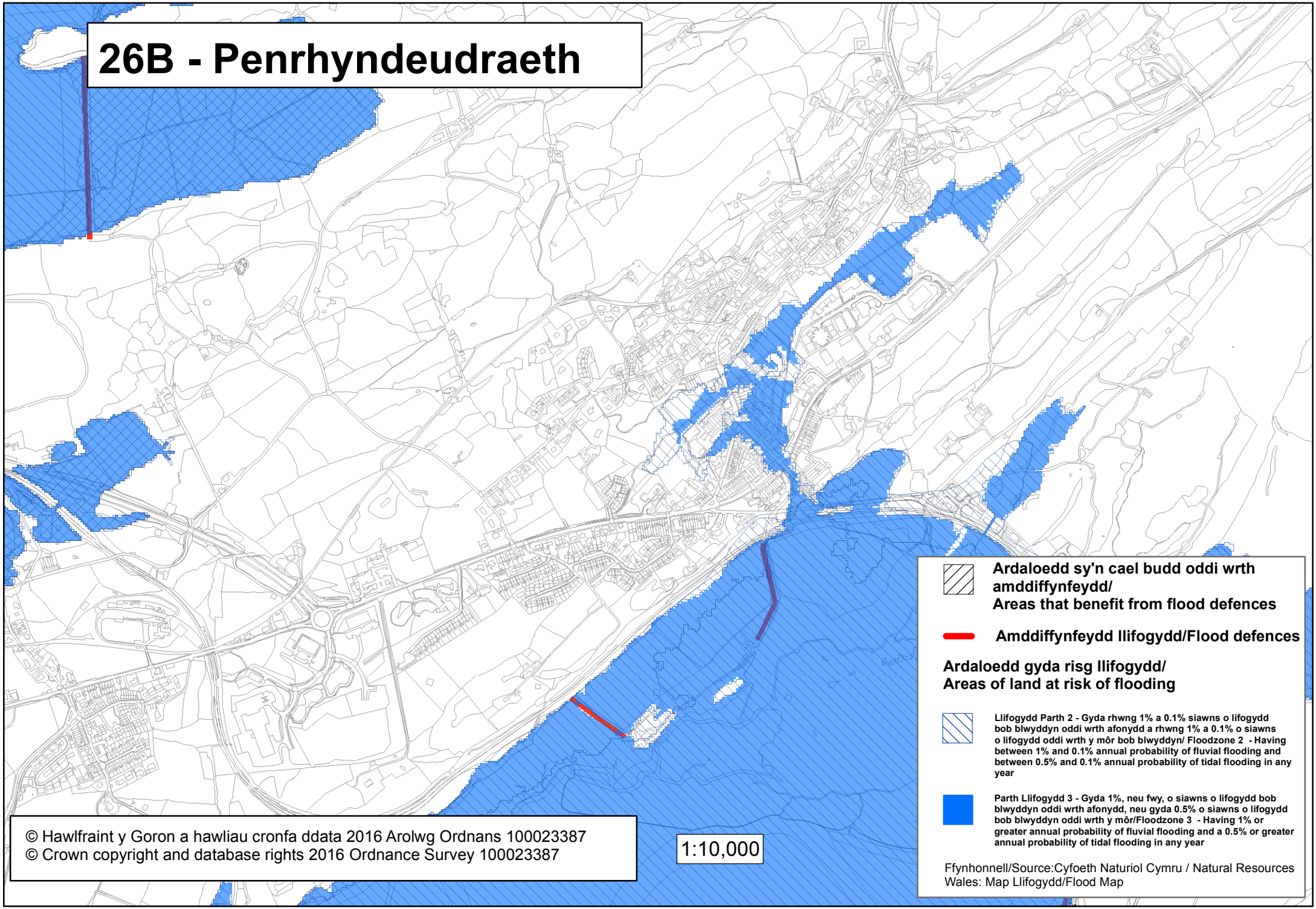


1:6,000

26A - Penrhyndeudraeth

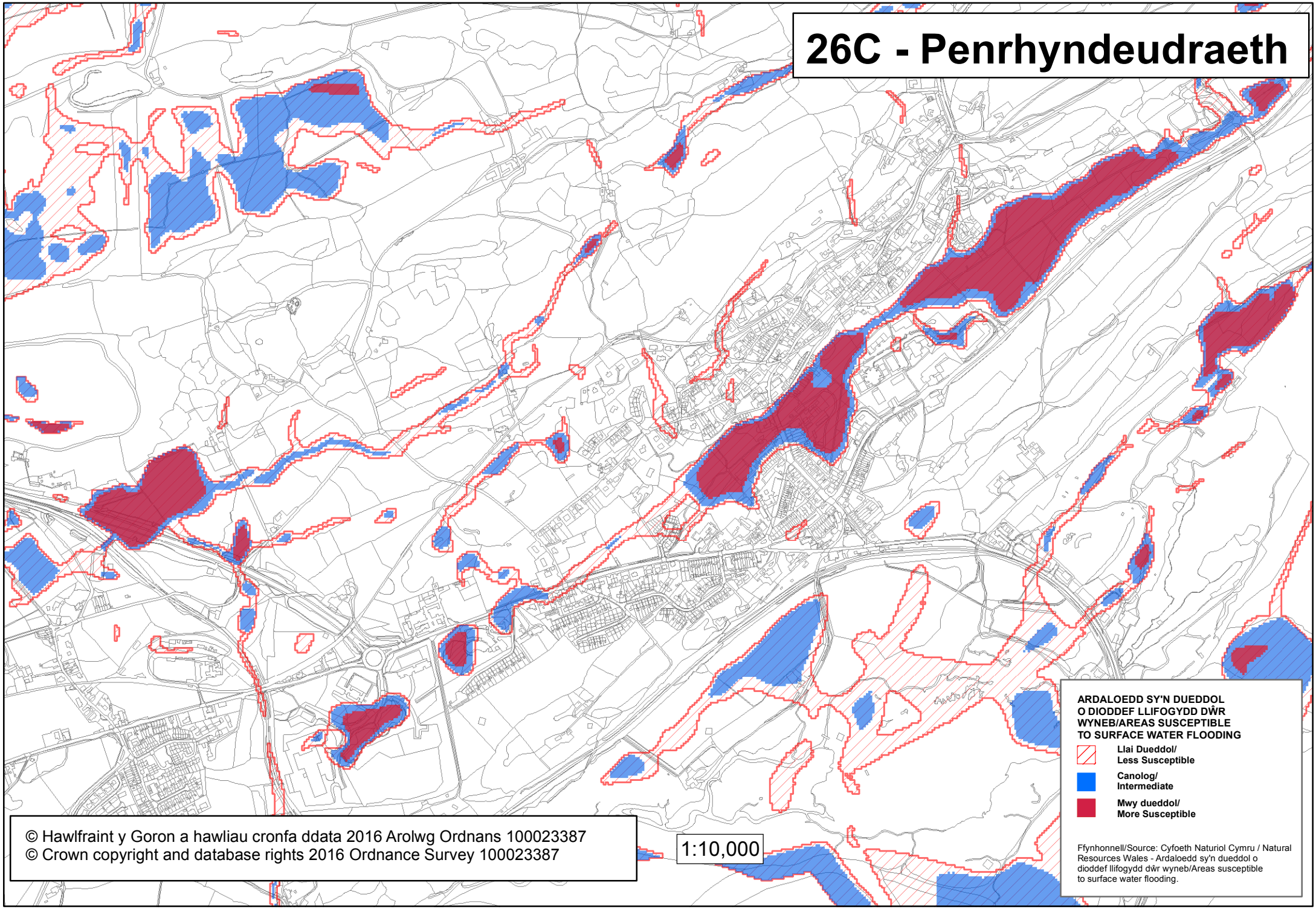


26B - Penrhyndeudraeth

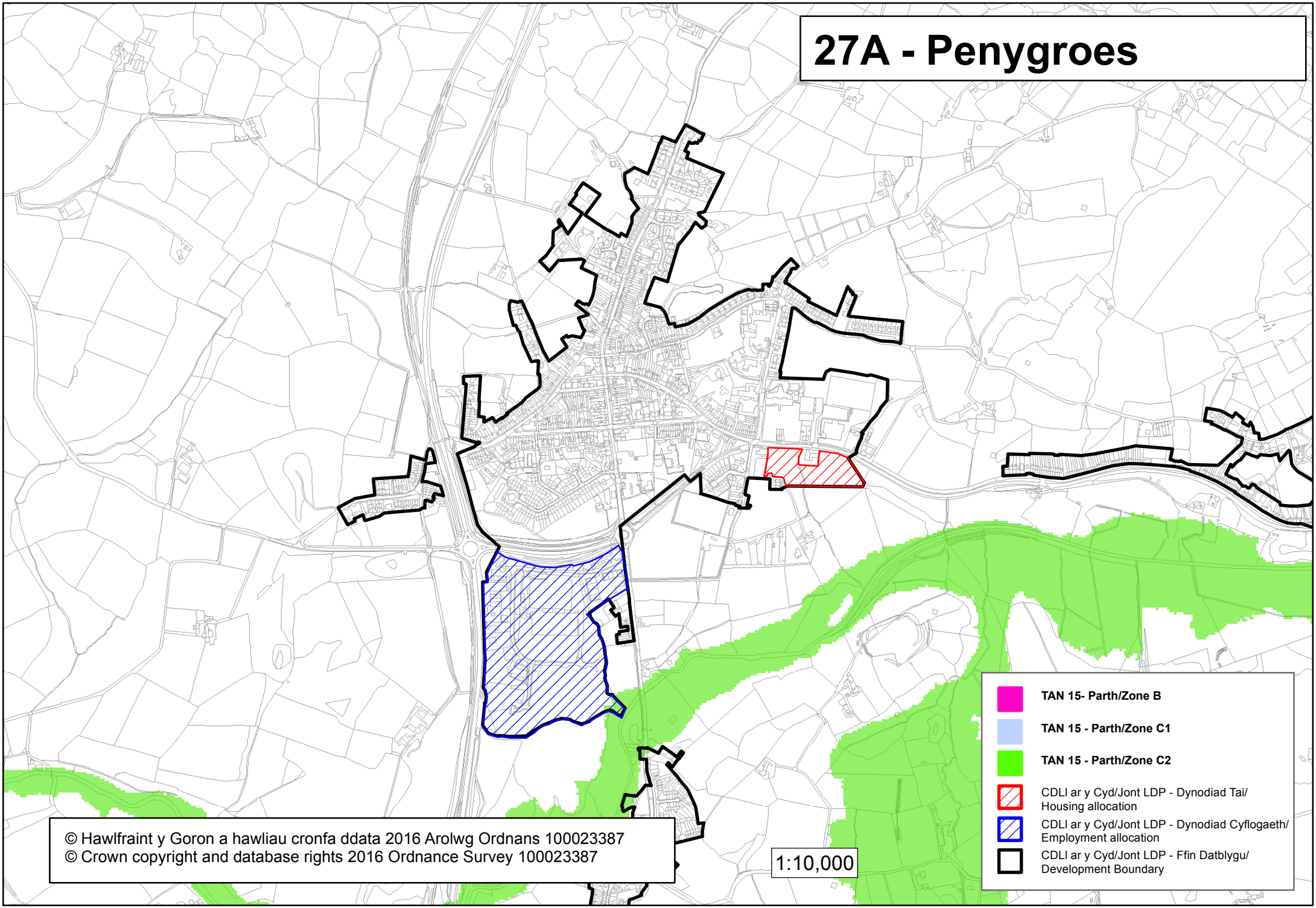


1:10,000

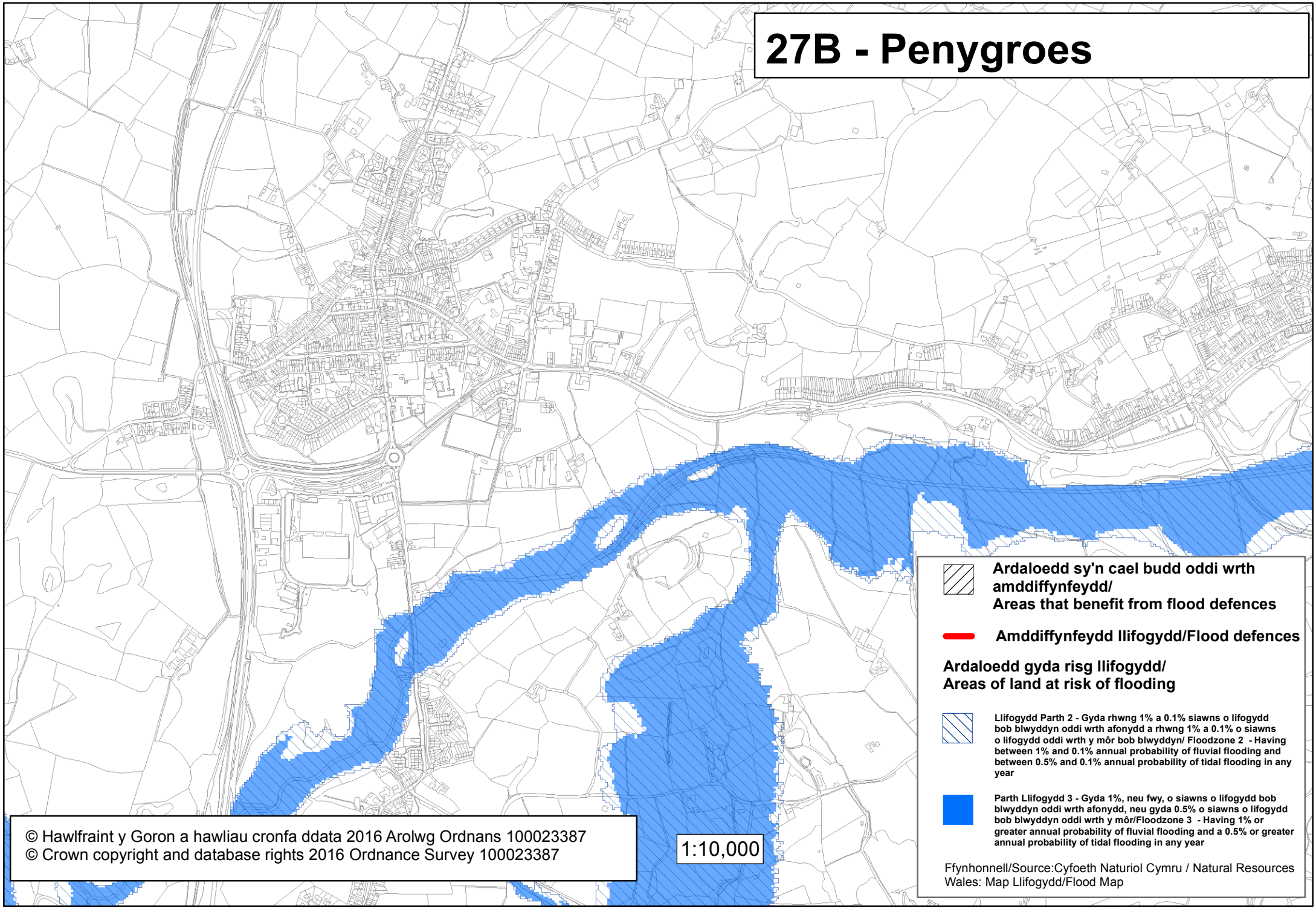
26C - Penrhyndeudraeth



27A - Penygroes



27B - Penygroes



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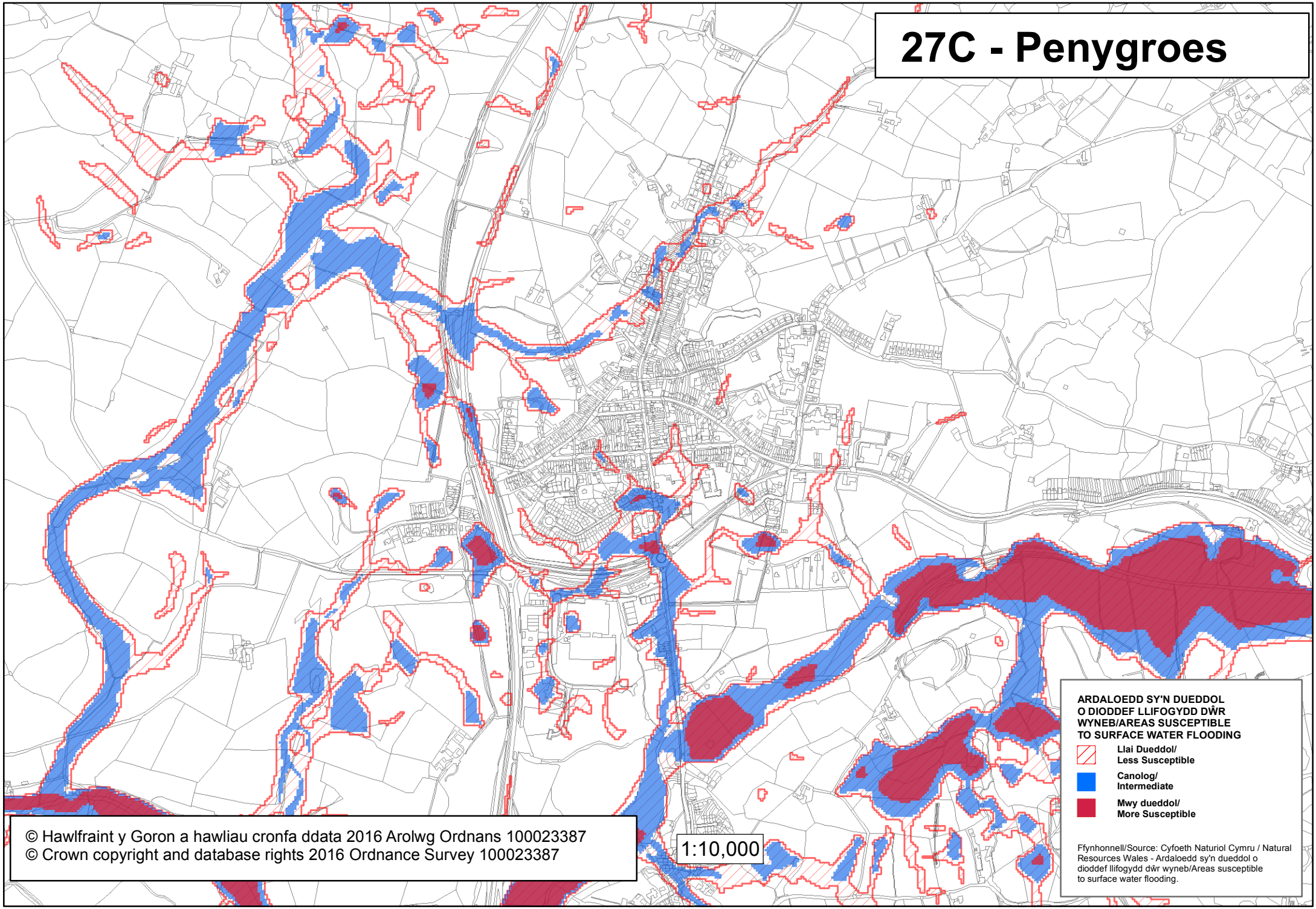
27C - Penygroes



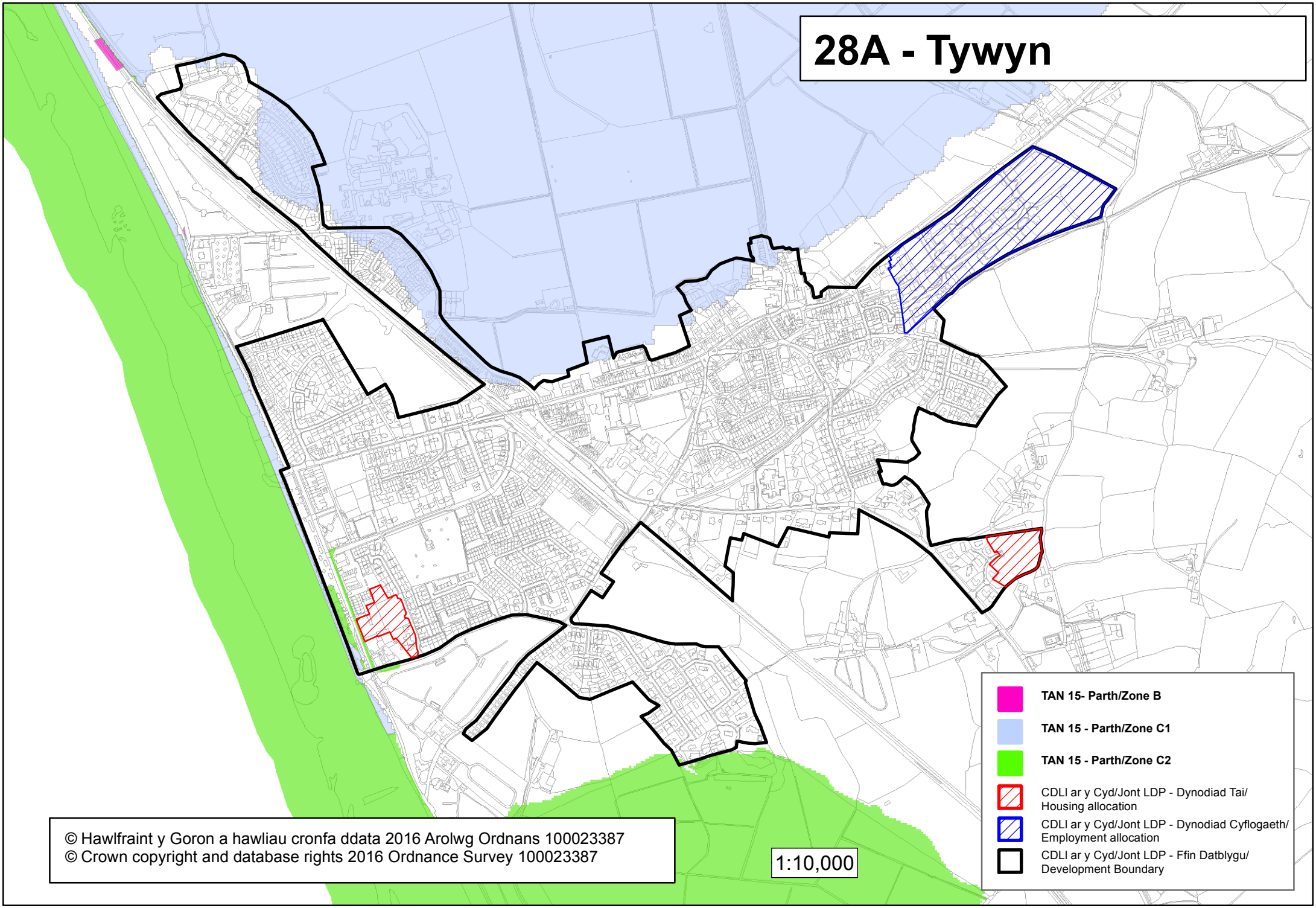
ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

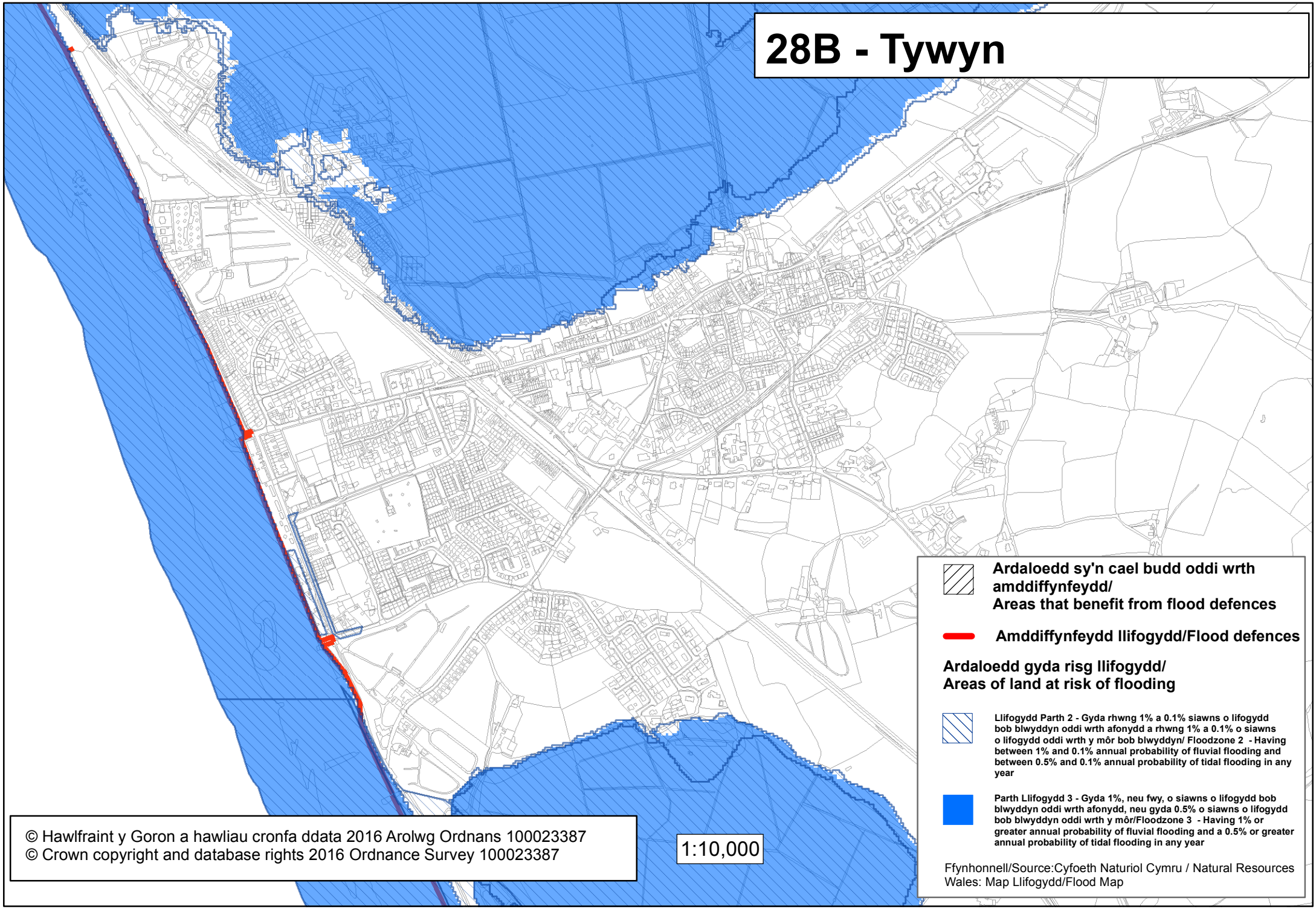
- **Llai Dueddol/ Less Susceptible**
- **Canolog/ Intermediate**
- **Mwy dueddol/ More Susceptible**

Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

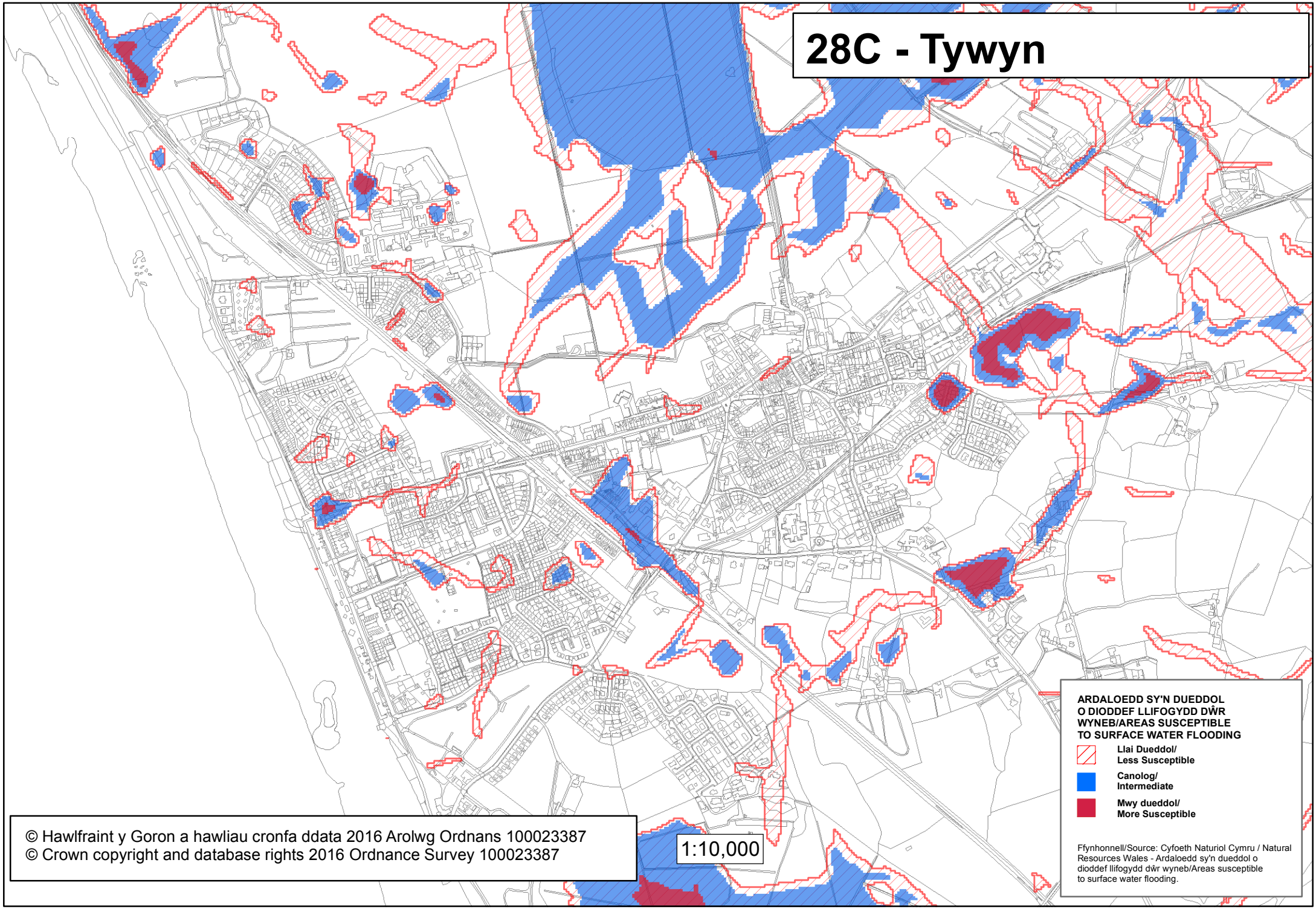
1:10,000

28A - Tywyn




28B - Tywyn
Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences
Amddiffynfeydd llifogydd/Flood defences
Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year
Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year
Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map
© Hawlfraint y Goron a hawliau cronfa ddata 2016 Arolwg Ordnans 100023387
© Crown copyright and database rights 2016 Ordnance Survey 100023387
1:10,000

28C - Tywyn



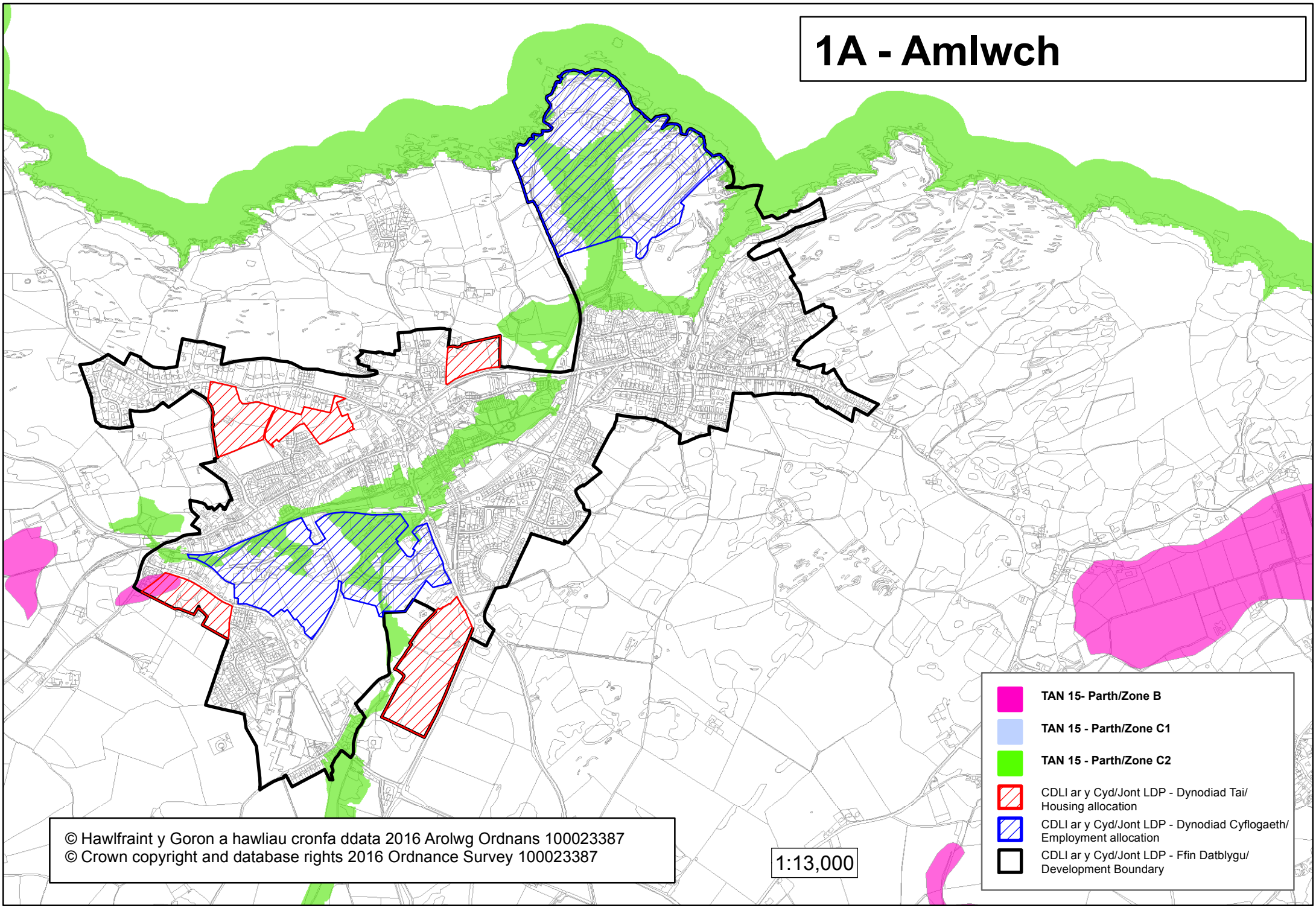
ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- **Llai Dueddol/ Less Susceptible**
- **Canolog/ Intermediate**
- **Mwy dueddol/ More Susceptible**

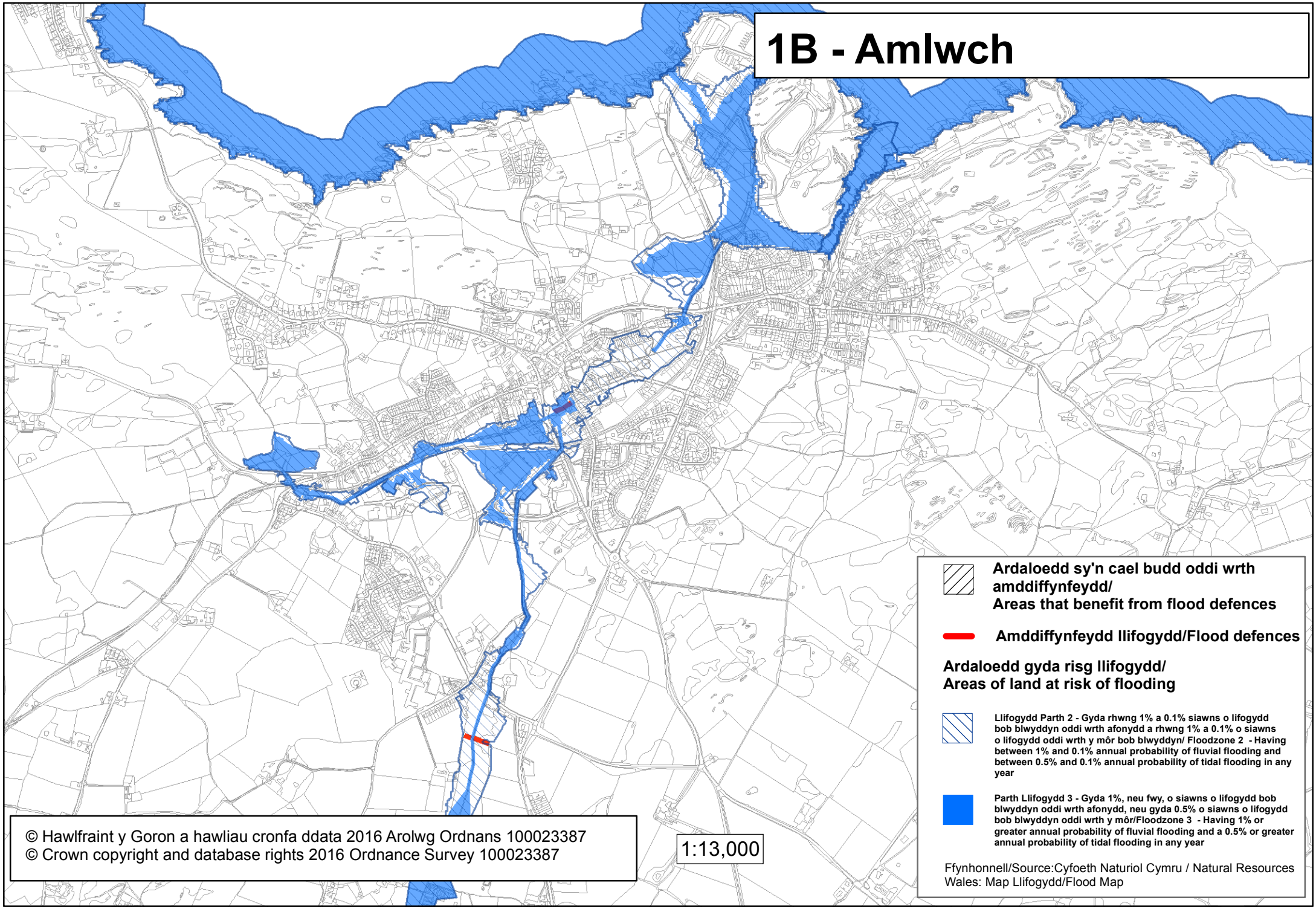
Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

1:10,000

1A - Amlwch



1B - Amlwch



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
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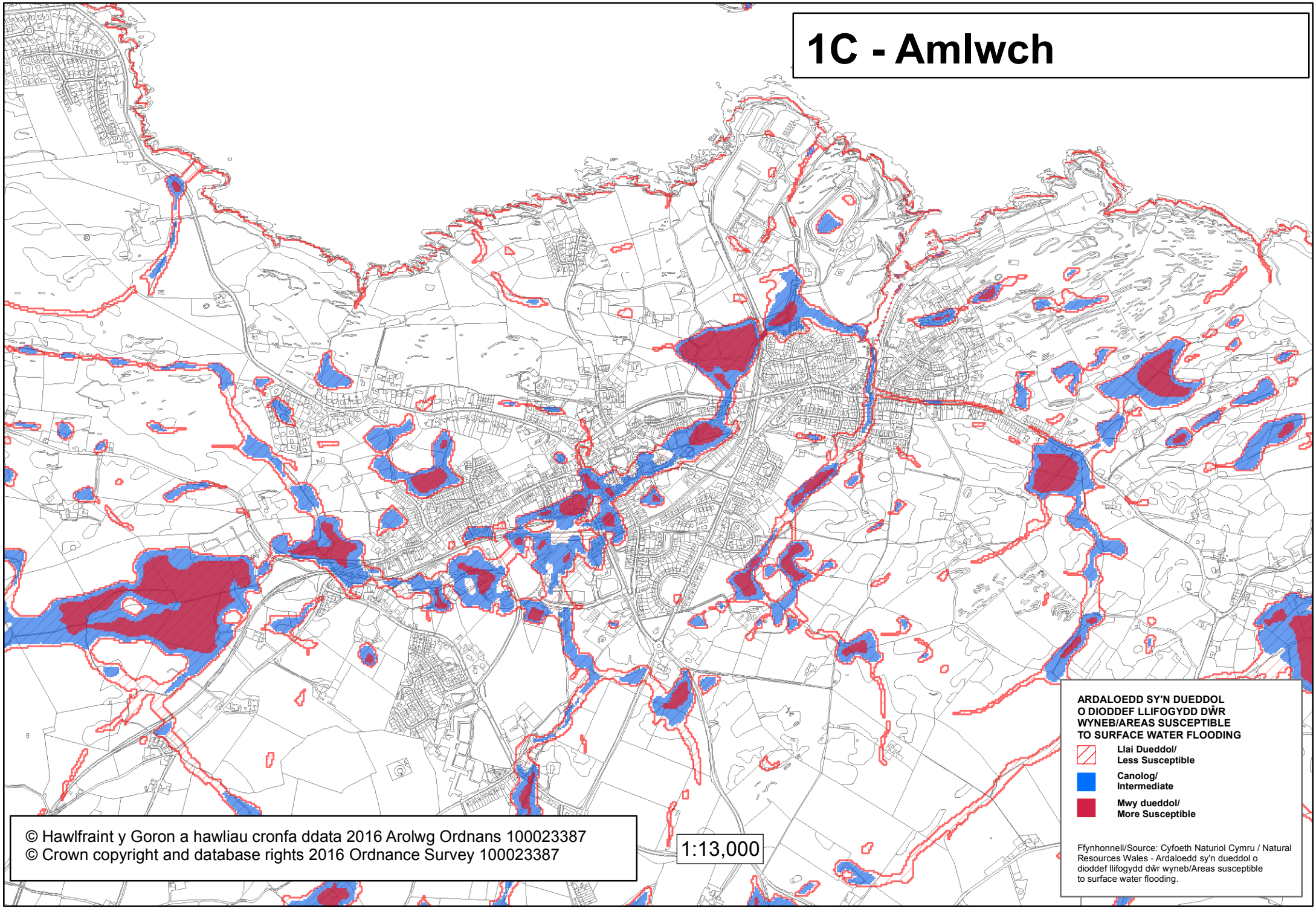
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

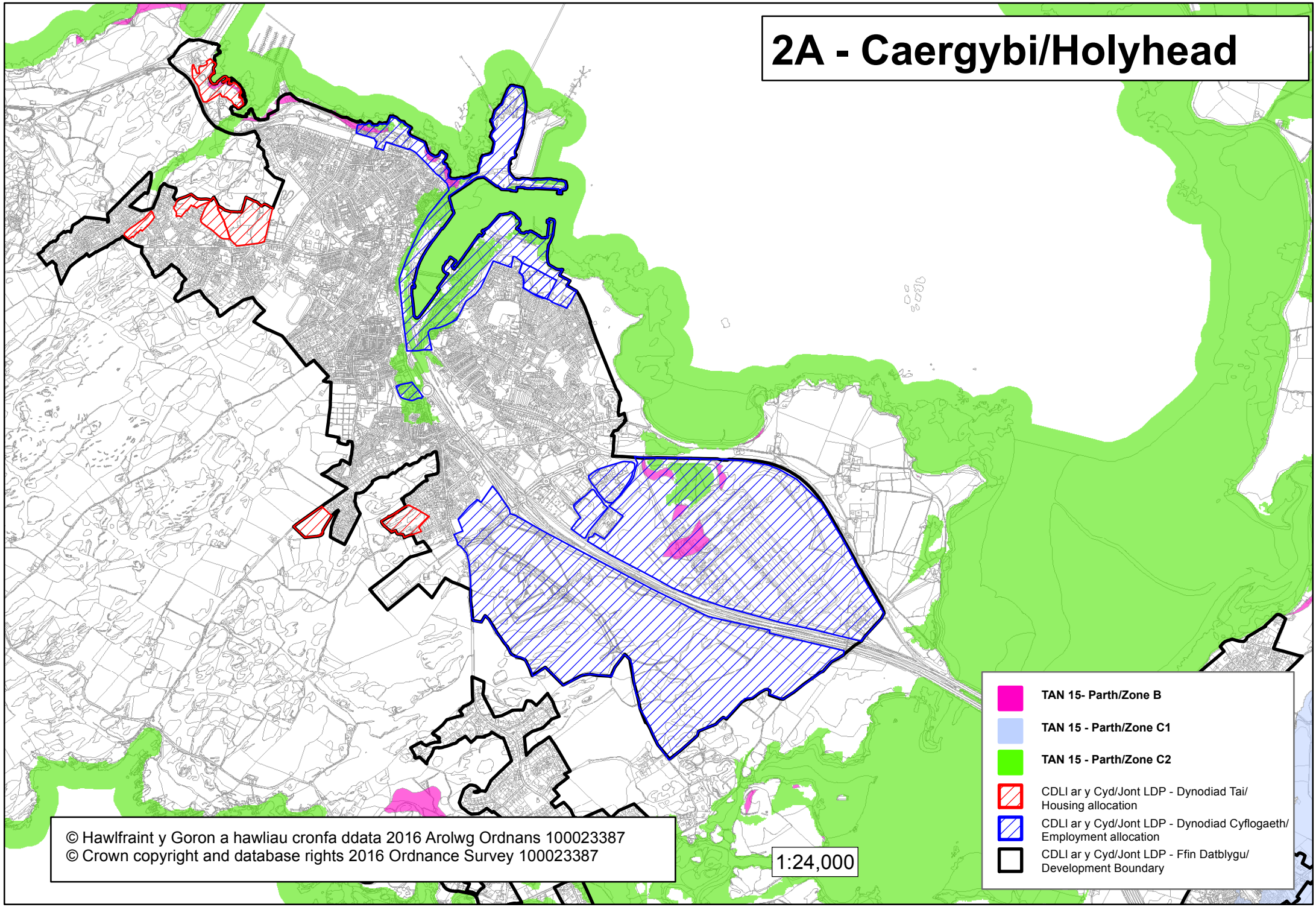
1:13,000

1C - Amlwch

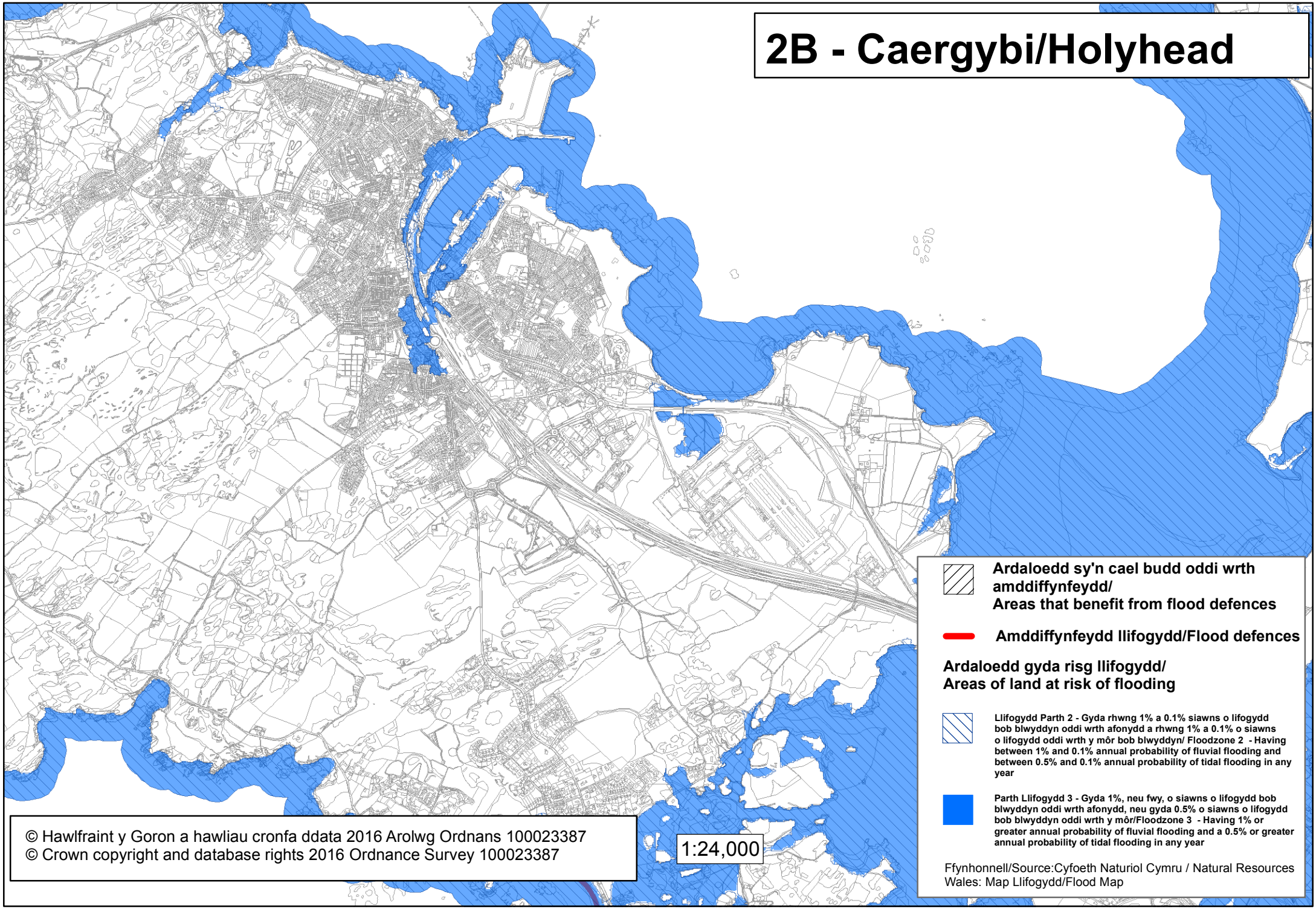


1:13,000

2A - Caergybi/Holyhead



2B - Caergybi/Holyhead



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

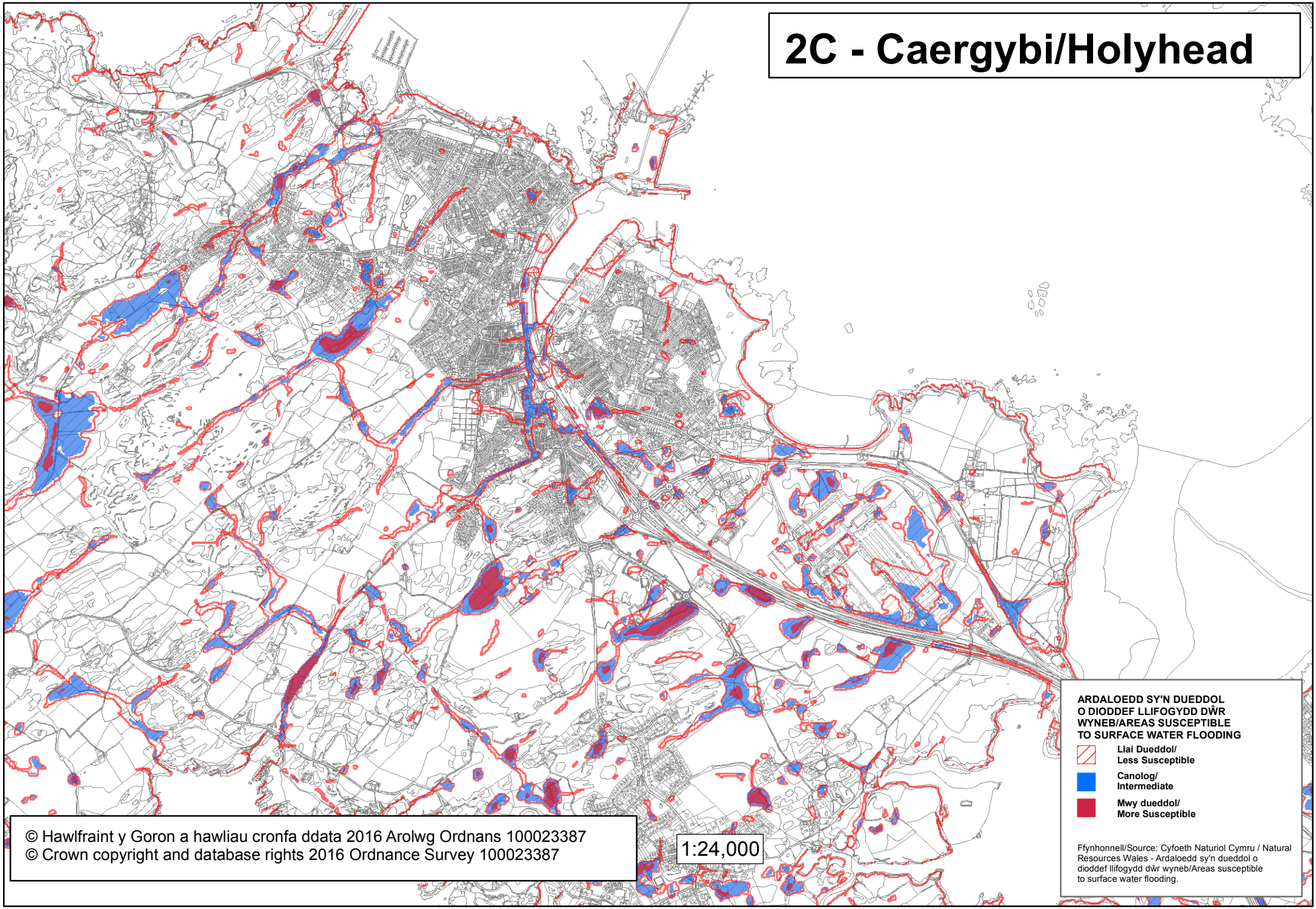
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:24,000

2C - Caergybi/Holyhead



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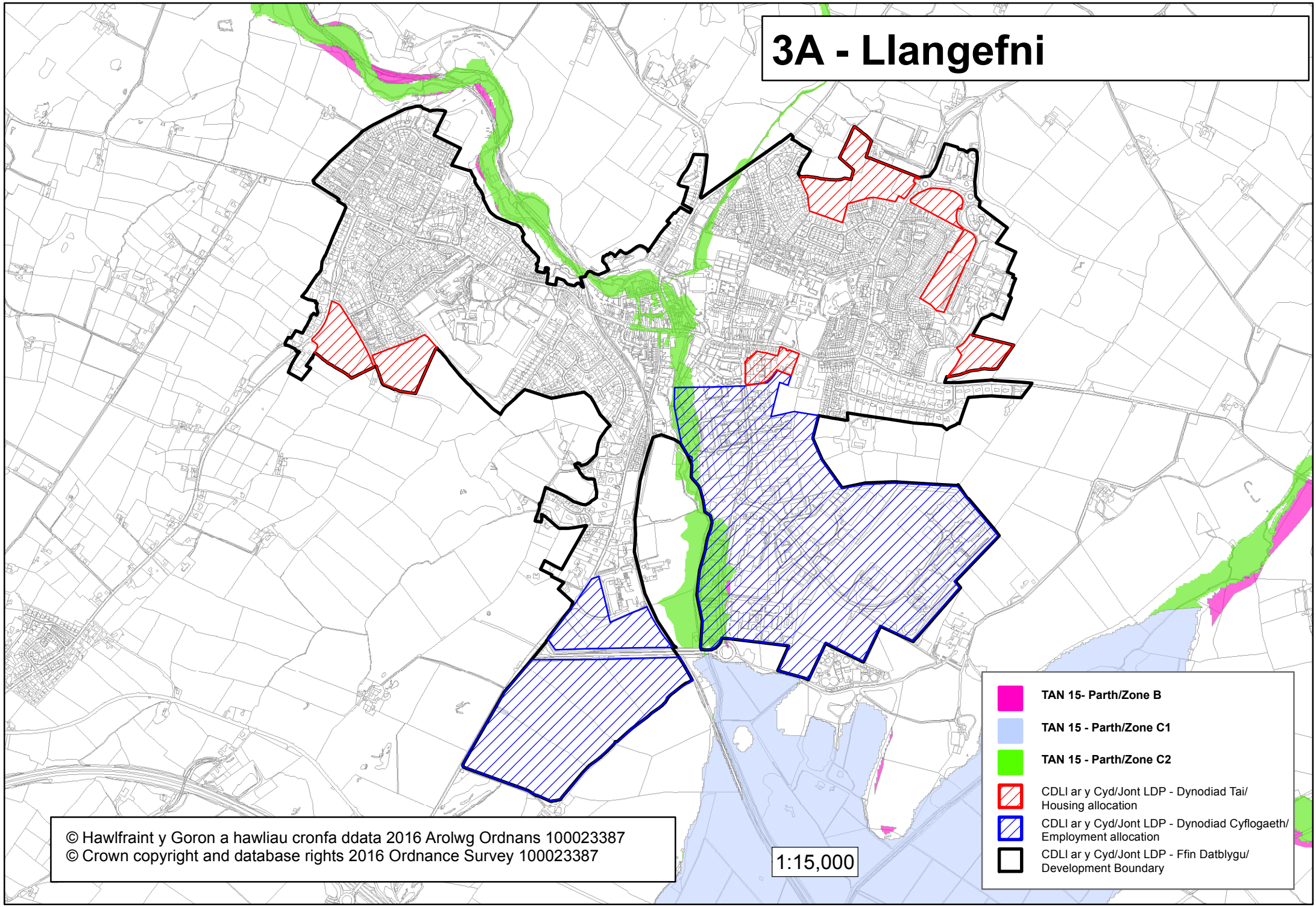
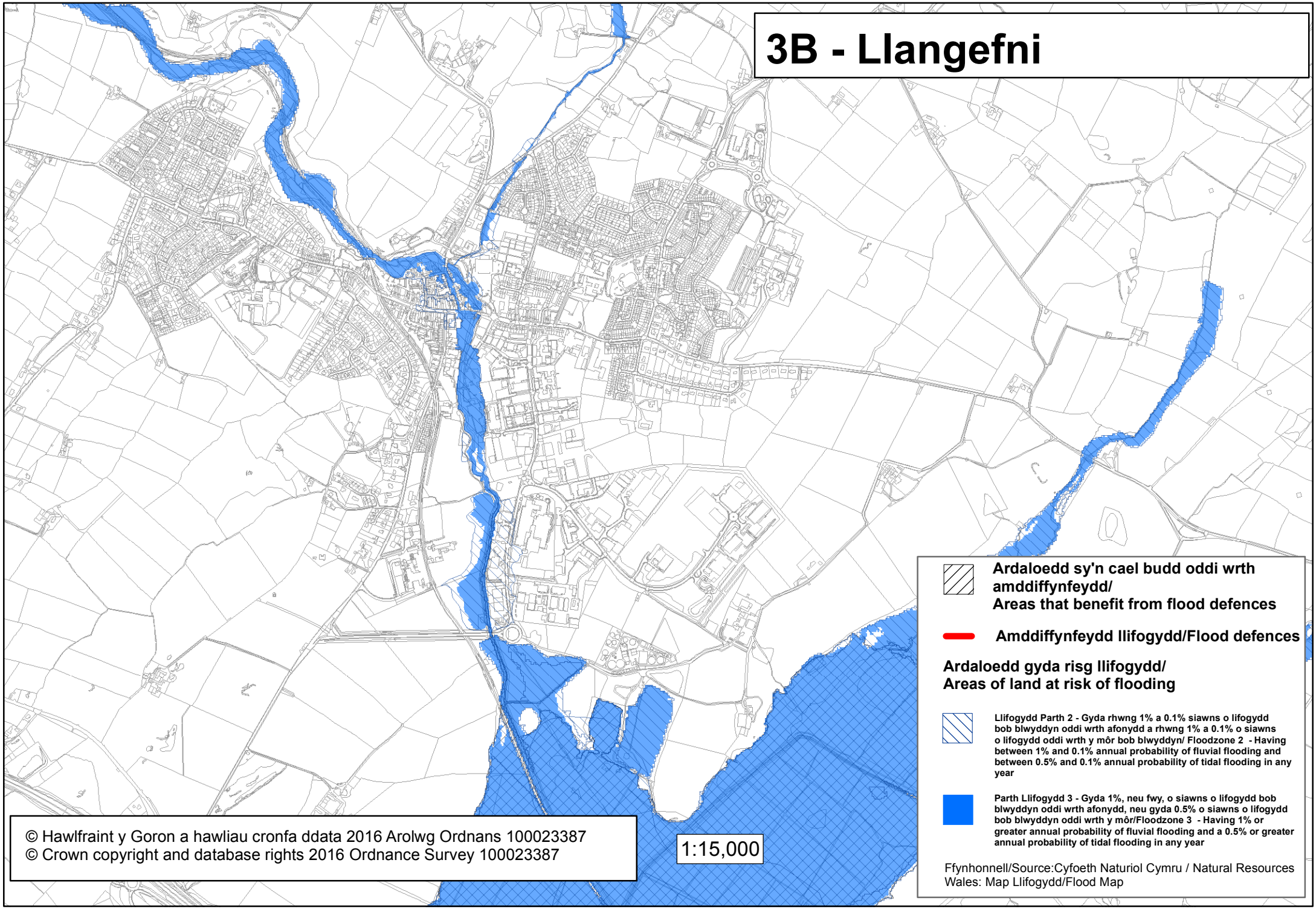
3A - Llangefni



3B - Llangefni



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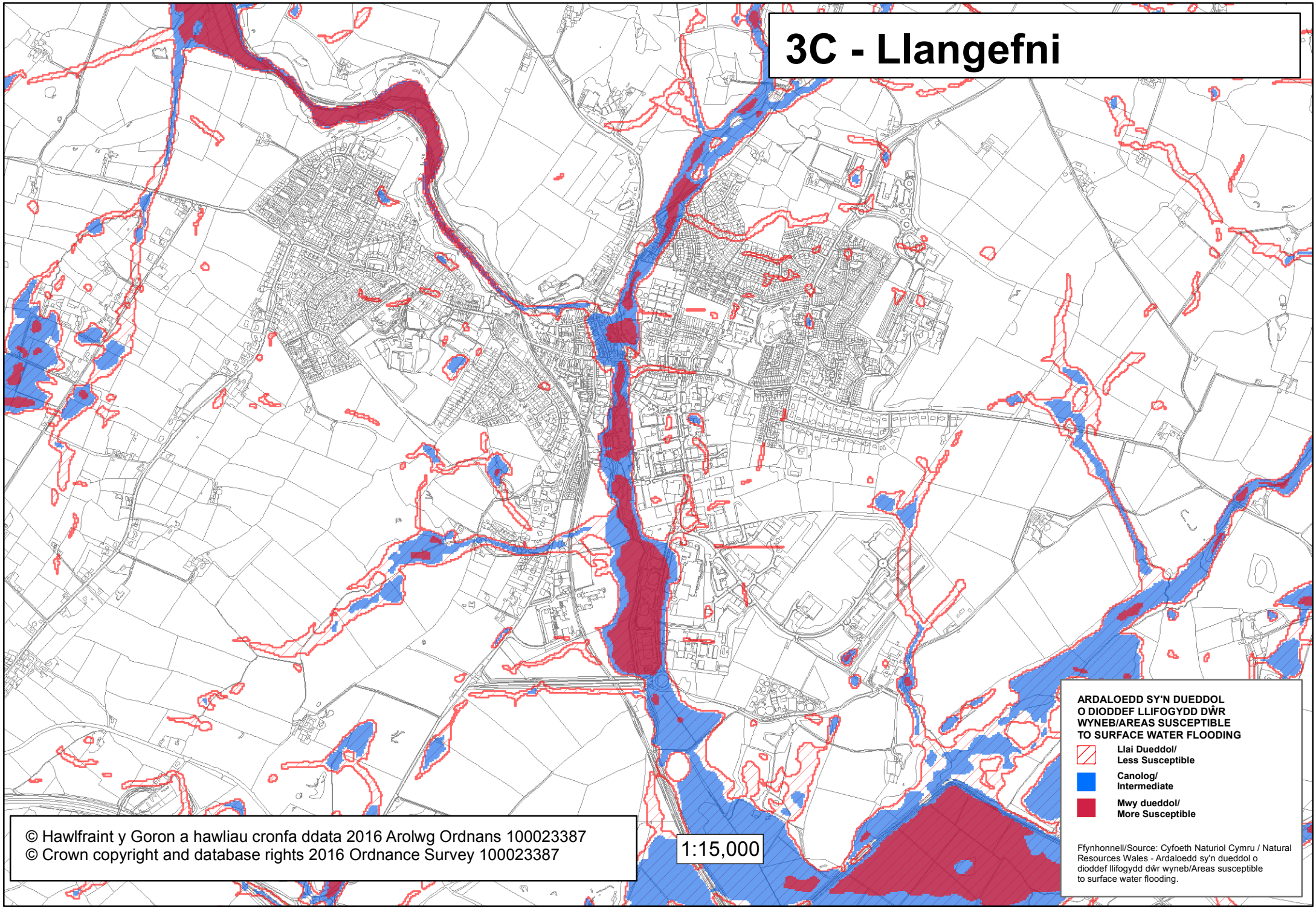
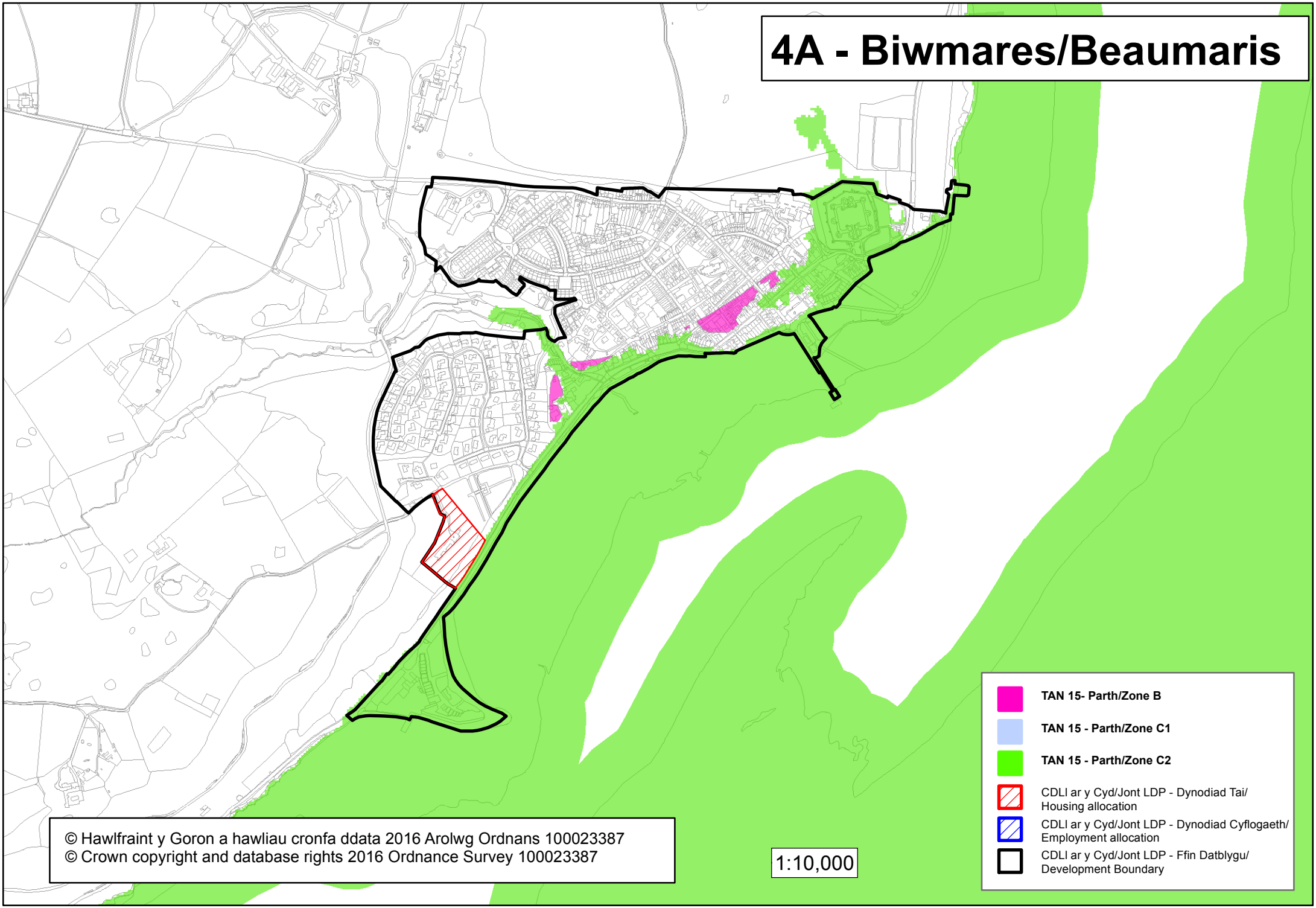
3C - Llangefni

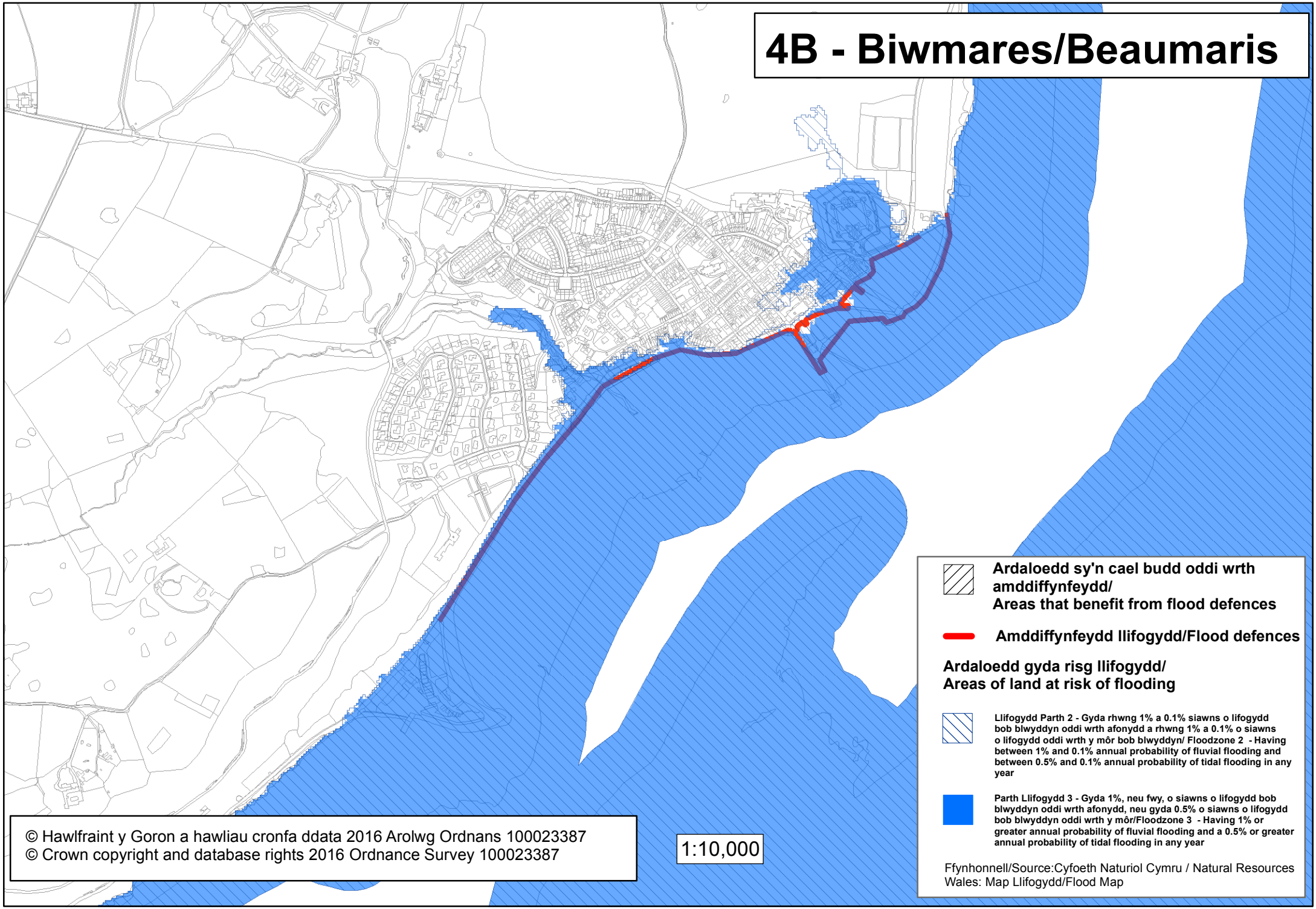


4A - Biwmares/Beaumaris



1:10,000

4B - Biwmares/Beaumaris



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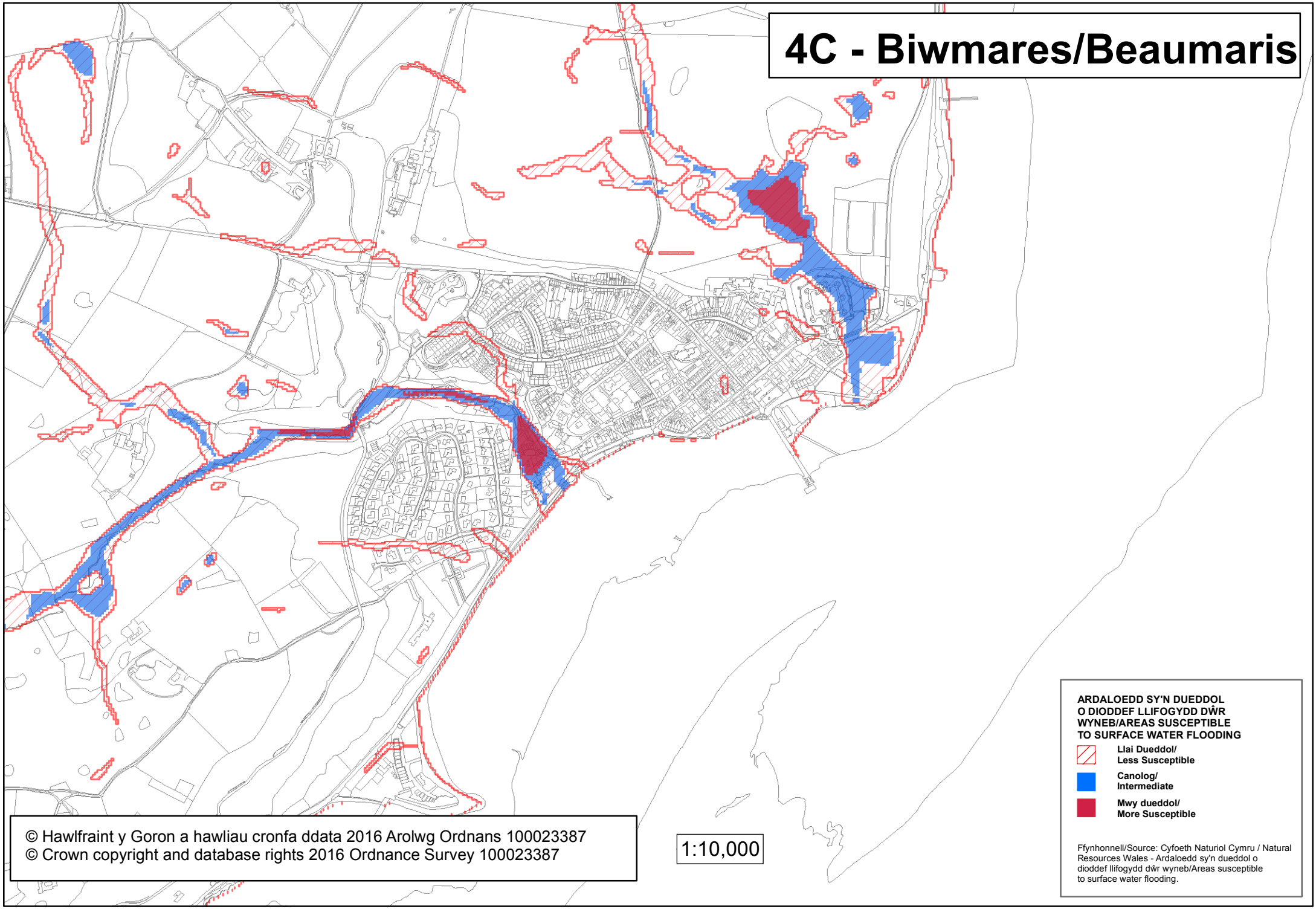
4C - Biwmares/Beaumaris



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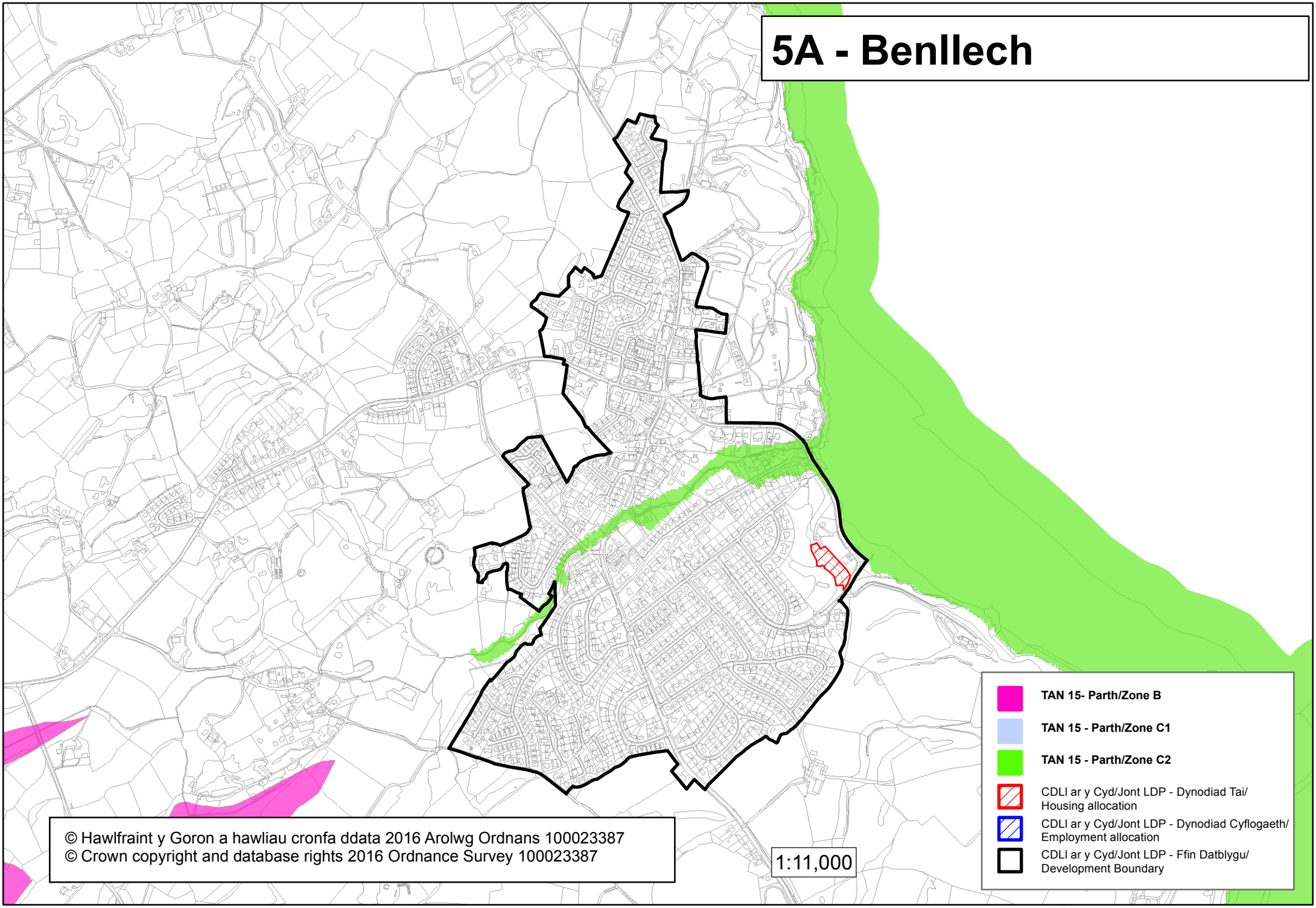
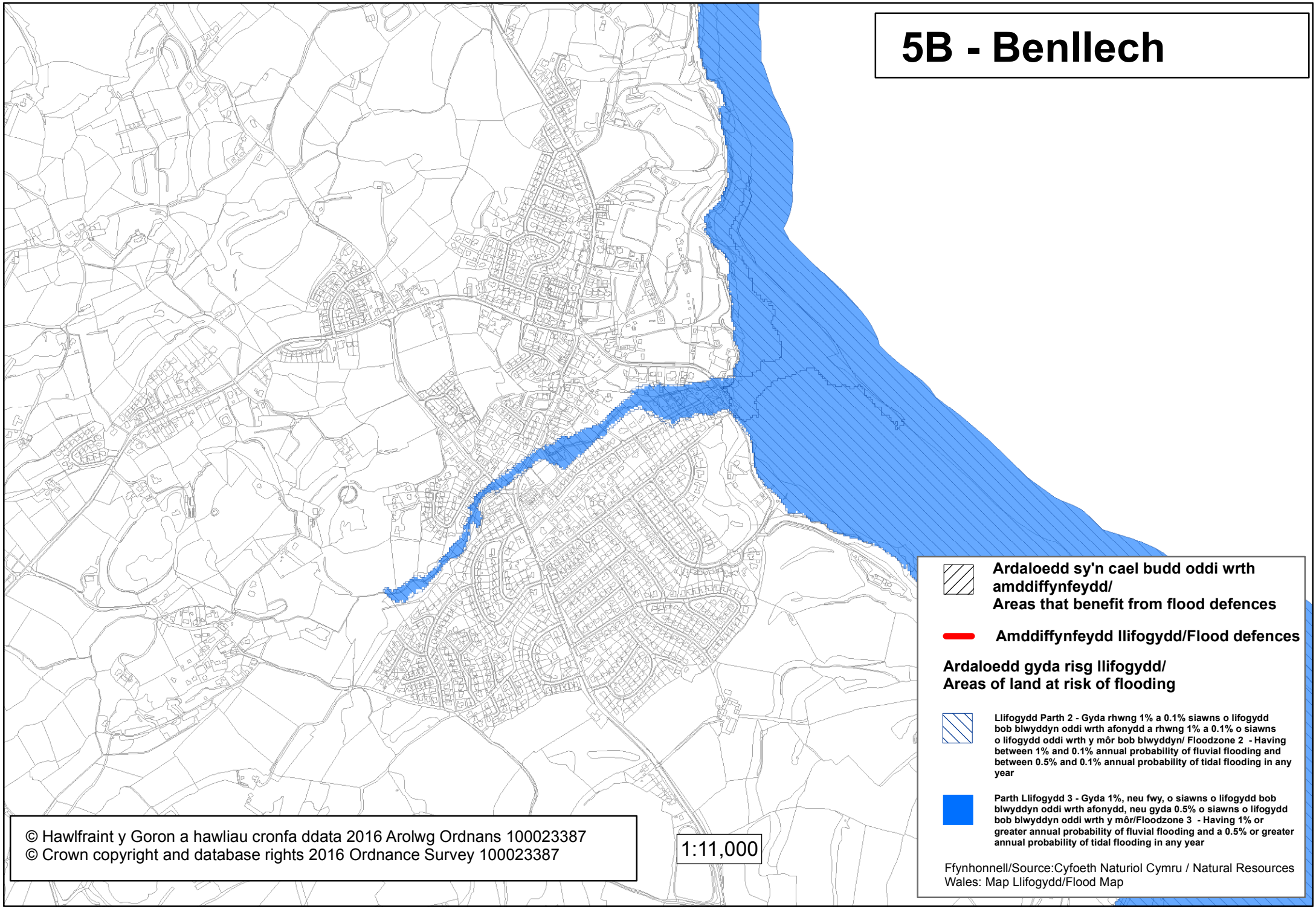
ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- **Llai Dueddol/ Less Susceptible**
- **Canolog/ Intermediate**
- **Mwy dueddol/ More Susceptible**

Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.



5B - Benllech



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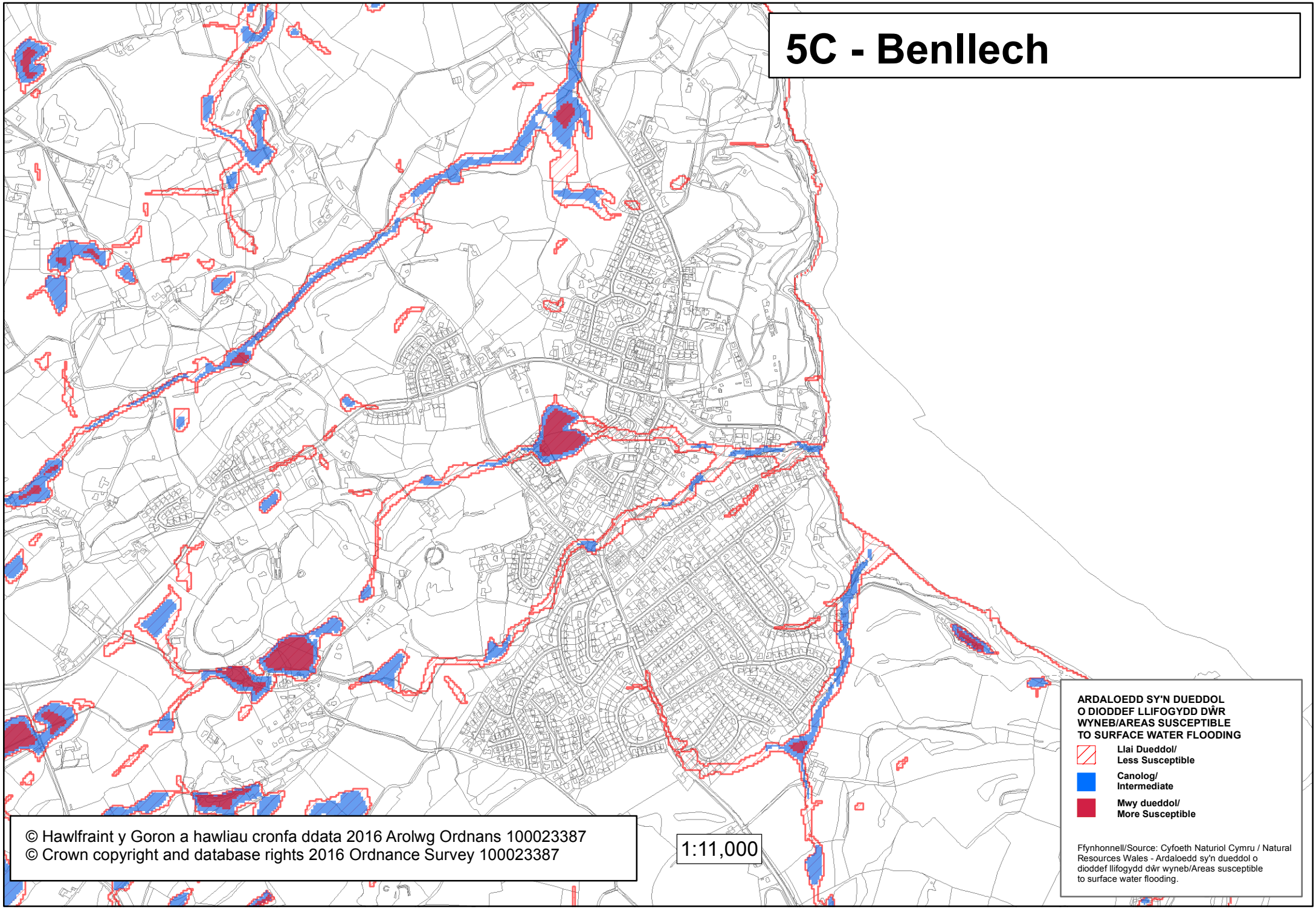
5C - Benllech



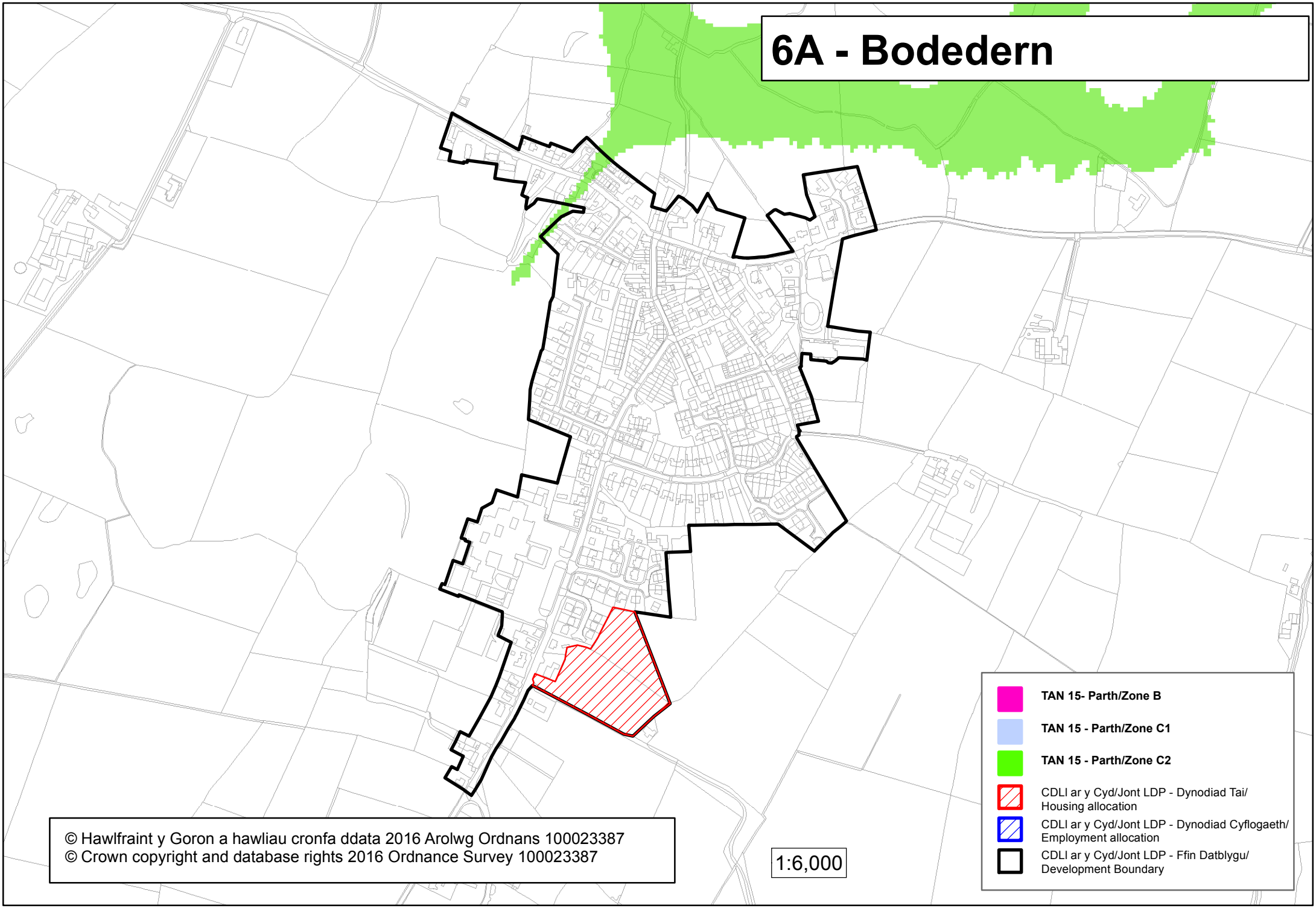
ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- Llai Dueddol/ Less Susceptible
- Canolog/ Intermediate
- Mwy dueddol/ More Susceptible

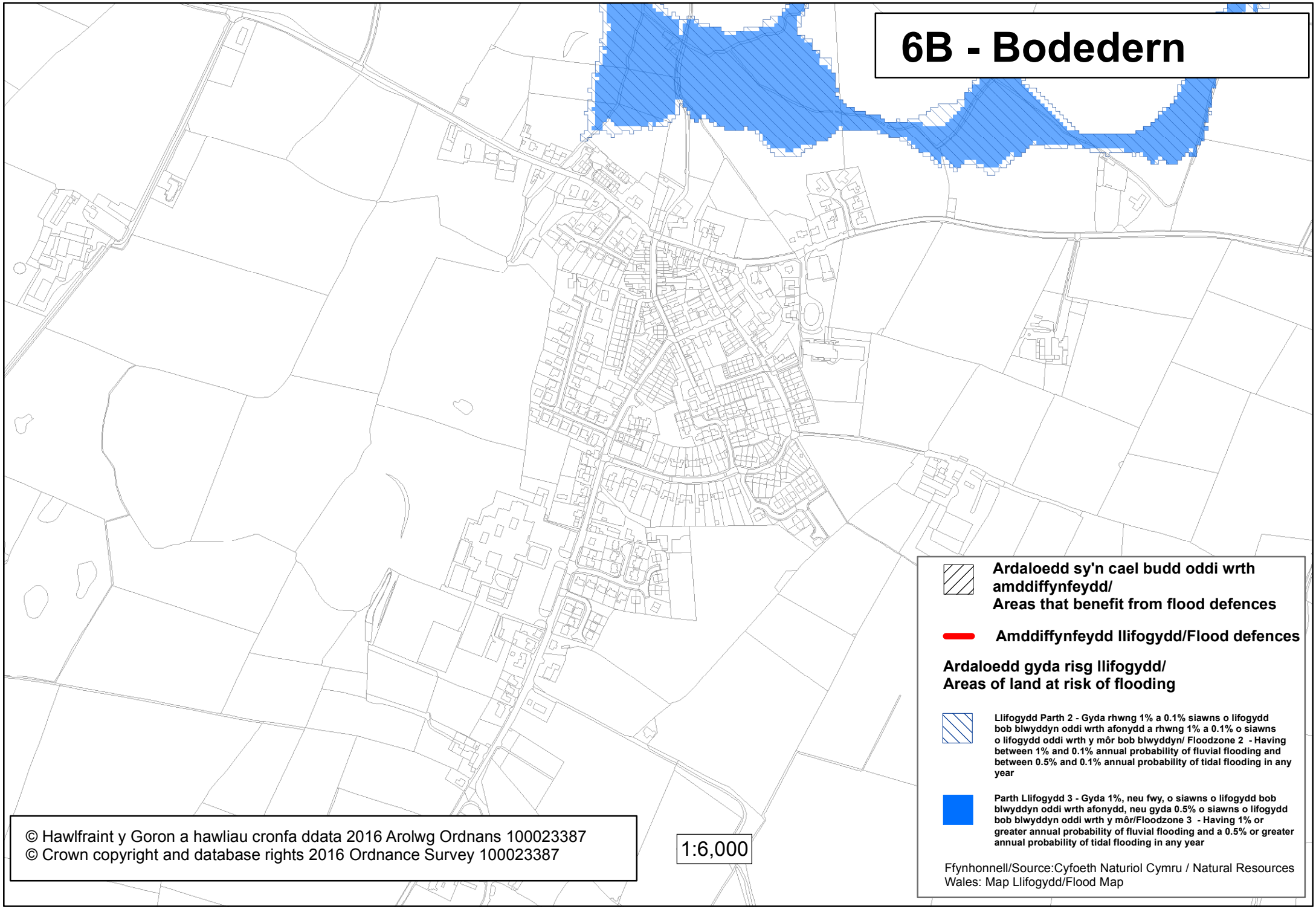
Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

1:11,000

6A - Bodedern



6B - Bodedern



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

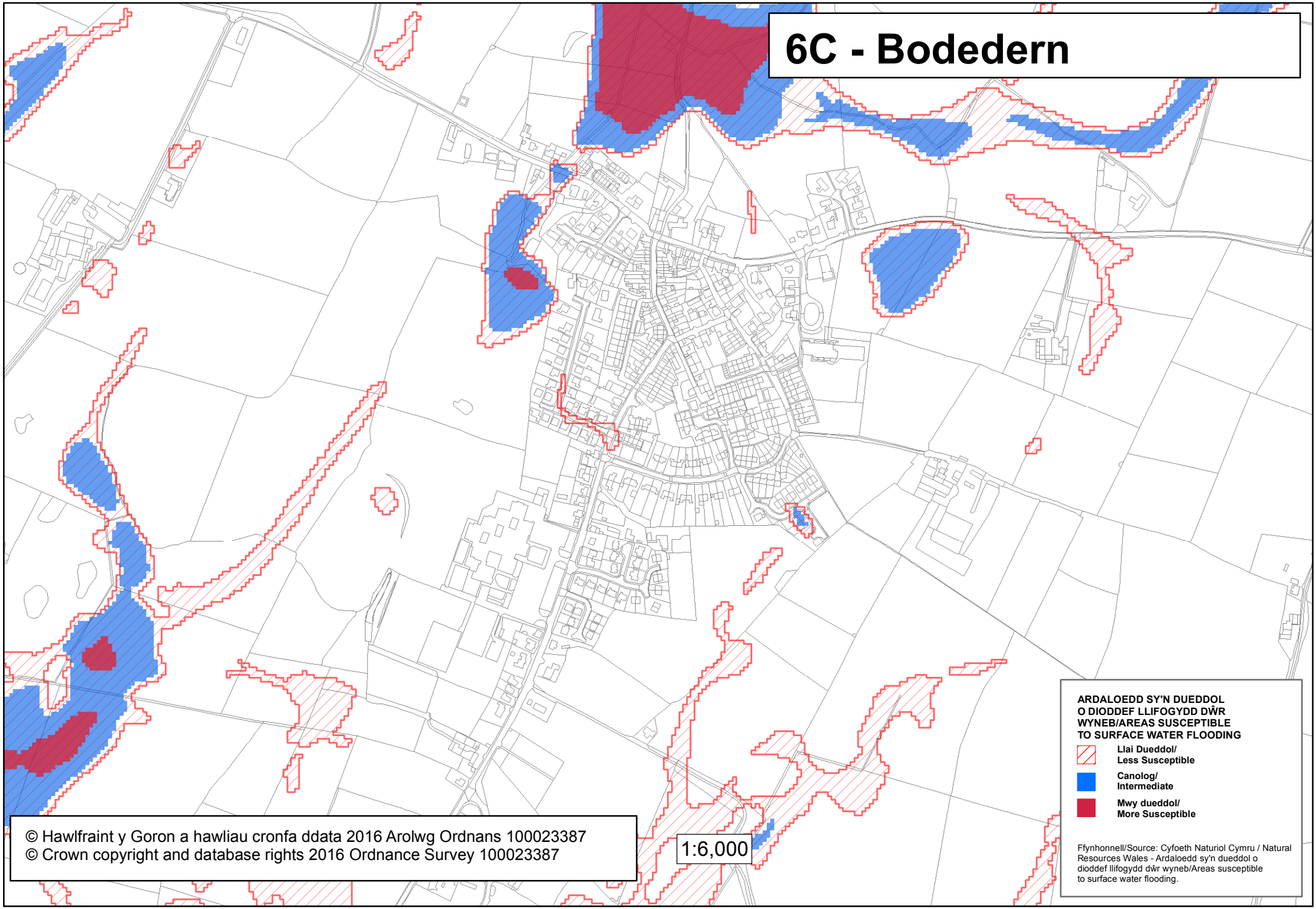
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

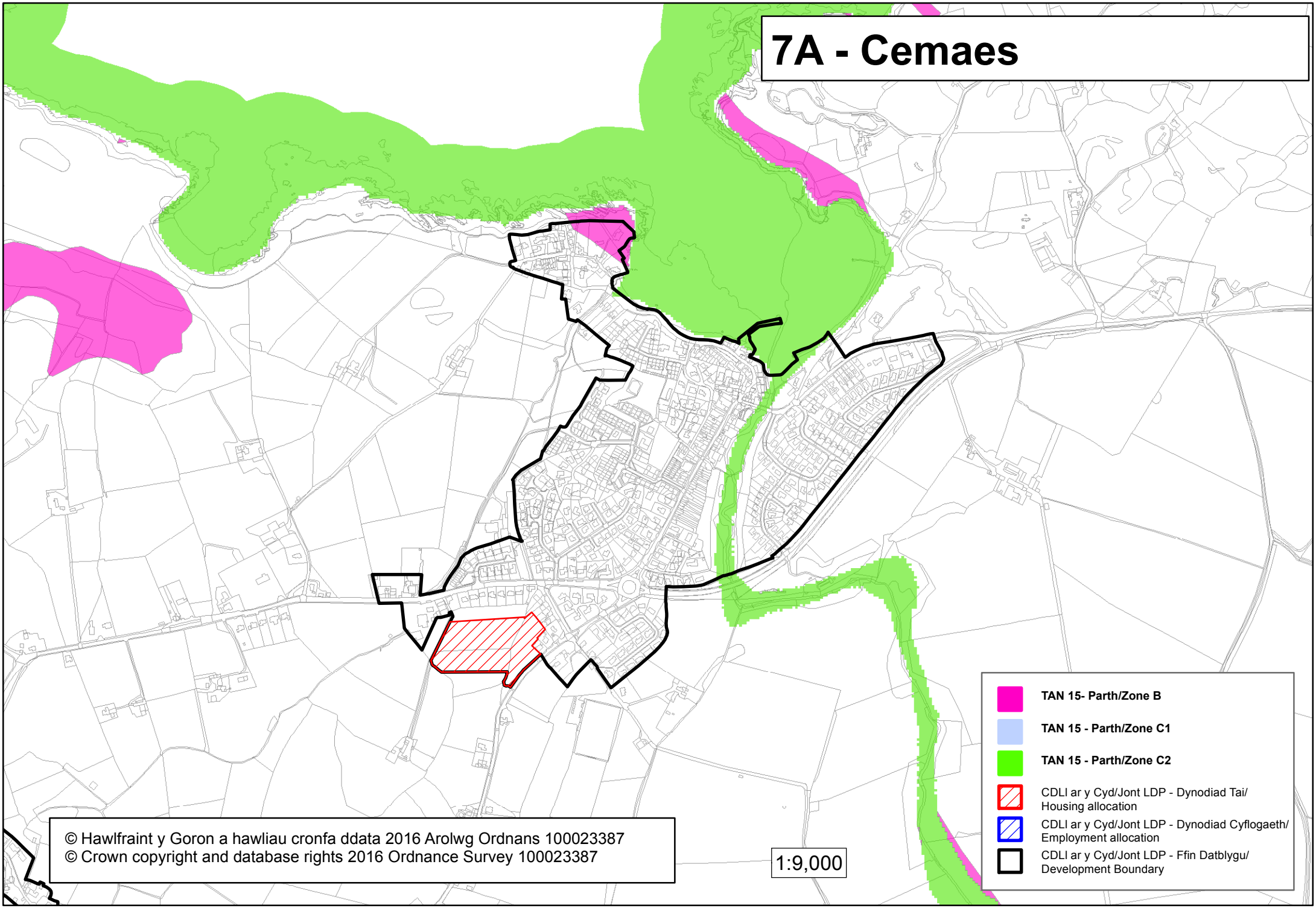
Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:6,000

6C - Bodedern

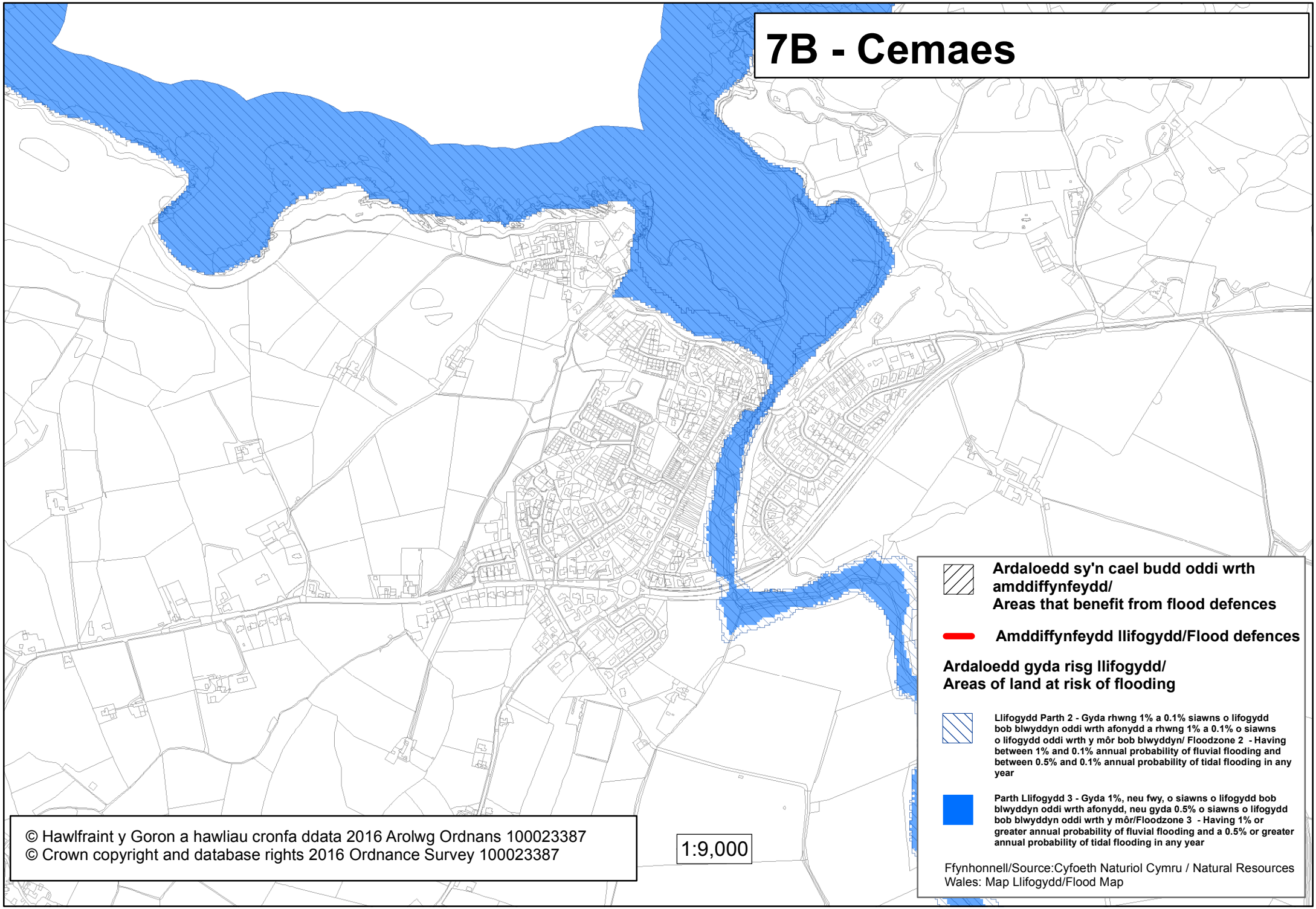


7A - Cemaes



1:9,000

7B - Cemaes



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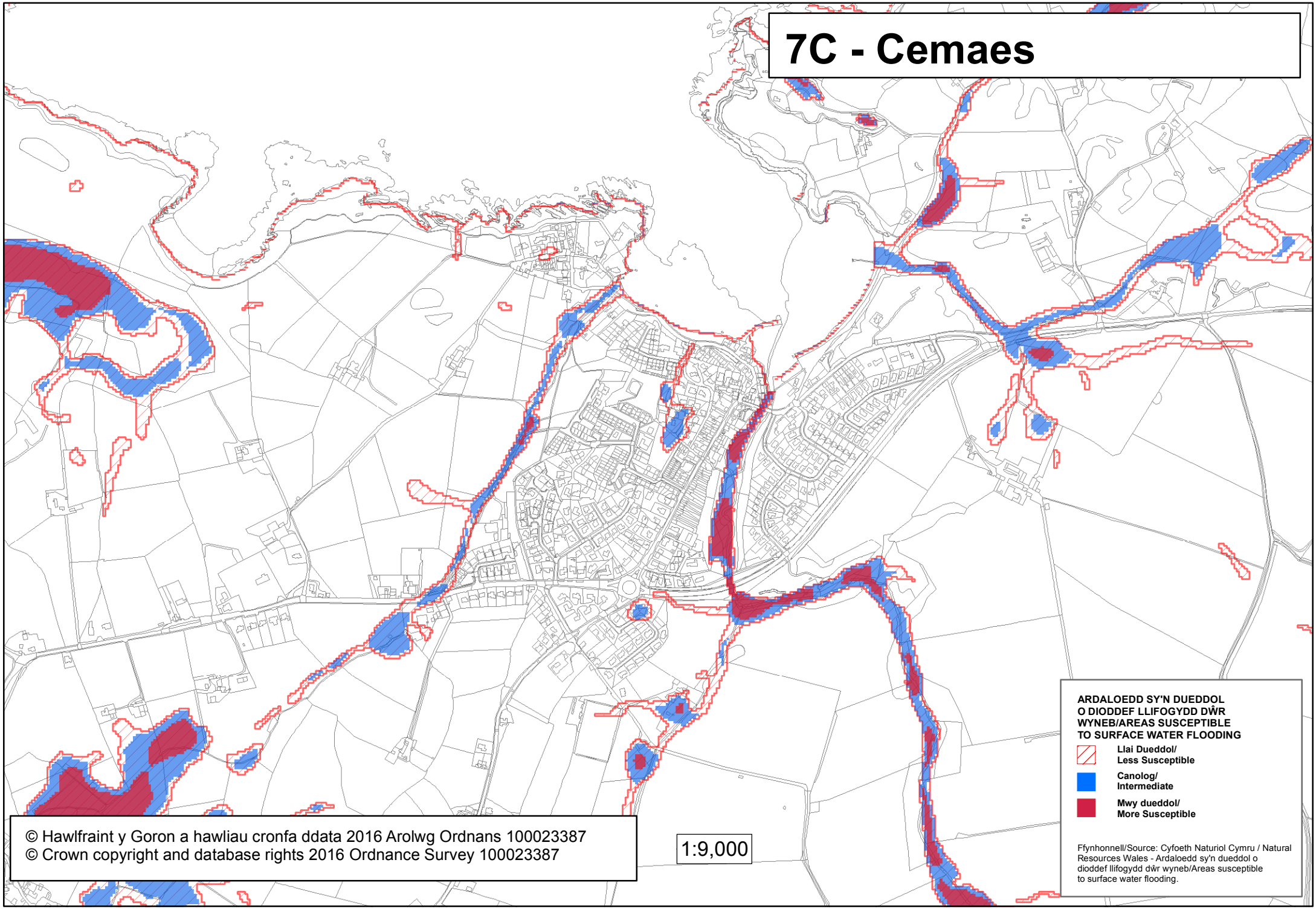
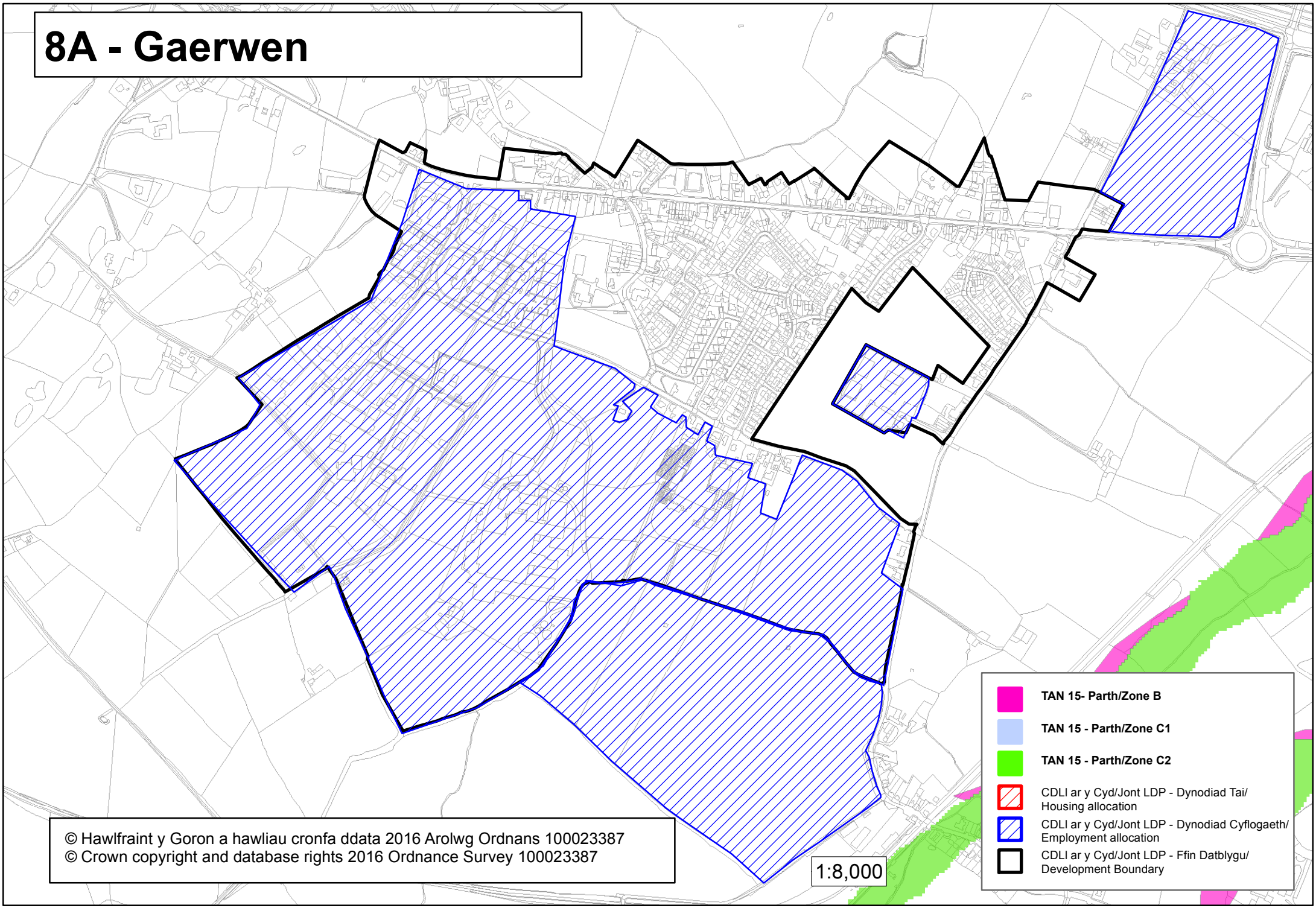
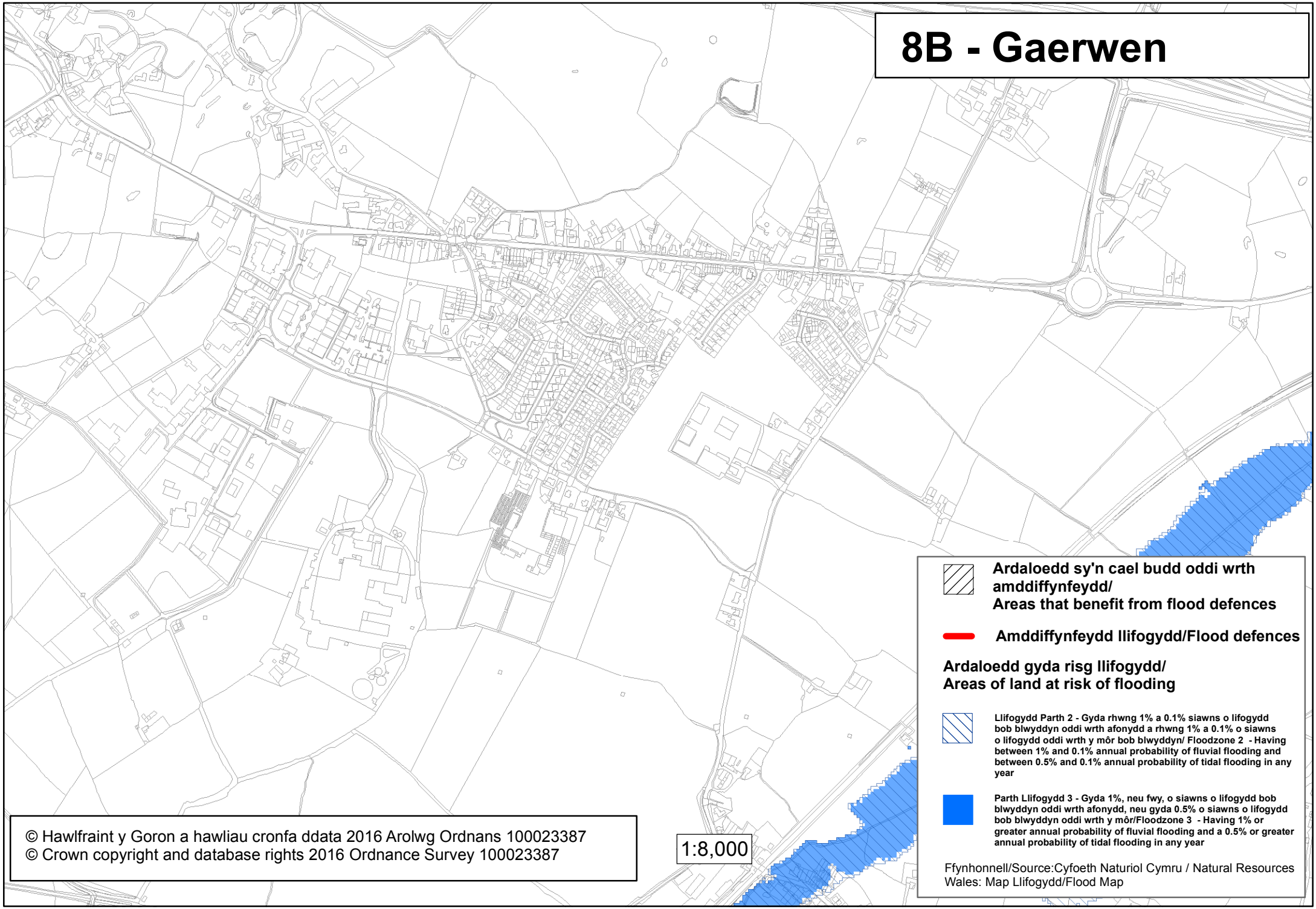
7C - Cemaes



8A - Gaerwen



8B - Gaerwen



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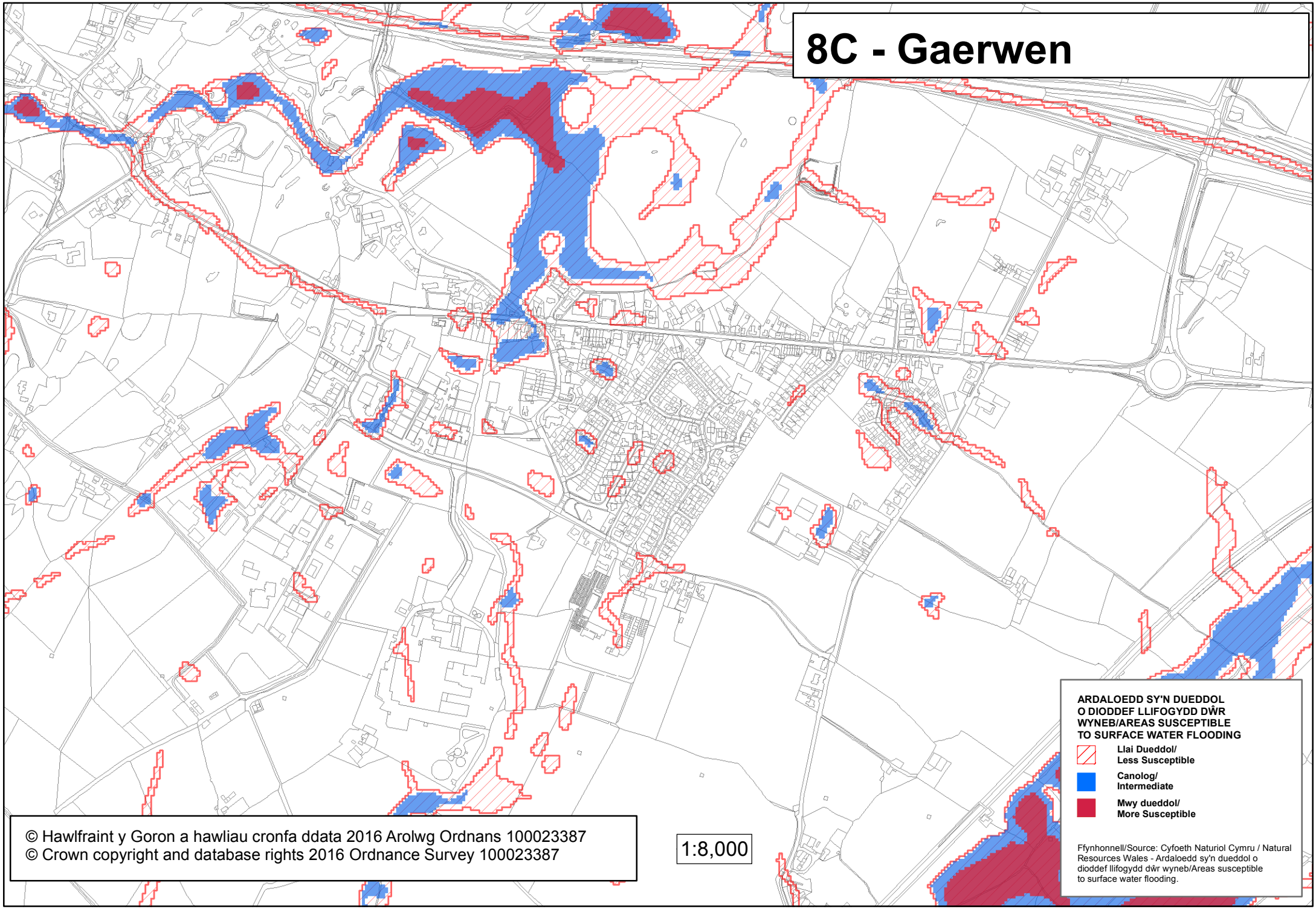
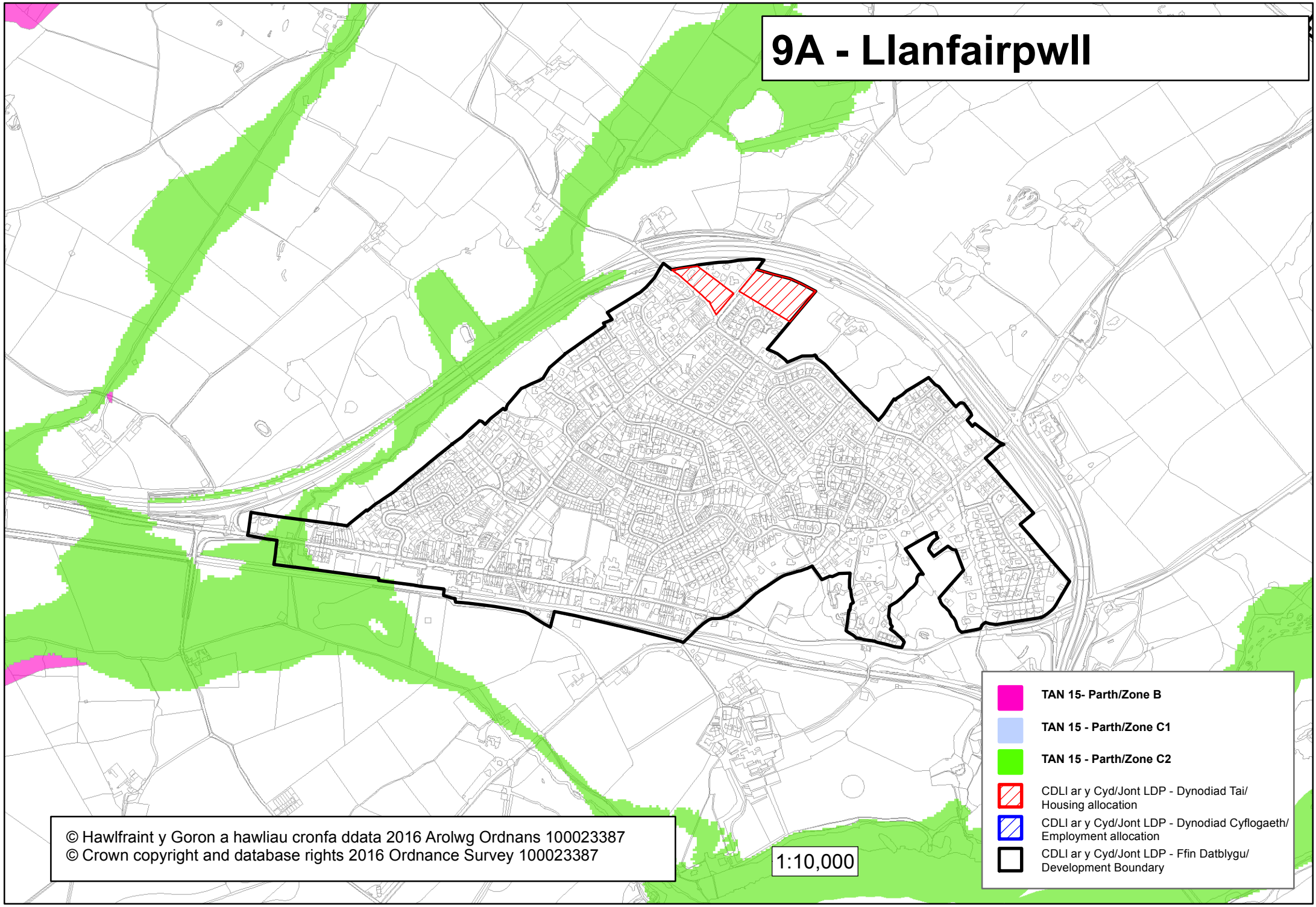
8C - Gaerwen

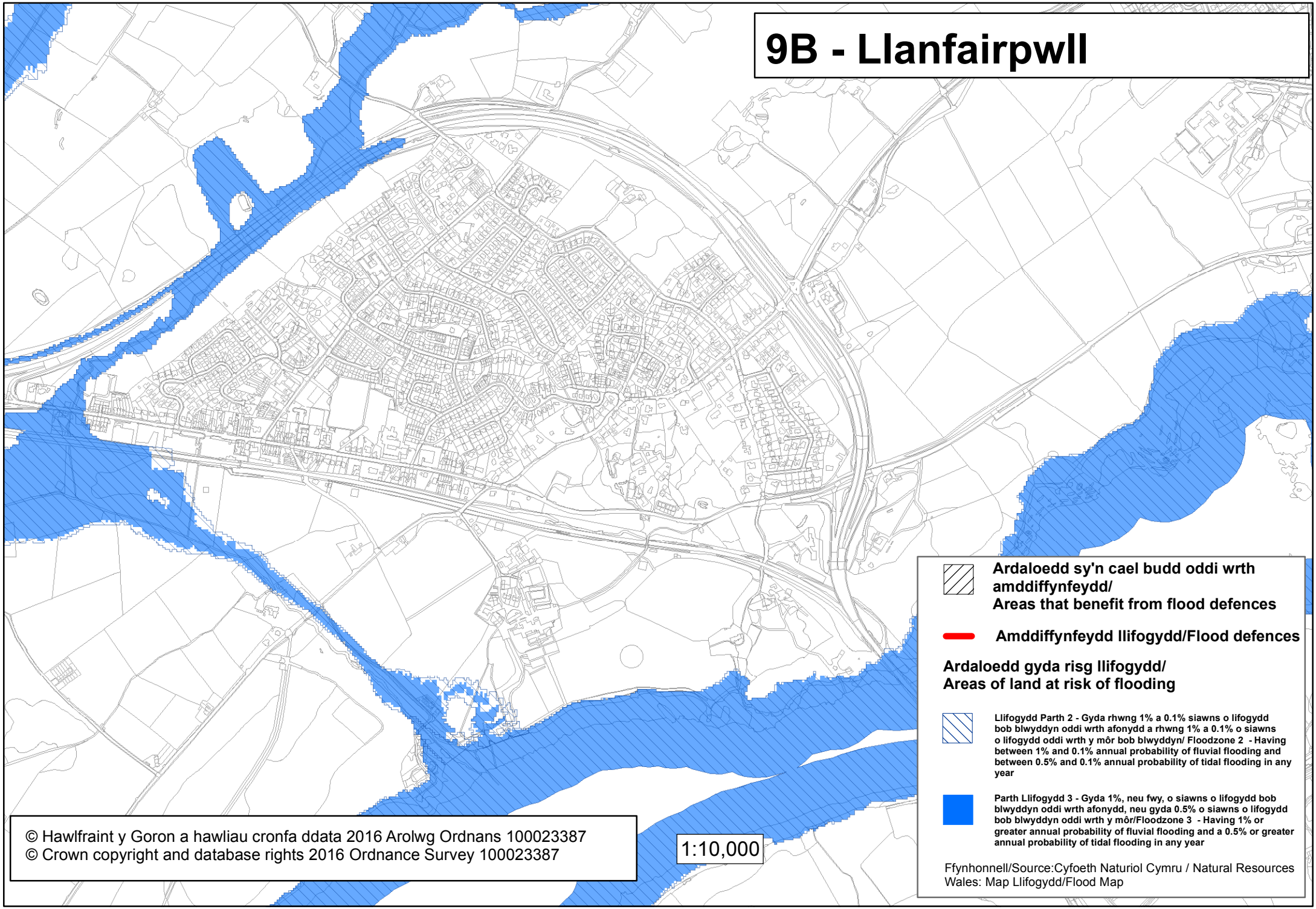


1:8,000

9A - Llanfairpwll



9B - Llanfairpwll



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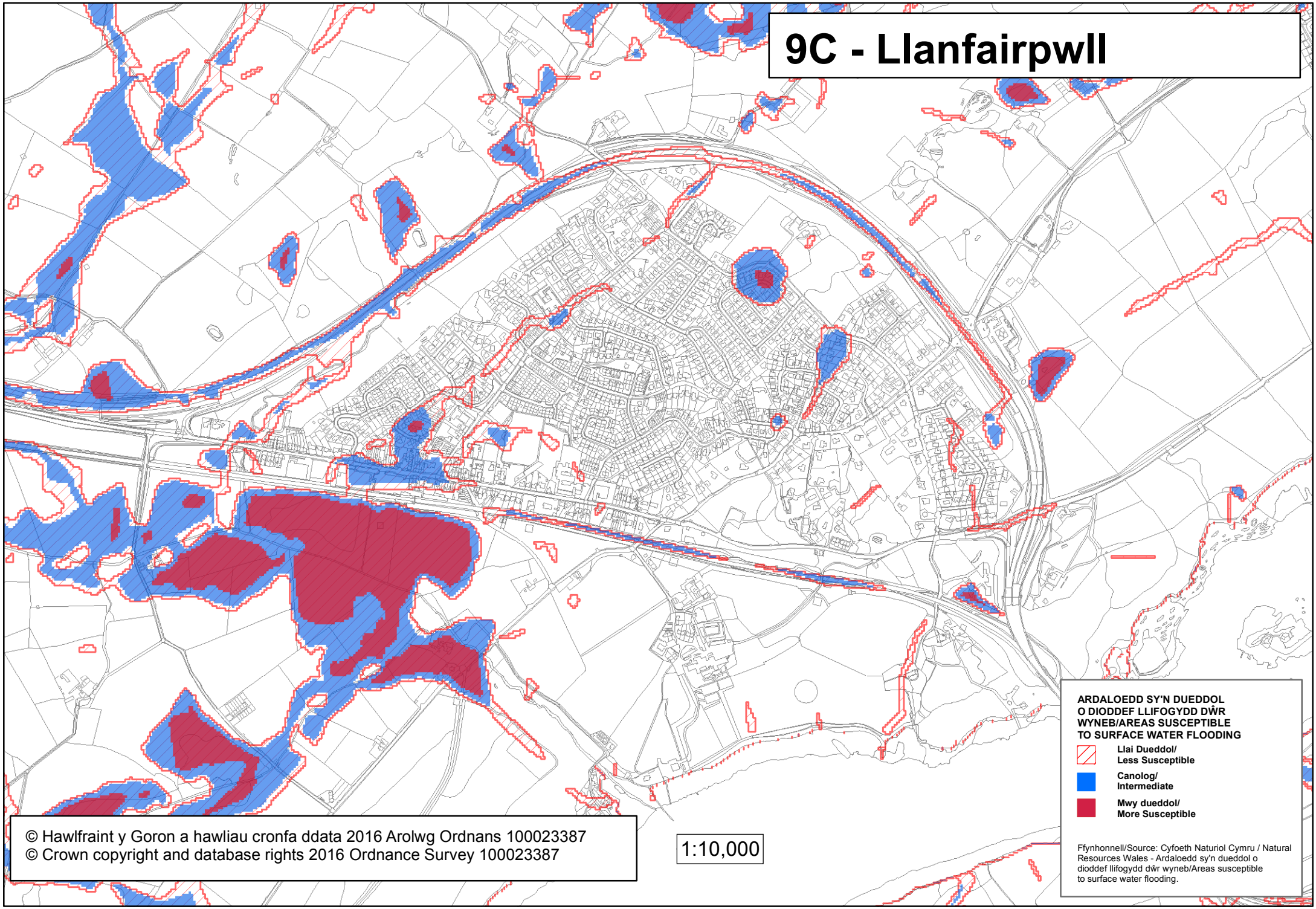
9C - Llanfairpwll



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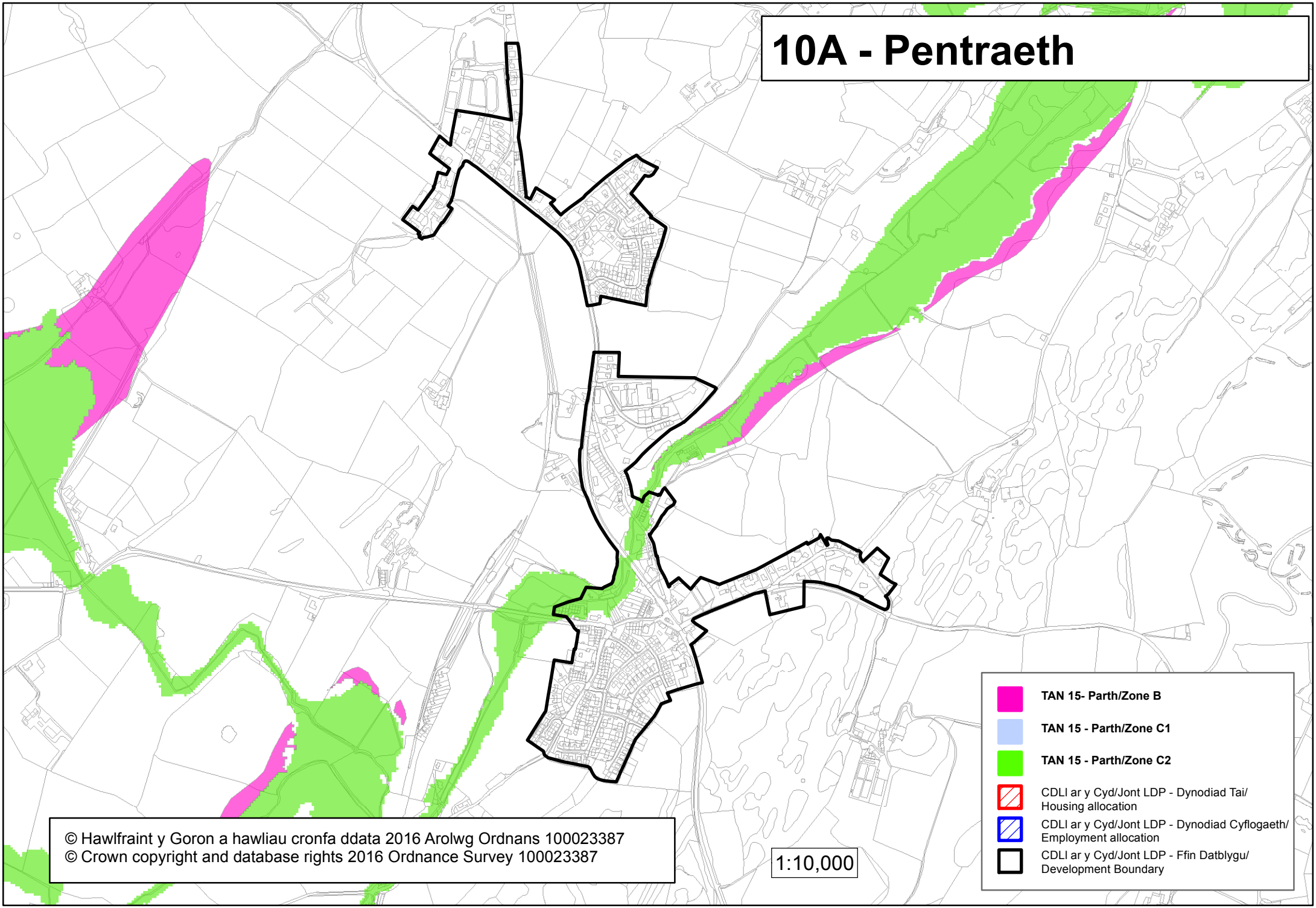
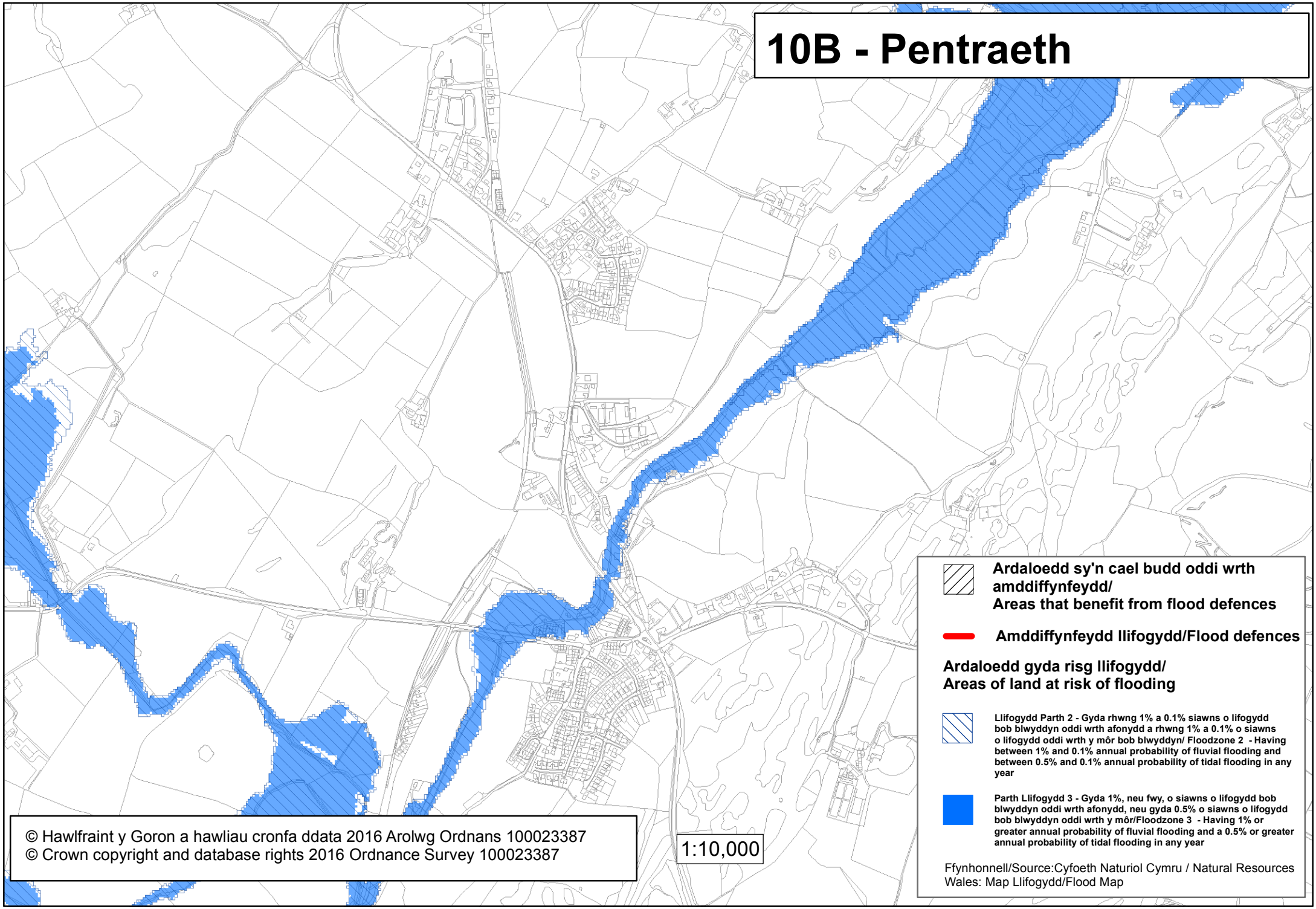
10A - Pentraeth



10B - Pentraeth



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
Areas of land at risk of flooding

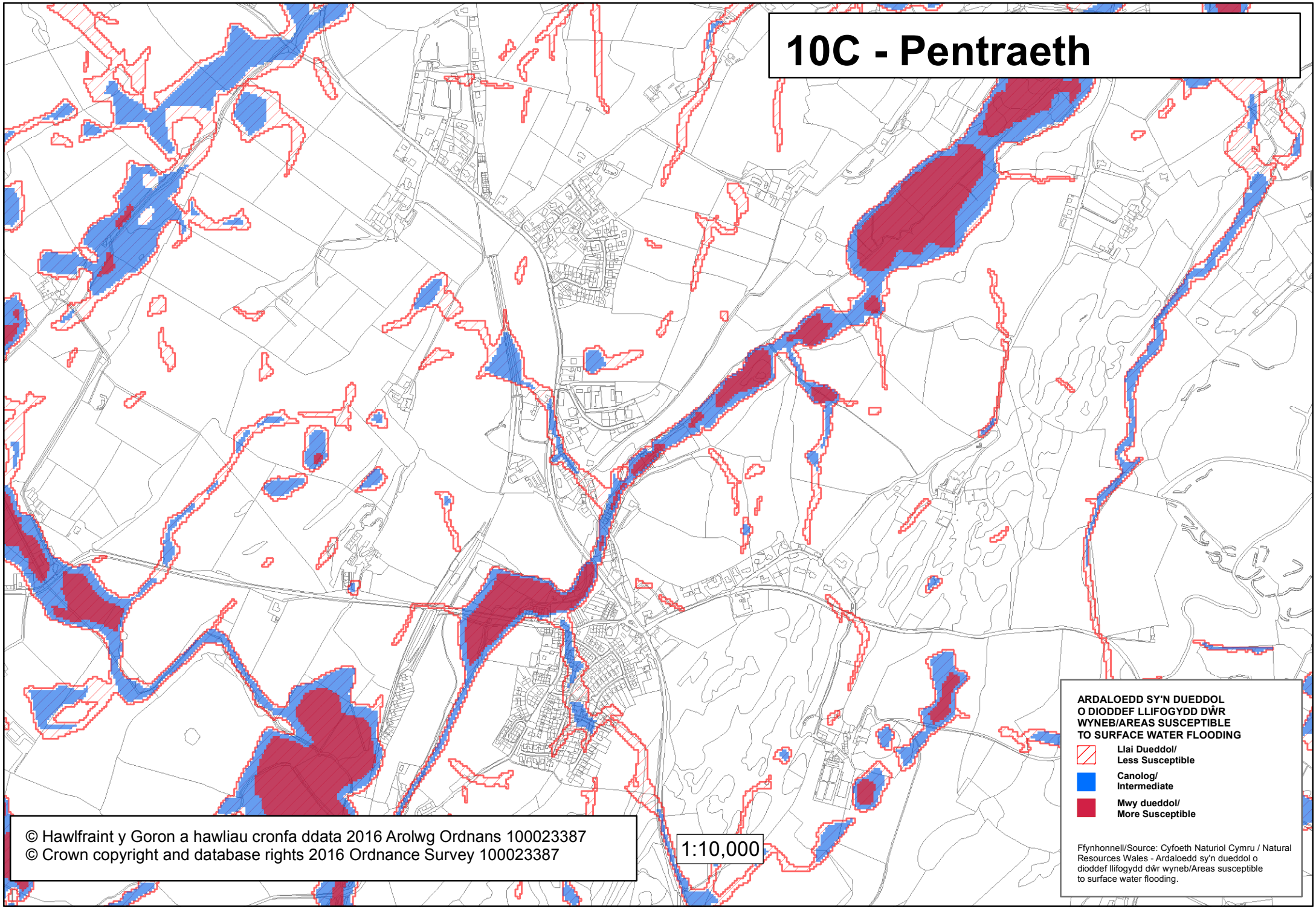
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:10,000

10C - Pentraeth



ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- **Llai Dueddol/ Less Susceptible**
- **Canolog/ Intermediate**
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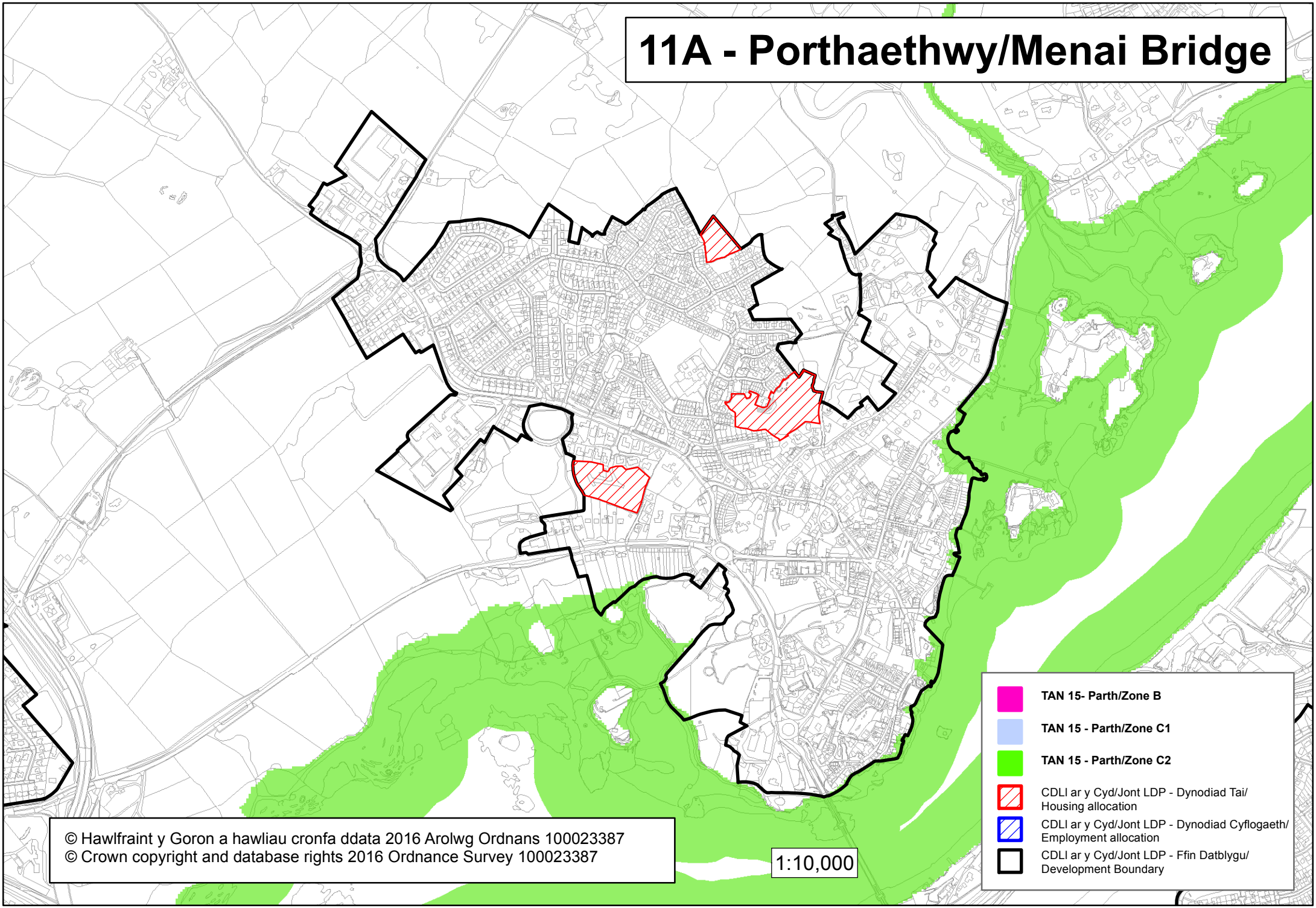
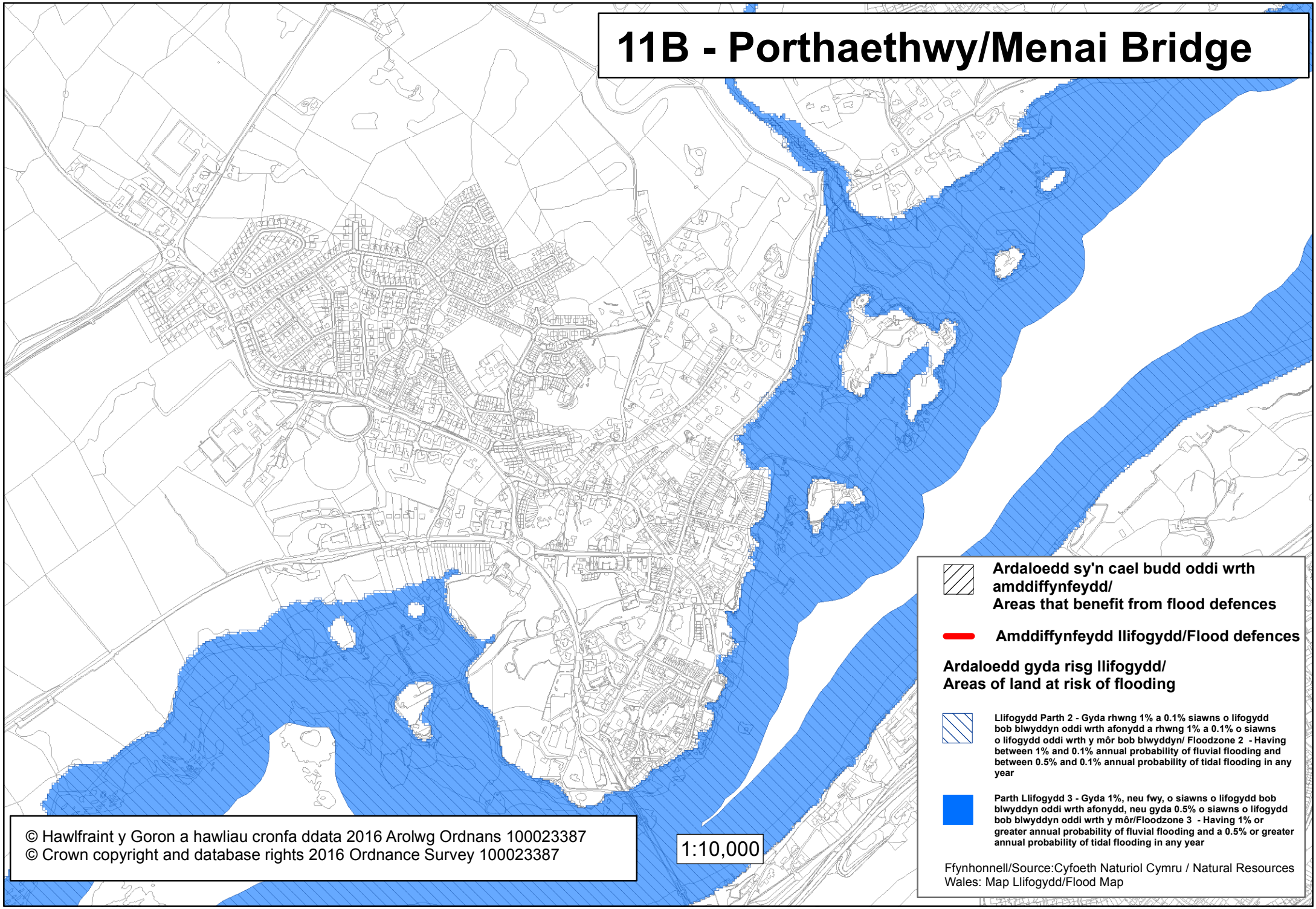
Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

1:10,000

11A - Porthaethwy/Menai Bridge



11B - Porthaethwy/Menai Bridge



Ardaloedd sy'n cael budd oddi wrth amddiffynfeydd/
Areas that benefit from flood defences

Amddiffynfeydd llifogydd/Flood defences

Ardaloedd gyda risg llifogydd/
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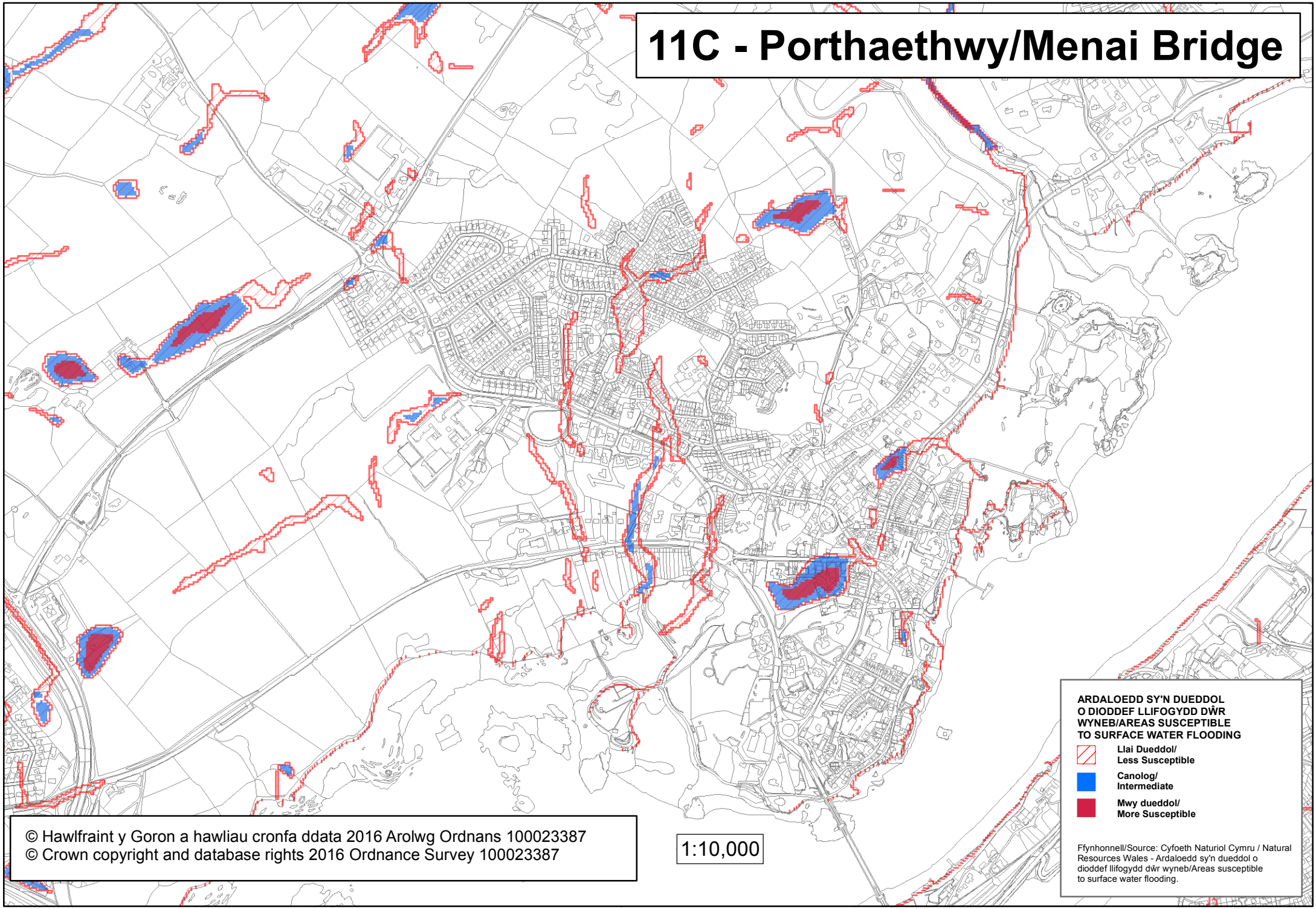
Llifogydd Parth 2 - Gyda rhwng 1% a 0.1% siawns o lifogydd bob blwyddyn oddi wrth afonydd a rhwng 1% a 0.1% o siawns o lifogydd oddi wrth y môr bob blwyddyn/ Floodzone 2 - Having between 1% and 0.1% annual probability of fluvial flooding and between 0.5% and 0.1% annual probability of tidal flooding in any year

Parth Llifogydd 3 - Gyda 1%, neu fwy, o siawns o lifogydd bob blwyddyn oddi wrth afonydd, neu gyda 0.5% o siawns o lifogydd bob blwyddyn oddi wrth y môr/Floodzone 3 - Having 1% or greater annual probability of fluvial flooding and a 0.5% or greater annual probability of tidal flooding in any year

Ffynhonnell/Source:Cyfoeth Naturiol Cymru / Natural Resources Wales: Map Llifogydd/Flood Map

1:10,000

11C - Porthaethwy/Menai Bridge



ARDALOEDD SY'N DUEDDOL O DIODDEF LLIFOGYDD DŴR
WYNEB/AREAS SUSCEPTIBLE TO SURFACE WATER FLOODING

- **Llai Dueddol/ Less Susceptible**
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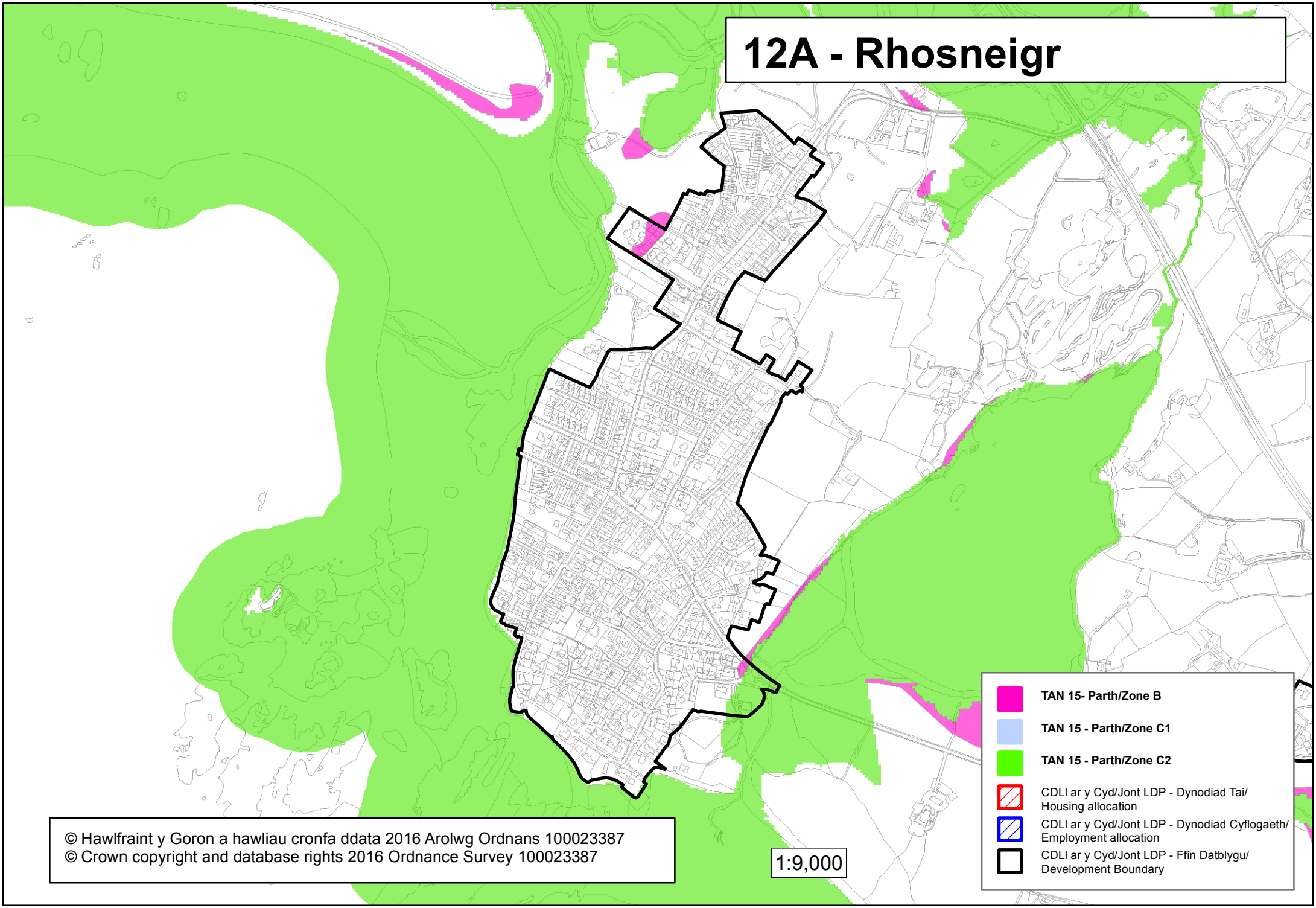
Ffynhonnell/Source: Cyfoeth Naturiol Cymru / Natural Resources Wales - Ardaloedd sy'n dueddol o dioddef llifogydd dŵr wyneb/Areas susceptible to surface water flooding.

1:10,000

12A - Rhosneigr



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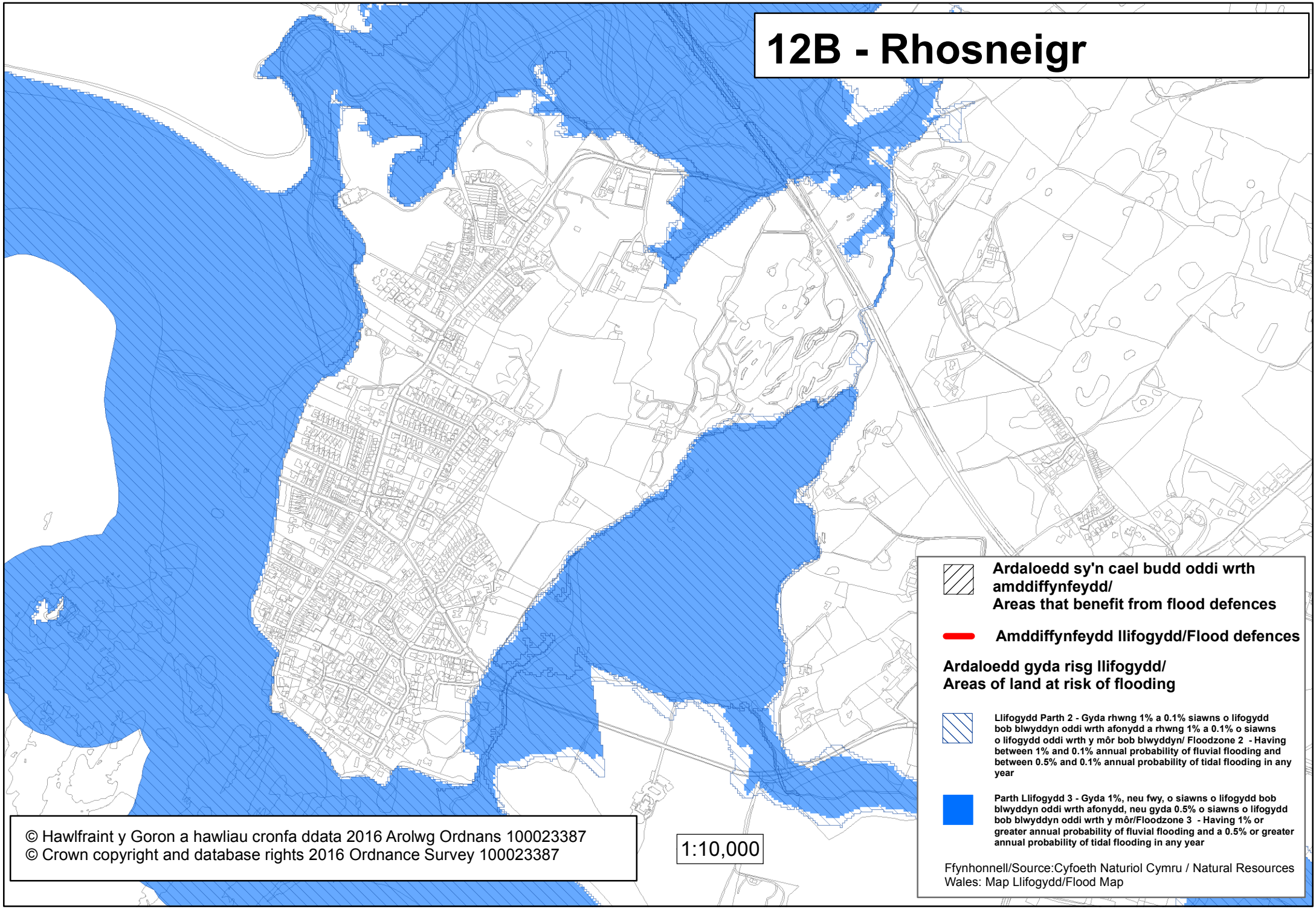
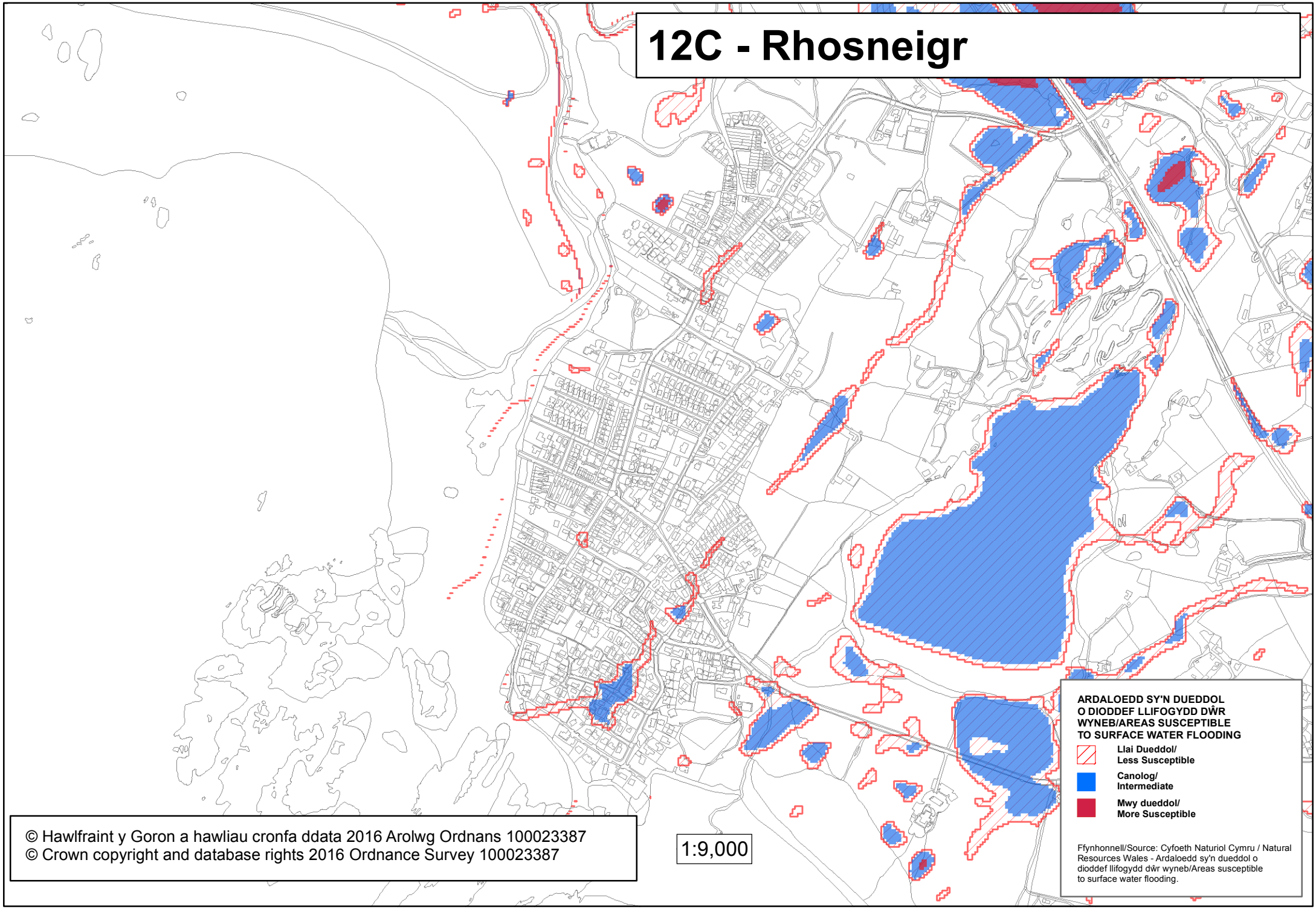
12B - Rhosneigr



12C - Rhosneigr



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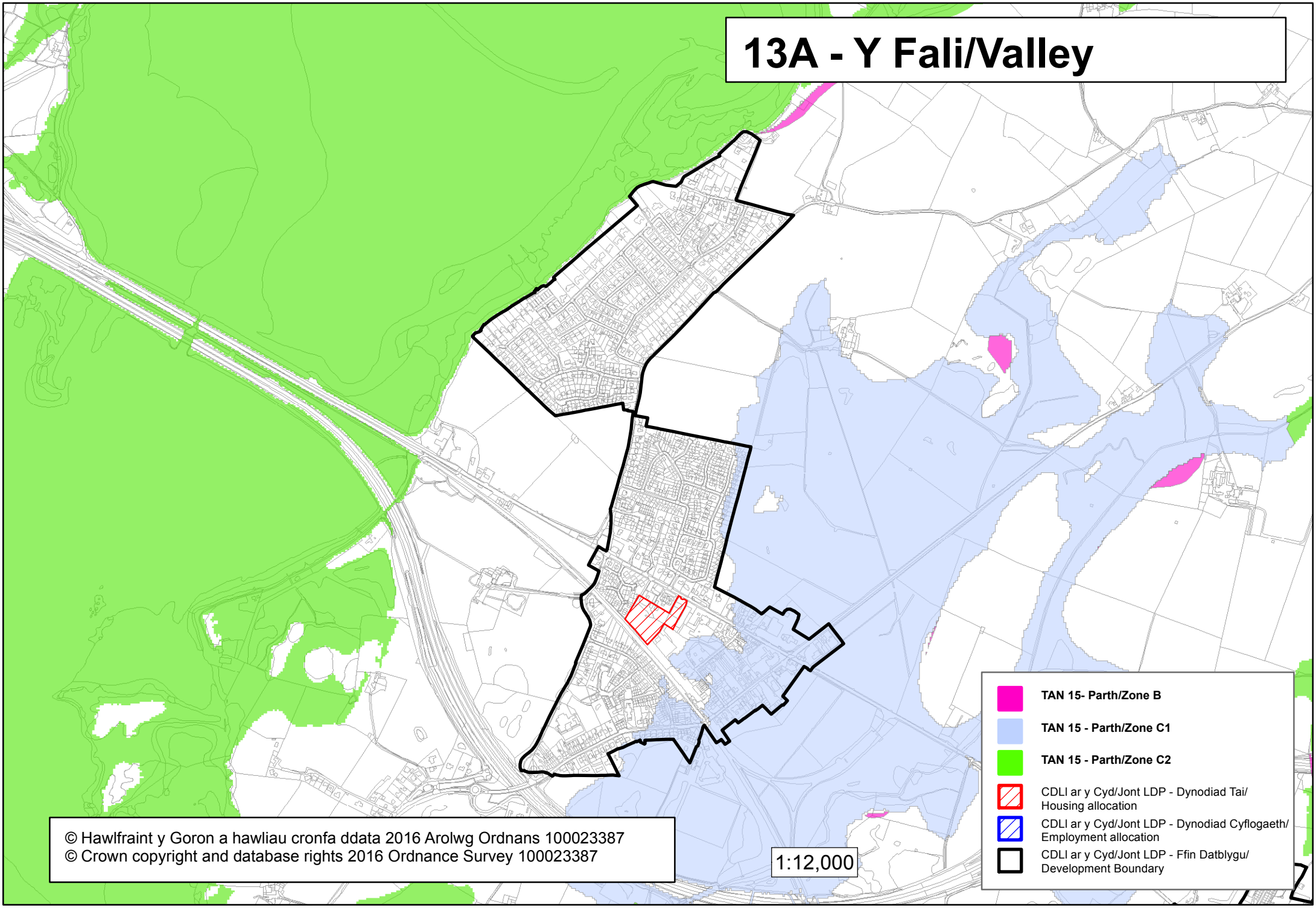
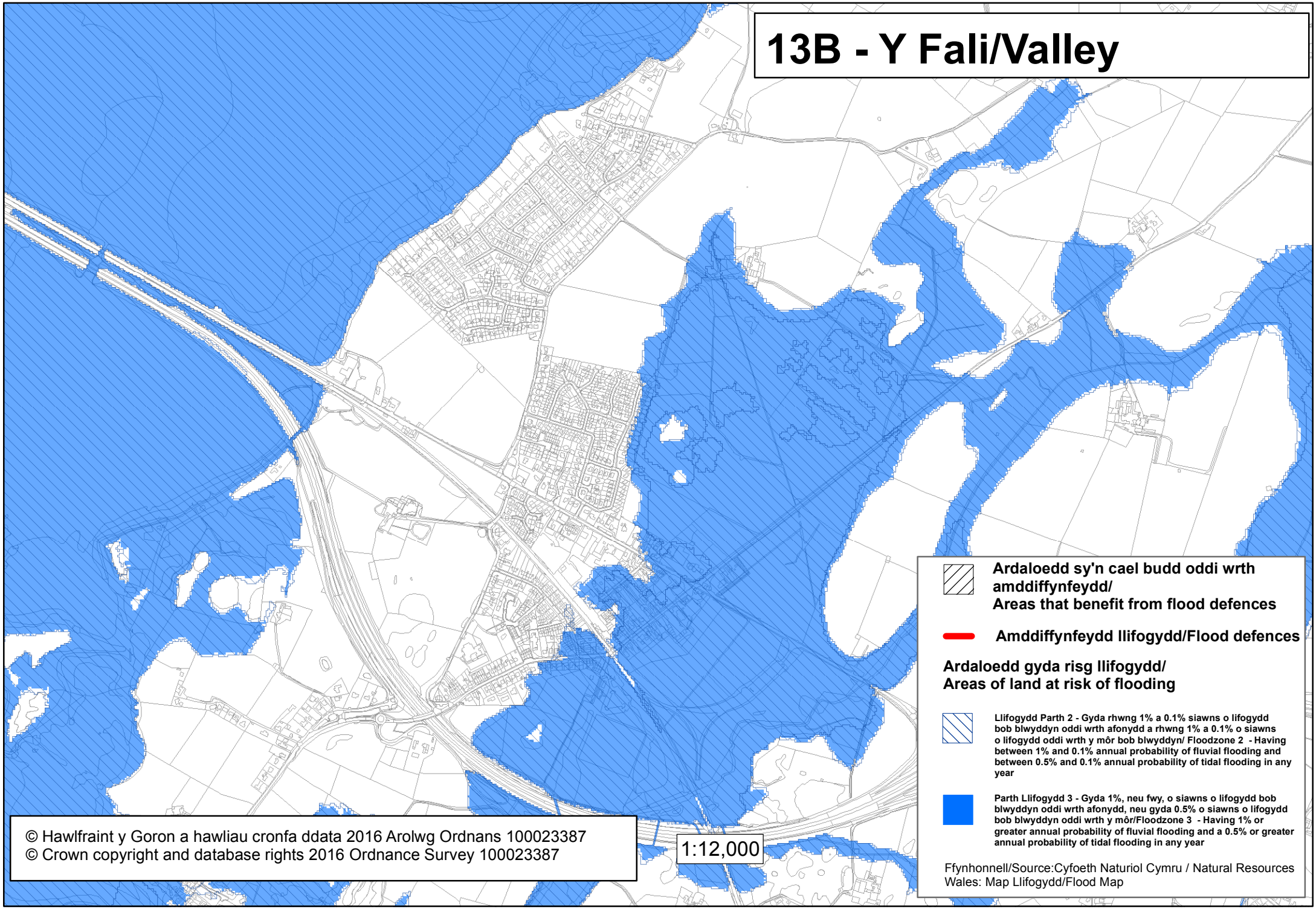
13A - Y Fali/Valley



13B - Y Fali/Valley



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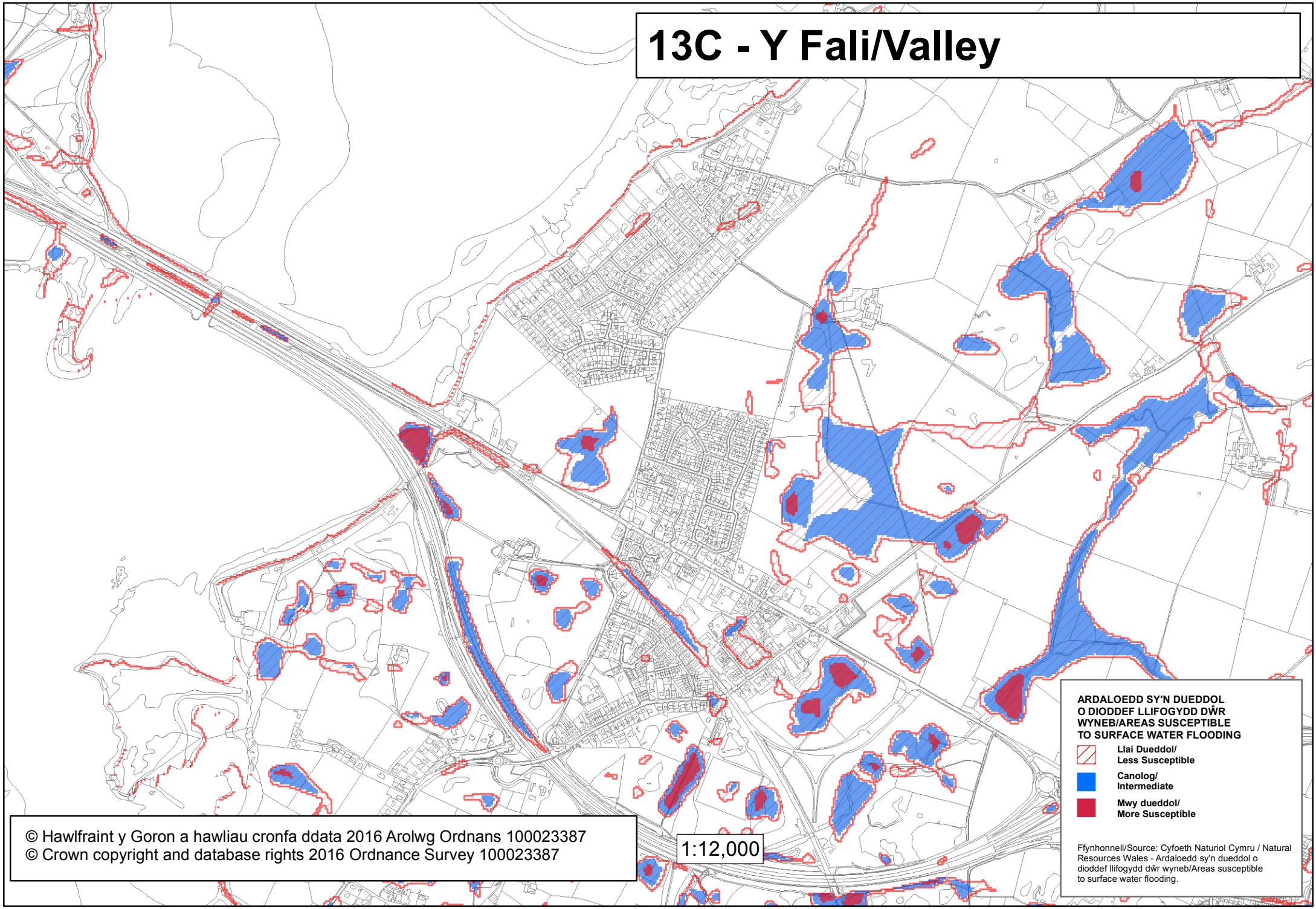
13C - Y Fali/Valley



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