Gwynedd Local Flood Risk Management Strategy

Strategic Environmental Assessment (SEA)

Environmental Report (Draft)

CPF 8599

Document Control Sheet

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Reviews

Name	Title	Date	Version
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Approvals

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Executive Summary

Ymgynghoriaeth Gwynedd Consultancy (YGC) have been commissioned to undertake a Strategic Environmental Assessment of Cyngor Gwynedd's Local Flood Risk Management Strategy (GLFRMS).

It is a legal requirement in the UK for certain plans and programmes stipulated by the Strategic Environmental Assessment (SEA) Directive (2001/42/EC) to undergo SEA. It has been deemed that the GLFRMS fall within the types of plan that require SEA, as they may lead to activities that result in changes in land use, and thus have significant environmental effects.

Environmental effects include issues such as "*human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors*," as specified in Annex 1(f) of the Directive.

The SEA process has five chronological stages:
Stage A – Setting the context & objectives, establishing the baseline & deciding on the scope
Stage B – Developing & refining alternatives & assessing effects
Stage C – Preparing the Environmental Report
Stage D – Consulting on the draft LFRMS and the SEA Report
Stage E – Monitoring the significant effects of implementing the LFRMS

This report follows Stage B and C of the SEA process, with Stage A already complete. At the scoping stage of the SEA (Stage A), a detailed analysis of environmental issues and problems and their relevance to the LFRMS was carried out, and this informed the criteria or 'SEA Objectives' to be used to conduct the SEA (Stage B tasks).

The GLFRMS's individual Objectives and associated Actions have been tested against the SEA objectives, the findings of which are documented in this report. Due to the high level nature of the GLFRMS, which sets out objectives and actions undefined in terms of their spatial and geographical extent, it is difficult at this point in time to develop a meaningful set of "reasonable alternatives" to test. The GLFRMS Objectives and associated Actions have therefore been compared to a 'Do Minimum' scenario, which represents the future state of the environment based on the minimum measures Cyngor Gwynedd would undertake as part of its statutory obligations.

Each of the GLFRMS Objectives would result in positive effects for Population and Human Health (SEA Objective 1), Climatic Factors (SEA Objective 5), and Material Assets (SEA Objective 6). No adverse environmental effects were identified as a result of GLFRMS

Objectives 2, 4 and 5. Potential negative environmental effects were identified for some Actions associated with GLFRMS Objectives 1 and 3.

The main environmental effects of the GLFRMS are considered to be a result of the delivery of minor works programme associated with flood risk / coastal erosion asset maintenance, and the implementation of SMP2 coastal policies. It was assessed that potential negative environmental effects could arise from works carried out at the project level (minor works programme) that does not allow for consideration of Environmental effects on biodiversity (such as disturbance of protected species), water quality (through water pollution from construction activities), and cultural heritage (disturbance / damage to cultural heritage features), depending on the extent and location of such work. Potential negative environmental effects were identified with actions associated with implementing coastal policies (SMP2), which could adversely affect SEA Objectives 2, 3 and 7 due to potential loss of habitat, loss of agricultural land, and loss of cultural heritage features.

Proposed mitigation and enhancement measures to alleviate such effects are outlined in Section 6.3. of the report. Assuming that the recommended mitigation is implemented for Objectives 1 and 3 the potential negative effects associated with them would be expected to be avoided or at least reduced so that they were no longer significant. Monitoring will involve testing the assessment criteria that have been proposed for the SEA Objectives using the relevant indicators.

This initial draft of the Environmental Report is subject to public consultation alongside the draft GLFRMS document and Habitat Regulations Assessment.

Cynnwys

Glossary of Acronyms

ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
CG	Cyngor Gwynedd
EIA	Environmental Impact Assessment
FCERM	Flood and Coastal Erosion Risk Management
FWMA	Flood and Water Management Act
GAT	Gwynedd Archaeological Trust
GAPS	Gwynedd Archaeological Planning Service
GCR	Geological Conservation Review
GLRFMS	Gwynedd Local Flood Risk Management Strategy
HRA	Habitats Regulations Assessment
LBAP	Local Biodiversity Action Plan
LDP	Local Development Plan
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LOHI	Landscape of Outstanding Historic Interest
LoWS	Local Wildlife Site
NLCA	National Landscape Character Area
NNR	National Nature Reserve
NRW	Natural Resources Wales
ODPM	Office of the Deputy Prime Minister
RIGS	Regionally Important Geological Site
RMA	Risk Management Authority
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SEA	Strategic Environmental Assessment
SNPA	Snowdonia National Park Authority
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
T-ENT	Trans-European Transport Network
UKCP18	UK Climate Projections
WFD	Water Framework Directive
WHS	World Heritage Site
YGC	Ymgynghoriaeth Gwynedd Consultancy

1. Introduction

1.1 Context of the Environmental Report

The Flood and Water Management Act (FWMA), 2010 places a legal requirement on all Local Authorities to take responsibility for managing flood risk in their areas via their role as Lead Local Flood Authority (LLFA). In doing so each LLFA is required to develop, maintain, apply and monitor a Local Flood Risk Management Strategy (LFRMS). Therefore, Cyngor Gwynedd is currently developing a revised LFRMS. The purpose of the Local Strategy is to guide the management of local flood risk across Gwynedd. Further information on the LFRMS is provided in Section 2.0 of this document.

Cyngor Gwynedd have undertaken a Strategic Environmental Assessment (SEA) for their LFRMS. The aim of the SEA is to provide a high level of protection to the environment and contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development. The scope of the SEA has considered the potential effects of the Gwynedd LFRMS (GLFRMS) on various environmental receptors within the GLFRMS area of application so that they could be taken into account prior to its approval and formal adoption.

The purpose of the Environmental Report is to identify and document the likely significant effects of the GLFRMS, while the overall Environmental Assessment incorporates the entire process of preparing the Environmental Report; including scoping, carrying out consultation with relevant bodies and taking into account the result of the consultation, and providing information on how the results of the Environmental Assessment have been considered for the adopted strategy.

The SEA Environmental Report (Draft) forms part of the consultation (along with the Local Strategy and Habitats Regulations Assessment) undertaken as part of the development of the Local Flood Strategy.

1.2 Structure of the Environmental Report

As initially proposed in the Scoping Report (YGC, 2023) the Environmental Report largely follows the structure provided in Table 1.1 which is based on Figure 7 from the SEA Guidance[1], although the sections regarding Methods and Background have been alternated in order to ensure that the document is clear and logical to read.

Table 1.1: Structure of the SEA Environmental Report

Structure of Report	

[1] A Practical Guide to the Strategic Environmental Assessment Directive, ODPM (September 2005)

	Information to be Included
Executive summary	• Summary of the SEA process and outcomes.
Background	• Purpose of the SEA and links with the GLFRMS. • Objectives of the GLFRMS.
Methods used	• Who completed the SEA and how. • Who has been consulted, and when. • Difficulties encountered in compiling information and carrying out the assessment.
SEA objectives, baseline and context	• Links to other relevant plans and programmes and environmental objectives and how they have been considered. • Description of baseline characteristics and predicted future baseline, including without the GLFRMS. • Relevant environmental issues and problems. • Limitations of the data and assumptions made. • SEA objectives, targets and indicators.
GLFRMS issues and alternatives	• Main strategic alternatives considered and how they were identified. • Comparison of the significant environmental effects of the alternatives. • How environmental issues were considered in choosing the preferred strategic alternatives. • Other alternatives considered and why they were rejected. • Any proposed mitigation and enhancement measures.
GLFRMS policies/objectives	• Significant environmental effects of the policies/objectives. • How environmental problems were considered in developing the policies/objectives. • Proposed mitigation and enhancement measures. • Uncertainties and risks identified.
Implementation	• Links to other tiers of plans and programmes and project level assessment (*e.g.* environmental impact assessment, design guidance *etc.*) • Proposals for monitoring and reporting.

2.0 Projects Background

2.1 The Purpose of SEA and its links with the Gwynedd LFRMS

SEA is a statutory requirement of the European Directive 2001/42/EC on "the assessment of the effects of certain plans and programmes on the environment" and involves the appraisal of the potential environmental effects (positive and negative) of plans and programmes (including strategies) so that they can be taken into account prior to their approval and formal adoption. In Wales, the SEA Directive is implemented by The Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (SI 1656, 2004). Under these Regulations environmental assessment is a legal obligation for certain plans and programmes required by legislative, regulatory or administrative provisions that are either:

"subject to preparation and/or adoption by an authority at national, regional or local level; or
prepared by an authority for adoption, through a legislative procedure by Parliament or Government".

Local strategies are considered to be statutory plans and therefore the GLFRMS has been determined to require statutory SEA by meeting the aforementioned criteria. The requirement for environmental assessment particularly applies to plans or programmes for specified key resources and industries (including water management) and which have been determined to require an assessment in accordance with the EU Habitats Directive (EU Council Directive 92/43/EC, as amended, on the Conservation of Natural Habitats and of Wild Flora and Fauna) as implemented in the United Kingdom by The Conservation of Habitats and Species Regulations 2017, as amended; which is generally referred to as a Habitats Regulations Assessment (HRA).

Habitats Regulations Assessment (HRA)

The GLFRMS has been considered to have the potential to result in significant effects on sites of international nature conservation importance, namely: Special Areas of Conservation (SACs), Special Protection Areas (SPA's) and Ramsar sites.

Therefore, as the 'competent authority' for the GLFRMS, Gwynedd Council has completed a HRA (YGC, November 2023) in parallel with the SEA process. The HRA report is available as a separate document to this Environmental Report but the conclusions of the HRA process are summarised as follows.

A scoping exercise was initially completed to identify the European sites that fall within the Gwynedd Local Flood Risk Management Strategy (GLFRMS) area. This exercise then proceeded to identify which of these sites are likely to remain unaffected by the GLFRMS and hence not requiring to be considered further. 7 sites were scoped out, leaving 25 European sites, comprising 18 SAC's, 4 SPA's, and 3 Ramsar Sites, to be considered in the assessment.

A scoping exercise was also completed to investigate which of the GLFRMS Objectives / Actions have the potential for a significant effect on European sites. Potential adverse effects associated with the GLFRMS may occur from a limited number of the GLFRMS objectives. Many of the options are involved with non-environmentally damaging operations, such as development of flood risk community engagement and emergency planning, and hence will not have an adverse effect on the environment.

A screening process was undertaken which involved an assessment of likely significant effects on the identified European sites screened in, taking account of the screened in GLFRMS objectives and the likely impacts from these objectives / actions. The screening exercise concluded that likely significant effects (LSE) could not be ruled out for a total of 18 SAC's, 4 SPA's, and 3 Ramsar sites. Therefore, an appropriate assessment was required for these likely significant effects.

The Appropriate Assessment found that some of the objectives/actions of the GLFRMS could effect the integrity of European sites. However, due to the high level of the strategy it is not possible to conclude with any certainty which, if any sites will be affected, or if the effects will be significant. Subsequent plans and projects / schemes arising from the GLFRMS will need to be subject to HRA if there is a potential to affect European Designated Sites, under the Habitats Regulations.

The assessment showed that for identified likely impacts, effective mitigation approaches are available at lower – tier levels. Provided that effective and appropriate mitigation is implemented it can be concluded that no adverse effects on European Site integrity will occur as a result of adopting the GLFRMS. The Appropriate Assessment therefore concluded that the GLFRMS is not likely to have any significant adverse effects on European sites, alone or in combination with other plans or projects. Detailed assessments will be required at lower-tier levels to identify any likely significant effects at the site-specific level and implementation of the required mitigation to avoid these.

2.2 The GLFRMS and its Objectives

In accordance with the Flood and Water Management Act (FWMA) 2010, Gwynedd

Council as a Lead Local Flood Authority (LLFA) must develop, maintain, apply and monitor a strategy for local flood risk management in Gwynedd. Local flood risk includes surface runoff, groundwater and ordinary watercourses (including lakes and ponds), ordinary watercourses are defined by the FWMA 2010 as those that do not form part of a main river. The FWMA 2010 requires that each LFRMS must specify:

The LFRMS must specify the following:

1) The risk management authorities in its area (in Gwynedd these are Natural Resources Wales, The Gwynedd LLFA, Dwr Cymru Welsh Water, and the Gwynedd Council Highway Authority);
2) The flood and coastal risk management functions that may be exercised by those authorities in relation to the area (Gwynedd);
3) The objectives for managing local flood risk (including any objectives included in the authority's flood risk management plan prepared in accordance with the Flood Risk Regulations 2009);
4) The measures proposed to achieve those objectives;
5) How and when the measures are expected to be implemented;
6) The costs and benefits of those measures, and how they are to be paid for;
7) The assessment of local flood risk for the purpose of the strategy;
8) How and when the strategy is to be reviewed, and;
9) How the strategy contributes to the achievement of wider environmental objectives.

The GLFRMS must accord with the Welsh Government's National Flood and Coastal Erosion Management Strategy (Welsh Government, 2020). The National Strategy sets out the legislative context to FCERM activities in Wales. This will chiefly deal with flood risk from main rivers, the sea and reservoirs. However, the interaction of these aspects with local sources of flooding must still be considered within the LFRMS.

The GLFRMS acknowledges that adopting a risk management approach is about recognising that drainage and flood defence may not always be the most appropriate solution, and that some circumstances may require a complex and interlinked approach combining several different options.

As the GLFRMS is a statutory requirement of the FWMA 2010, Section 10, and must also accord with the objectives of the Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management in Wales (NSFCERM, 2020), consideration of alternative options to the Strategy itself was not considered realistic or feasible. However, several options have been identified for each GLFRMS objective defined for the SEA. These options, together with the associated local measures to achieve them, follow a risk-based approach to

adapting to the effects of flooding at a local level and have been assessed against the SEA objectives to identify any significant environmental effects.

A 'Do Minimum' scenario has also been considered in order to provide a comparison of the situation without the GLFRMS. In this case, Do Minimum means that the current situation with regard to managing flood risk would not change and the existing measures would continue as normal. A comparison of the effects of each Objective and it associated Actions is provided in Section 5.

Defining the GLFRMS Objectives for the SEA

The Welsh Government National Strategy provides the framework for flood and coastal erosion risk management in Wales. The framework is centred around five key objectives and the measures to achieve those objectives. The aim of the strategy is to 'reduce the risk to people and communities from flooding and coastal erosion'. The aim is supported by five objectives that complement and overlap each other with the intention of reducing the risk to life. These are summarised in the table below:

Table 2.1: The five main objectives identified within the National Strategy

For the GLFRMS, Cyngor Gwynedd have developed their own strategic objectives which both align with the National Strategy and reflect local context and priorities. GLFRMS Objectives are listed in table 2.2 below and have been selected to reflect the greatest areas of priority whilst considering the Council's remit for managing risks associated with local flooding and coastal erosion. All objectives are supported by a range of actions which are listed and

described in table 2.3. The actions are designed to complement and improve the methods currently adopted by the Council to manage flood and coastal erosion risks.

Table 2.2: The strategic objectives of the GLFRMS

Local Strategy Objectives	Link to National Strategy Objectives
Objective 1: To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd	**C, D**
Objective 2: To further develop an understanding of the flood risk to Gwynedd and the impacts of climate change	**A**
Objective 3: To continue to work with all relevant bodies to ensure appropriate and sustainable development in Gwynedd	**B, D**
Objective 4: Raising awareness of local flood and coastal erosion risk	**A**
Objective 5: Working collaboratively with all other Risk Management Authorities and relevant groups/bodies to ensure a coordinated response to flood and coastal erosion events	**E**

Table 2.3: GLFRMS Actions:

Objective 1:	***To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd***
1.1	***Flood and coastal erosion risk management programmes***
Action 1.1A	*Maintain long term capital programme to reduce risk of inland flooding*
	Cyngor Gwynedd will prepare and maintain a long-term programme of studies and schemes to manage the risks of inland (river and surface water) flooding upon our communities. The programme will contain high-level details of the objectives and potential benefits of each item and identify opportunities to work alongside partner organisations and/or other stakeholders. The programme will be reviewed and updated annually as more information regarding flood risk and flooding incidents becomes available. Schemes currently included on the Councils inland flood risk management programme are listed in Appendix A of the Local Strategy.
Action 1.1B	*Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2*

	Cyngor Gwynedd will prepare and maintain a long-term programme of studies and schemes to manage the risks of coastal flooding and coastal erosion upon our communities. The programme will contain high-level details of the objectives and potential benefits of each item and identify opportunities to work alongside partner organisations and/or other stakeholders. Our programme will incorporate the actions identified within SMP2 to move towards a sustainable approach of coastal management. The programme will be reviewed and updated annually as more information regarding risk and condition of coastal assets becomes available. Schemes currently included on the Councils coastal risk management programme are listed in Appendix B of the Local Strategy.
1.2	***Flood and coastal erosion risk management improvements***
Action 1.2A	*Prepare annual list of schemes from long term action plan to reduce risk of flooding and coastal erosion to be presented for inclusion on WG capital programme*
	Our works programmes (inland and coastal) will form the basis of our annual submission of studies and schemes to be included on the national FCERM programmes thereby securing grant support from Welsh Government. Further information regarding prioritisation of work and means of funding our programmes is provided in 13 and 14 of the Local Strategy. As well as reducing flood and coastal erosion risks all schemes will be developed with the aim of maximising environmental and socio-economic benefits to the study areas. This will include reducing any adverse effects on designated ecological sites which will be driven by EIA and HRA processes.
1.3	***Management of flood/coastal erosion risk management assets***
Action 1.3A	*Develop register and map of highway drainage assets in flood prone areas*
	Information regarding the layout of surface water drainage systems within the Council's ownership and responsibility, as well as supporting records, are often incomplete. The Council will work to improve the records that exist in high surface water flood risk areas, so that opportunities to improve the network can be identified and that adequate maintenance and/or management plans can be developed to reduce surface water flood risk for our communities.
Action 1.3B	*Develop register and map of all SuDS elements adopted by the Council*
	In their role as SAB, Cyngor Gwynedd has a duty to adopt sustainable drainage systems that have been constructed to comply with national standards. The Council will develop a detailed inventory of adopted drainage systems, including information on the construction and function of each element as well as appropriate inspection and maintenance schedules.
1.4	***Maintenance and deployment of flood/coastal erosion risk management assets***
Action 1.4A	*Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain standard of protection afforded by flood risk/costal erosion assets*
	Following completion of our asset inspection programme the Council shall identity a risk-based programme of maintenance or minor works to ensure that asset condition is maintained and present-day standard of protection is not compromised. Any works that cannot be carried out using the Council's dedicated

	revenue budget for any given year will be included on a capital works programme (see Actions 1.1).

Objective 2:	***To further develop an understanding of the flood risk to Gwynedd and the impacts of climate change***
2.1	***Working with partner RMAs***
Action 2.1A	*Contribute to stakeholder events with colleagues from partner RMAs and other stakeholders i.e. North Wales Regional Flood Group, West of Wales Coastal Group*
Action 2.1B	*Hold regular discussions regarding flood risk issues within Gwynedd with colleagues from NRW and DCWW*
	Working alongside partner RMAs and other stakeholders at a local and regional level will allow Cyngor Gwynedd to better understand flood challenges from all sources, and make us aware of policies, studies or schemes that are proposed by partner authorities to manage flood risk. Regular discussions with other organisations will also enable us to identify opportunities for partnership working, by sharing resources or knowledge to address challenges.
2.2	***Flood investigations***
Action 2.2A	*Develop and improve current mechanisms to identify incidents of flooding within Gwynedd as early as possible*
	Experience has shown us that information gathering exercises following storm events can take longer than we would like which can delay the commencement of investigation work. We are also aware that the Council are not alerted of all incidents of flooding to properties. Therefore, to build up a complete picture of flood impacts and to enable us to engage with effected residents as early as possible we intend to look at alternative methods of collecting information.
2.3	***Flooding to highway network***
Action 2.3A	*Initiate study to identify areas of the county highway network that are most vulnerable to flooding and will become more susceptible as a results of climate change effects in the future*
	Prevention of access towards populated areas during storm events is a significant risk to our communities and therefore a good understanding is needed of present day and future risks of flooding to the highway network so that measures to mitigate these risks can be considered.
2.4	***Flood Modelling***
Action 2.4A	*Development of high quality hydrological and hydraulic modelling to build on national maps and better understand flood risk at local level*
	Detailed investigation of flood risk in high-risk areas will be supplemented by modelling work to enable the Council to estimate the extent and depth of flooding

	for a range of rainfall and/or tidal events and also for various conditions (blockages, defence failure etc.).
Action 2.4B	*Incorporate most up-to-date climate change projections into all flood modelling exercises*
	All hydrological and/or tidal modelling exercises carried out to inform investigation or design work will make the correct allowances for future climate change effects, based on the most up to date available guidance
Action 2.4C	*Sharing of local flood modelling information with NRW so that national maps can be updated as appropriate*
	All hydrological and/or tidal modelling exercises carried out to inform investigation or design work will comply with NRW modelling standards to allow the national flood maps to be updated with more detailed and current information as appropriate. Challenging and updating national flood maps will enable the Council to identify the number of properties and other receptors that have benefitted from FCERM schemes in the future, thereby allowing success of this Local Strategy to be measured (see section 15).
2.5	***Data Collection***
Action 2.5A	*Enhancing our network of LoraWAN sensors to measure water levels within watercourses as well as groundwater level in areas of particular interest*
	Cyngor Gwynedd are in the processing of developing a network of telemetry sensors that can continually measure tidal level, the level of water within watercourses and groundwater. We intend to enhance the current network of sensors to build a better picture of the areas most affected by storm events. Further application of the sensors should also enable the Council to be alerted when flood risk requires intervention (e.g., to clear a blocked screen or culvert).
Action 2.5B	*Develop and implement a monitoring programme for areas of the coastline where cliff instability poses a risk to people, property and infrastructure.*
	The risk of coastal erosion is prevalent along certain areas of the coastline which could lead to instability of property or infrastructure in certain locations. Cyngor Gwynedd is to identify the areas where coastal erosion risks are highest and develop a programme to monitor any movements within the cliff face so that risk can be measured over time and actions to manage these risks can be identified.

Objective 3:	***To continue to work with all relevant bodies to ensure appropriate and sustainable development in Gwynedd***
3.1	***Development Planning/Development Control***

Action 3.1A	*Incorporation within the Local Development Plan of the requirements contained within TAN15 with regard to Strategic Flood Consequence Assessment*
	Cyngor Gwynedd's Local Development Plan is currently under review. The replacement plan will be guided by a Strategic Flood Consequence Assessment undertaken in accordance with the updated version of TAN15 (Development, flooding and coastal erosion) scheduled for publication in 2024, along with the information contained within the Flood Map for Planning.
Action 3.1B	*Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline*
	The current Local Development Plan includes a Climate Change Management Area policy intended to direct vulnerable developments away from coastal areas that may face a greater risk of flooding and/or coastal erosion in the future due to changes in coastal policies, as outlined in the SMP2. The replacement plan will also include an equivalent policy, whilst taking into consideration specific land use recommendations that may have derived from subsequent coastal adaptation planning studies.
3.2	***Works near watercourses***
Action 3.2A	*Review of all policies relating to Land Drainage consenting procedures to ensure best practice is maintained and proposed developers are aware of design and construction requirements*
	Cyngor Gwynedd is opposed to the culverting of watercourses because of the adverse ecological, flood risk, human safety and aesthetic impacts. Watercourses are important linear features of the landscape and should be maintained as continuous corridors to maximise their benefits to society. The Council have a culverting policy which explains to applicants in which circumstances culverting is appropriate and also provides general design criteria[2]. We shall review the content of this policy to ensure that this guidance provided is fit for purpose and in line with industry guidance. Opportunities to deliver environmental enhancement will be included in such policies where relevant, including proactive use of green infrastructure and restoring natural processes. WFD objectives and measures are to be delivered where reasonable to do so.
3.3	***Sustainable Drainage Systems (SuDS) and Natural Flood Risk Management (NFM)***
Action 3.3A	*Identify opportunities for the implementation of SuDS and NFM schemes in areas which will deliver meaningful flood risk benefits as well as other environmental and amenity benefits*
	SUDS are drainage systems that are considered to be environmentally beneficial, causing minimal or no long-term detrimental damage. They are often regarded as a sequence of management practices, control structures and strategies designed to efficiently and sustainably drain surface water, while minimising pollution and managing the impact on water quality of local water bodies. NFM involves working with nature to reduce the risk of flooding for communities. It uses various techniques to restore or mimic the natural functions of rivers,

[2] Ref i wefan need web address?

	floodplains and the wider catchment. It aims to store water in the catchment and slow the rate at which water runs into rivers, to help reduce flooding downstream. A key priority of the National Strategy is to deliver more schemes of this kind, and with this in mind Cyngor Gwynedd will identify urban and upland areas that are suitable for delivery of SuDS and NFM interventions respectively, either as stand-alone projects or as part of wider flood risk management schemes.
Action 3.3B	*Work with partner authorities and landowners to deliver NFM schemes as part of a national programme*
	As funding becomes available for NFM schemes Cyngor Gwynedd will identify and work alongside landowners and partners to deliver successful projects that realise all potential benefits associated with NFM.
Action 3.3C	*Develop position statement which clearly outlines how NFM schemes should be designed and developed to obtain necessary watercourse consents (S23 and LD bylaws) from Cyngor Gwynedd*
	As explained above Cyngor Gwynedd are responsible for consenting of in-channel works as well as works adjacent to ordinary watercourses. In this role our general aim is to ensure that river channels remain free from obstruction to allow effective conveyance of flow and reduce risk of out of channel flooding. However, some NFM measures are generally opposed to this idea and instead look to re-connect the channel with its floodplain further up the catchment from flood-prone areas, so that peak flows are delayed. Cyngor Gwynedd will develop a position statement to establish design criteria for NFM measures which require our consent to avoid any conflict with our current consenting procedures. Our criteria will promote options that provide environmental enhancement measures.

Objective 4:	***Raising awareness of local flood and coastal erosion risk***
4.1	***Raising awareness of local flood risk***
Action 4.1A	*Cyngor Gwynedd will raise awareness of flood risk to its residents*
	As the Council considers the risk of flooding to a community through a scheme or a study we will engage with residents and business/property owners of the area of interest to make them aware of risk from different flood sources. We shall also let our communities know where to find the most up to date information relating to flood risk.
Action 4.1B	*Cyngor Gwynedd will advise on and promote flood resilience and resistance measures amongst its residents*
Action 4.1C	*Cyngor Gwynedd will prepare and publish an information pamphlet available to all residents within flood risk areas, and any residents that have experienced flooding to their properties*
	The Council encounter many residents that face a continuous risk of flooding to their properties, and in some cases reducing the level of risk is not feasible or viable. In such cases we shall advise our residents on ways to live alongside the risk in the form of an information pamphlet prepared alongside the National Flood Forum.

	We shall also provide advice on methods to reduce the likelihood of damages through property level protection, and direct our residents towards reputable agents or suppliers that can provide the quality assured products.
4.2	***Raising awareness of coastal erosion risk***
Action 4.2A	*Cyngor Gwynedd will raise awareness of coastal erosion risk to its residents, focusing on the most at-risk areas*
	Cyngor Gwynedd will engage with residents and business/property owners in areas where costal erosion is of concern in order to make them aware of present-day risks and any likely changes in ground stability over time. We shall also let our communities know where to find the most up to date information on coastal erosion risk.

Objective 5:	***Working collaboratively with all other RMAs and relevant groups/bodies to ensure a coordinated response to flood and coastal erosion events***
5.1	*Preparation and testing of Emergency Plans*
Action 5.1A	*Cyngor Gwynedd will review and update its flood emergency plans alongside North Wales Councils Regional Planning Service; to include evacuation and rest centre plans.*
	The Council has an important role to play if our communities are unfortunate enough to experience a significant flood event. It is therefore important that concrete plans are in place to protect our residents in such an event and that these plans are tested occasionally to ensure that they are appropriate and that all the relevant agencies have an understanding of their responsibilities.

3.0 Approach to the SEA

3.1 Scoping

The SEA Regulations require that a scoping exercise is completed prior to commencing with the SEA and writing the Environmental Report. The outcome of the scoping phase is a Scoping Report, which was completed by YGC in September 2023. The Scoping Report followed the guidance provided in Stage A of *A Practical Guide to the Strategic Environmental Assessment Directive; Practical guidance on applying European Directive 2001/42/EC "on the assessment of the effects of certain plans and programmes on the environment"* published by the Office of the Deputy Prime Minister (ODPM), September 2005.

The contents of the Scoping Report included:

- An explanation of the GLFRMS and the requirement for SEA;
- A summary of other plans, programmes and environmental protection objectives, focusing on those that may influence or be influenced by the GLFRMS;
- A summary of the existing baseline environmental information for the study area and clarification of which environmental topics were to be scoped in and out of the SEA;
- Identifying the environmental issues and problems within the study area;
- Developing a list of proposed SEA objectives, assessment criteria and monitoring indicators, and;
- Outlining the proposed structure of this Environmental Report, the approach to the SEA and explaining the statutory consultation process.

The Scoping Report was submitted to Cadw, and Natural Resources Wales (NRW) as the current statutory SEA consultant bodies in Wales. Gwynedd Archaeological Planning Service (GAPS) were also sent a copy of the Scoping Report, due to the Gwynedd heritage regulatory function vested in them by Cadw. Section 3.4 provides a summary of the responses received and how these have influenced the SEA process and this Environmental Report.

3.2 Methods and Guidance

The main source of guidance was *A Practical Guide to the Strategic Environmental Assessment Directive; Practical guidance on applying European Directive 2001/42/EC "on the assessment of the effects of certain plans and programmes on the environment"* published by the Office of the Deputy Prime Minister (ODPM), September 2005. The ODPM document provides guidance and methods to enable an SEA and accompanying Environmental Report to meet statutory requirements by following a logical series of stages from A to E.

The completion of the scoping exercise and Scoping Report enabled the requirements of Stage A *(Setting the context and objectives, establishing the baseline and deciding on the scope)* to be met.

The SEA process and this Environmental Report are considered to contain the information required for Stages B *(Developing and refining alternatives and assessing effects)* and C *(Preparing the Environmental Report)* respectively.

Stage D *(Consulting on the draft plan or programme and the Environmental Report)* will be fulfilled by the publication of the draft Environmental Report, along with the draft GLFRMS document, for public consultation in early 2024.

Stage E *(Monitoring implementation of the plan or programme)* is to be fulfilled by implementing the proposals outlined in Section 7 of this Environmental Report.

Reference has also been made to the SEA guidance document published by the Welsh Government 'Strategic Environmental Assessment in Wales'[3]

3.3 The Study Area

Gwynedd is located in the north west of North Wales and is bordered by five Unitary Authorities, clockwise from the north being; Isle of Anglesey, Conwy, Denbighshire, Powys and Ceredigion.

There are two local planning authorities with statutory responsibilities within Gwynedd's boundaries:
1) Gwynedd Council: responsible for the areas of Arfon, Dwyfor and Meirionnydd that are outside of the Snowdonia National Park.
2) Snowdonia National Park Authority (SNPA): independently responsible for the area within its boundaries, which extend beyond Gwynedd into Conwy County Borough Council.

The GLFRMS application area covers all of the land within the Gwynedd boundary (including the area of the Snowdonia National Park that lies within Gwynedd). Therefore, the Gwynedd boundaries form the Study Area for this SEA (see Figure 3.1).

[3] strategic-environmental-assessment-sea-in-wales.pdf (gov.wales)

Figure 3.1: The Study Area (shaded pink) (Source: Map Gwynedd, Cyngor Gwynedd)

3.4 Consultation

As previously discussed in Section 3.1, a consultation exercise was carried out at the scoping stage of the SEA.

The respective comments received were considered when completing the SEA process and Environmental Report and a summary of the responses from the consultation and their influence on the SEA and Environmental Report is provided in Table 3.1. It should be noted that, while table 3.1 provides a summary, the full responses received were all considered and accommodated within the Environmental Report wherever appropriate.

In addition, a public consultation on this draft Environmental Report, along with the draft GLFRMS document and HRA report will be carried out in early 2024.

Table 3.1 Summary of consultation responses from Statutory Consultation Bodies

Consultee	Summary of Response	Influence on SEA process
Cadw	Scoping: 1. Are there any other plans, policies and environmental objectives additional to those addressed that are relevant to this assessment? No 2. Are the draft SEA objectives appropriate? Yes 3. Do the draft SEA objectives address all areas of interest without duplicating each other? Does the second objective "Number and condition of designated sites and features" duplicate the first one "Percentage of Listed Buildings and archaeological sites 'at risk'? Possibly these could be separated to " Number of designated historic assets and increase since last assessment" and "Percentage of designated historic assets 'at risk' 4. Do you or your organisation have any information that may contribute to the assessment of the objectives or increase the robustness of the baseline data? Cof Cymru, the Buildings at Risk assessments and however we consider the assessment of the condition of SMs 5. Is the proposed structure of the Environmental Report acceptable? Yes	Potential indicators for cultural heritage have been updated and included in Environmental Report Noted. No direct impact on SEA
NRW	Scoping: In terms of consultation questions 1, 2, 3 and 4 : The main source of info we want to direct you to input into this scope/evidence and framework is within Natural Resources Wales newly published flood risk management plan *Natural Resources Wales / Flood risk management plan 2023 to 2029* , and environmental report Strategic Environmental Assessment - Environmental Report (naturalresources.wales) including the North West Place appendix on challenges and opportunities Appendix G: North West Local Measures (naturalresources.wales) and Habitats Regulation Assessment	

	https://naturalresources.wales/media/glelyxwp/hra-frmp2.pdf We would also draw your attention to gaps and advice gathered from various teams in NW Place (below). For consultation question 5 (as above) we recommend: • The climatic factors topic is replaced with "flood risk and climate change" topic with relevant national/local data is inserted and assessed within framework	Noted. This has been reviewed and it is felt that flood risk is adequately covered in the updated Population and human health baseline information (4.2.1) and potential increase in flood risk due to climate change covered in (4.2.5). Baseline information and SEA topics are aligned to the requirements set out in the Regulations and associated guidance which require the assessment of the likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.
	• All baseline evidence is updated to reframe and define key environmental issues/opportunities in terms of flood risk management.	All baseline information topics include relationship with GLFRMS summary where key issues are considered.

	• The updated SEA and advice provided is used to update and help draft Gwynedd local flood risk management strategy.	Noted. See section 6 and 7 of SEA report
	<u>Table 3.1 Draft local flood strategy objectives</u> – This SEA scope needs to include a specific topic on flood risk and climate change, separate to water resources and quality.	See above. See section 4.2.1 and 4.2.5 of this Environmental Report
	<u>Section 4 Relevant Plans</u> –	
	NRW Flood Risk Management Plan 2023 Shoreline Management Plan 2 Refresh/actions Gwynedd and Mon Public Service Board Well Being Assessment Plan 2023 -2028 Natural Resources Wales Corporate Plan 2020-2030 Natural Resources Wales - North West Wales Area Statement Upcoming PSB work on CCRA3 in Wales, is focus for action from new Wellbeing Plans. NRW climate change guidance/toolkit (not yet issued). Progress in Wales CCRA3: Adapting to Climate Change. Cimate Change Committee	Relevant plans updated
	<u>Section 5 Baseline Information</u> Population and Human Health:	
	Plans and baseline info need to refer to Rights of Way Improvement Plans and prioritisation/legal implications, Wales Coastal path, Active Travel Routes.	Gwynedd Rights of Way Improvement Plan included in list of relevant plans. Reference to Public Right of Way and active travel routes included in Population and Human Health baseline information.
	This section on population needs to cross reference to topic information on flood risk and climate change in terms of present day and risks from climate change.	Noted.
	Health Impact Assessment (2023) Fairbourne – relevant here in terms of SEA Scope, draft strategy and wider governance requirements in flood risk management.	Noted. Included in assessment of relevant plans.
	Biodiversity:	

	Fisheries is not just angling but sustainability of fish populations as integral part of biodiversity and function of rivers as a healthy ecosystem, maintain/thrive fish stocks in Welsh rivers. In terms of flood risk planning – Salmon and sea trout are under extreme pressure at the moment within Welsh rivers from physical modification and fragmentation of habitat as well as water quality and pressures at sea. This is also true for the critically endangered European eel. All species are being affected by climate change, but salmonids are particularly vulnerable to increasing water temperatures and changes in flows (both drought and floods). Migratory species, such as salmon, sea trout, sea lamprey and eels all need free passage up and downstream as a critical element of their life cycles. If flood alleviation structures reduce the connectivity for these species and impede their movement up or downstream it will have significant impacts on their ability to access habitats necessary to their life stages and it will affect the populations and their resilience in the face of climate change. As well as connectivity, the general riverine habitat should also be considered with flood management schemes, the removal of habitat to increase conveyance will also reduce the areas where fish can find cover from flows, predators and temperature, it will reduce the quantity of habitat available and could create bottlenecks for life stages. There are several lakes within Gwynedd other than those named in the report, that while supporting a fishery, have other important fish species, like Padarn with Arctic charr or Tegid with Gwyniad. There is also the consideration of the role that brown trout and other salmonids play in the life cycle of the fresh water pearl mussel and their populations in Gwynedd.	Biodiversity and Material Assets sections updated to include additional fisheries information.
	Water Quality: WFD regulations text is outdated as it references 2015.	Water Resources and Quality information of Environmental Report reviewed accordingly.
	Need to reference climate and nature emergency.	Referenced in Biodiversity and Climatic Factors baseline

		information of Environmental Report
	Need to reference/assess Dee Regulation scheme. Gwynedd provides a significant water resource for its own population, North East Wales and North West England via Dee.	Water Resources baseline information updated.
	Need to reference natural and HMWB classification for waterbodies (WFD) and highlight which ones due to physical modifications are not achieving good.	Water Quality baseline information updated to include information on HMWB classification.
	Cultural Heritage: Please refer to evidence within NRW FRMP/SEA assessment framework/baseline info and key environmental issues/opportunities.	Noted and included in SEA process.
	Forestry: Forestry/land management needs to be assessed given largely non-main rivers and clear links to sustainable forestry and peatland restoration programmes, as well as need for integrated catchment management.	Noted and included in Land Use baseline information
	Flood Risk and Climate change data – national and local:	Noted and included in SEA process.
GAPS	<u>Scoping:</u> No response received.	

3.5 Difficulties and Limitations

The baseline information obtained is considered to be that most relevant to each topic and the most recent available at the time of completing the SEA. Gwynedd is a large area and there is potentially a large source of information available. The data considered most informative and relevant to the GLFRMS and the SEA have been obtained and included in Section 4.2. While it is acknowledged that this is not necessarily an exhaustive account of the baseline environmental data available it is considered to be the most relevant in contributing

to assessing the likely significant effects of the GLFRMS and in ensuring that the Environmental Report remains focused and concise.

In assessing the potential environmental effects of the GLFRMS the SEA has not assessed any effects that are likely to arise at the project-level stage, since the exact nature of their implementation and their effects are not currently known. Nevertheless, it is expected that project-level environmental effects would be considered as part of an Environmental Impact Assessment (EIA) or other project-level environmental assessment (including environmental surveys) completed as part of such projects and that the relevant statutory consultant bodies would be provided with an opportunity to comment on such proposals in advance.

4.0 SEA Objectives, Baseline and Context

4.1 Other relevant plans, programmes and environmental objectives

The GLFRMS must comply with existing policies, plans and programmes at international, national and regional levels and strengthen and support local plans and strategies. It is therefore important to identify and review those policies, plans and programmes and environmental protection objectives which are relevant to both the GLFRMS and the SEA as this allows any potential synergies and inconsistencies or constraints to be addressed.

The Scoping Report[4] provisionally identified the key policies, plans and programmes considered to be most relevant in being either influential to or influenced by the GLFRMS. Table 4.1 summarises those policies, plans and programmes following comments received during the statutory scoping consultation period. A comprehensive description of these, together with their relevance to the GLFRMS, is provided within Appendix A. It is acknowledged that no list of policies, plans or programmes can be wholly definitive and as a result this Environmental Report describes only those considered to be most relevant to the GLFRMS.

Table 4.1: Policies, Plans and Programmes relevant to the GLFRMS

International Plans and Programmes
EU Floods Directive - Directive 2007/60/EC on the assessment and management of flood risks (2007)
EU Habitats Directive - Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (1992)
EU Water Framework Directive - Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (2000)
Our Life Insurance, our Natural Capital: The EU Biodiversity Strategy to 2020 (2011)
United Nations Framework Convention on Climate Change (1992)
Kyoto Protocol on Climate Change (1997)
National Plans and Programmes
Adapting to Climate Change – Progress in Wales. (Climate Change Committee 2023)
Civil Contingencies Act (2004)
Conservation of Habitats and Species (Amendment)(EU Exit) Regulations (2019)
Countryside and Rights of Way (CRoW) Act (2000)
Environment (Wales) Act (2016)
The Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999
Flood and Water Management Act (2010)
Flood Risk Regulations (2009)

[4] Gwynedd Local Flood Risk Management Strategy SEA Scoping Report, YGC September 2023

Land Drainage Act, 1991 (as amended 2004, 2011)
National Strategy for Flood and Coastal Erosion Risk Management in Wales (2020)
Nature Recovery Action plan for Wales 2020-21
Natural Resources Wales Corporate Plan 2023- 2030
Planning Policy Wales (2021)
TAN15: Development and Flood Risk
Technical Advice Note 5 (TAN 5): Nature Conservation and Planning, 2009
The State of Natural Resources Report for Wales 2020 (SoNaRR)
The Action Plan for Pollinators in Wales 2013
UK Biodiversity Action Plan (2002)
The Water Environment (Water Framework Directive)(England and Wales) Regulations 2017
Water Act (2014)
Water Strategy for Wales 2015
Well-being of Future Generations (Wales) Act 2015
Welsh National Marine Plan (2019)
Welsh Government Natural Resources Policy 2017
Welsh Government Prosperity for All: A Climate Conscious Wales (2019)
Wildlife and Countryside Act (1981), as amended
Woodland for Wales Strategy 2009
Regional Plans and Programmes
Dee and Western Wales River Basin Management Plans 2021 - 2027
Natural Resources Wales Flood Risk Management Plan: North West Wales Place. (2023)
North West Wales Area Statement – Natural Resources Wales
West of Wales Shoreline Management Plan 2 (SMP2)
Local Plans and Programmes
Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026
Anglesey and Gwynedd Well-Being Plan 2023-2028
Cynllun Eryri – The Snowdonia National Park Partnership Plan 2020
Eryri Local Development Plan (2016 – 2031)
Eryri Local Biodiversity Action Plan (LBAP)
Gwynedd Local Biodiversity Action Plan - Natur Gwynedd (LBAP) (2004)
Llyn Area of Outstanding Natural Beauty Management Plan (2015 – 2020)
Cyngor Gwynedd – Climate and Nature Emergency Plan 2022 - 2030
The Cyngor Gwynedd Plan 2023-28
Gwynedd Rights of Way Improvement Plan
Fairbourne Health Impact Assessment (HIA) – Cyngor Gwynedd 2023

4.2 Baseline Characteristics

Scoping

In accordance with the SEA Regulations and EC Directive 2001/42/EC the following Environmental Topics were considered at the SEA scoping stage:

- Population and Human Health
- Biodiversity, Flora and Fauna
- Land use, Geology, Soil & Contaminated Land
- Water Resources & Quality
- Climatic Factors
- Material Assets
- Cultural Heritage
- Landscape and Seascape
- Inter-relationship between the above factors

The Scoping Report listed each of the above Environmental Topics (and related subtopics) and explained which were scoped into or out of the proposed SEA along with a justification. The scoping decision was made using professional judgement considering whether the topic was likely to either affect or be affected by the GLFRMS and was subject to consultation. It is acknowledged that scoping is an iterative process that can occur at any stage of the SEA as further information about the GLFRMS and the environmental topics becomes available.

This section contains the initial baseline information that has been obtained for each scoped-in topic and explains the relevance of this to the GLFRMS.

Baseline Information

This section identifies the current environmental issues and problems in the study area which are relevant to the GLFRMS and provides a basis for predicting and monitoring the effects of implementing the GLFRMS. Without the adoption of the GLFRMS (i.e. the Do Minimum situation) the trends and themes identified within this section would be expected to continue.

4.2.1 Population and Human Health

Gwynedd's large spatial area is reflected by its population density of 46 persons per km², which is the third lowest among the Welsh unitary authorities, after Powys and Ceredigion[5]. Gwynedd's population in 2021 was 117,400 which was a decrease of 3.7% from the 2001 Census. By 2041 the projected population in Gwynedd is expected to increase to 131,603; an

[5] Office for National Statistics – Census 2021

estimated increase of 3.4% between 2024 and 2036.[6] This could result in more pressure on areas at risk of flooding due to increased development.

Overall, Gwynedd's population has gradually increased since 1971 due to inward migration exceeding outward migration and the net effect of more births than deaths. This has led to a lack of balance in the age structure of the population that is more obvious in the south and west of the County, where the age structure is much older than in the north, leading to a negative effect on economic activity rates and reducing communities' ability to create economic opportunities and increase income levels. In Gwynedd the life expectancy for persons born between 2017 and 2019 is 79.5 for men and 83 for females, which is similar to the Wales average.

Population and properties at risk from flooding

Flood risk is the combination of the likelihood (or probability) of a particular flood event occurring and the consequence (or impact) of the flood event if it occurred. Flood risk may be exacerbated by climate change, with wetter winters causing higher river flow, especially when combined with sea level rise and low pressure storms (see 4.2.5 below). The main sources of flood risk in Gwynedd include river flooding, tidally-influenced river flooding, surface water flooding and tidal flooding, with occasional cases of sewer flooding and groundwater flooding.

In Gwynedd, 12,563 residential properties are considered to be at risk of flooding (inland and coastal flood risk[7]). Inland flood risk is generally spread across the whole of Gwynedd, except for the most mountainous and rural areas. As expected, the largest concentrations of flood risk receptors are located within the most populated areas, with obvious hotspots occurring at Caernarfon, Llanberis, Bethesda, Blaenau Ffestiniog and Y Bala; and in most of these cases the risk is linked to large watercourses flowing through or nearby populated areas. In general, areas where a high number of receptors are at risk from a single source are afforded protection in the form of flood defences (e.g. Bala, Porthmadog, Pwllheli), however this is less often the case where source of flooding is more sporadic. The effects of climate change could be prominent in the future with an increase in the number of receptors at risk from inland flooding; this in addition to an increase in the level of flood risk for present day receptors (see section 4.2.5 below).

The areas of highest coastal flood risk are centred around highly populated lowland locations, where large rivers such as the Dysynni, Mawddach, Dwyryd, Glaslyn, Rhyd-Hîr and the Erch enter Cardigan Bay. There are also areas of increased flood risk in the populated centres

[6] Stats wales

[7] Data from NRW's National flood maps, including; Flood Risk Assessment of Wales (FRAW) and Flood Map for Planning (FMfP). 2023.

along the southern edge of the Menai Strait, including Caernarfon, Y Felinheli and Bangor. Most of the area at risk of coastal flooding are defended from inundation, however the standard of protection afforded by defences will vary between different areas, and defences in general are not adequate to withstand increase in sea level expected because of climate change. Furthermore, future shoreline policies outlined in SMP2 may dictate that certain defences are gradually abandoned or moved in-land, which would change the future flood risk profile of coastal areas as a result. Concentrations of receptors at risk of inland and coastal flooding in Gwynedd are shown in Appendix C

Quality of Life

Those who suffer flooding have a significant lowering of quality of life that can last for a number of years. Homes in areas that suffer increased flood risk will often have significantly higher insurance premiums, potentially leading to higher financial hardship in these areas. It is likely that economically and socially deprived areas will take longer to recover from flood events.

Access to key services can also influence social deprivation and quality of life. Gwynedd is a large rural county, second only in land area in Wales to Powys. Some areas within Gwynedd, particularly parts of Meirionnydd and the Llŷn peninsula, are remote even within the County. Effective transport infrastructure is therefore crucial for public access to key services, such as hospitals and schools. There is only one Accident and Emergency Hospital in Gwynedd (Ysbyty Gwynedd, Bangor), although there are nine Minor Injury Units and several other clinics and community hospitals within the County. Travel time from the tip of the Llŷn peninsula to Ysbyty Gwynedd, Bangor is approximately 1 hour, 30 minutes (40 miles) each way. Communities in Meirionnydd (the southern part of Gwynedd) are closer to Bronglais General Hospital in Ceredigion.

Access to public rights of way and active travel routes can also influence quality of life as well as the local economy. The network provides opportunities for travel to local facilities and places of work, as well as providing a means by which people can access, explore and enjoy Gwynedd's countryside and coastline. The importance of the public rights of way network in Gwynedd, which is over 3800km long in total, for its health and wellbeing benefits are outlined in the Gwynedd Right of Way Improvement Plan[8]. Flooding, and damage from flooding and erosion can impact upon the right of way network by causing damage to infrastructure. Of particular risk in some areas due to coastal erosion, is the Wales Coastal Path, which follows the Gwynedd coastline.

Employment

[8] Cyngor Gwynedd – Right of Way Improvement Plan 2022

Between January 2022 and 2023 76.9% of Gwynedd's residents were employed and 2.5% unemployed. This compares favourably with the Wales national equivalents of 73.3% and 3.0% respectively. The highest levels of employment in Gwynedd are in the human health and social work activities employing 19.6% and distribution which is above the Welsh and GB national averages for these sectors.[9]

Gwynedd's main problem in the context of employment is a tendency towards those sectors offering low wages. In 2022 the average weekly pay in Gwynedd was £568.9 compared to the Wales average of £598.1 and the UK average of £640. The Index of Multiple Deprivation 2019 reveals that 4 wards in Gwynedd are in the worst quintile (20%) for deprivation in Wales regarding income[10]. This situation is considered to be at the root of a number of the County's deprivation problems.

Relationship between the GLFRMS and Population and Human Health

Flooding can have far-reaching socio-economic consequences in Gwynedd by influencing people's Quality of Life through direct damage to properties and associated stress and through restricting access to key services and employment. Flooding can also be exacerbated as a result of increased development pressure to address population growth, especially if the development does not consider the impact on flood risk or include sustainable drainage systems (SuDS). It can also affect employment, especially in tourism, if it disrupts the access and amenity of tourist areas and results in fewer visitors to Gwynedd. The GLFRMS and the options considered within it will seek to manage flood risk for the benefit of the population of Gwynedd. The GLFRMS may therefore positively affect the likelihood of resident's properties being affected by flooding and public access to key services and employment by addressing flooding issues at the local scale.

4.2.2 Biodiversity, Flora and Fauna

International Nature Conservation Sites (See Appendix C for locations)

Gwynedd's predominantly rural character is represented by a diverse wildlife and numerous protected sites. There are 32 sites of international importance within or partially within Gwynedd covering three designation types; Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 provides protection for these sites and work within or likely to affect such sites must first address the requirements of these Regulations.

[9] Official labour market statistics
[10] Welsh Index of Multiple Deprivation 2019.

Special Areas of Conservation (SACs) are sites of international importance, designated under the EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC). There are a total of 19 SACs either fully or partially included within the Gwynedd boundary. These sites have a combined total area of approximately 985,900ha, of which 11,619ha are within Gwynedd's boundary.

Special Protection Areas (SPAs) are protected sites classified in accordance with Article 4 of the EC Birds Directive on Conservation of Wild Birds (79/409/EEC). SPAs are designated to protect vulnerable breeding and wintering birds and for regularly occurring migratory species on passage. Gwynedd has a total of 9 designated SPAs, which are either fully or partially included within its boundary. The total area of the SPAs in Gwynedd is approximately 21,695 ha.

Ramsar sites are wetlands of international importance designated under the 1971 Ramsar Convention. There are four Ramsar sites fully or partially included within Gwynedd: Llyn Tegid, Llyn Idwal, Anglesey and Llyn Fens and Cors Fochno and Dyfi. These have an area in Gwynedd of approximately 1,194ha.

National Nature Conservation Sites (See Appendix C for locations)

National Nature Reserves (NNRs) are designated by Natural Resources Wales under the National Parks and Access to the Countryside Act 1949, or under the Wildlife and Countryside Act 1981, as amended. The reserves are considered to be the best national examples of habitats, geology and wildlife, or a combination of these, and they have a strong legal protection. There are a total of 26 NNRs within Gwynedd and the total area of these sites is around 16,781ha (6,602ha of which is within Gwynedd). All of Gwynedd's NNRs are also Sites of Special Scientific Interest (SSSI).

SSSIs are designated by Natural Resources Wales under the Wildlife and Countryside Act 1981, as amended, to safeguard the quality, diversity and geographic range of habitats, species and geological features in the UK. There are 151 SSSIs fully or partially within the boundary of Gwynedd; 83 Biological SSSIs, 40 Geographical SSSIs, and 28 SSSIs that have both biological and geological features. These sites total an area of 97,000 ha, of which around 57,400ha lie within Gwynedd.

Local Nature Conservation Sites

Local Nature Reserves (LNRs) are designated by local authorities. They contain locally important features and combine conservation with opportunity for enjoyment of nature. There are six LNRs in Gwynedd: Traeth Lafan, Foryd Bay, Dudley Quarry, Coed Dinorwig, Lon Cob Bach and Pen y Banc.

Local Wildlife Sites (LoWS) support both locally and nationally threatened wildlife species and habitats. LoWS are protected within the local planning system and are a 'material consideration' in planning decisions. There are over 1100 LoWS in Gwynedd (the Snowdonia National Park is considered as one whole LoWS) and these are considered the most important sites for biodiversity outside legally protected areas.

Nationally and regionally important habitats and species

Habitats and species "of principal importance for the purpose of conserving biodiversity" are identified in the UK Biodiversity Action Plan and listed in Section 7 of the Environment (Wales) Act 2016. These must be considered by a public body when performing any of its functions, with a view to conserving biodiversity. Habitats and species of principal importance in Gwynedd that require conservation action are included in Local Biodiversity Action Plans, of which there are two within the study area; Natur Gwynedd for the Gwynedd Council Unitary Area and Bioamrywiaeth yn Eryri for the Snowdonia National Park.

Natur Gwynedd contains Action Plans for 41 species and 34 habitats while Bioamrywiaeth yn Eryri contains Action Plans for 48 species and 20 habitats. These Local Biodiversity Action Plans support the national UK Biodiversity Action Plan created in response to the Convention on Biological Diversity in 1992.

Aquatic features are of particular relevance to the GLFRMS, as flood risk management measures can adversely affect these features. There are 7 principle salmon rivers completely within Gwynedd and two that are partly within the county (Dee and Dyfi). The salmon stock status of seven of those rivers are 'at risk' and are predicted to decline over the next 5 years. There are 12 main sea trout rivers within Gwynedd (including Dee and Dyfi partly within the county), 7 of which are at risk and predicted to decline. Flood alleviation structures within rivers can reduce connectivity for such species and have wider implications on waterbody ecosystems (see section 4.2.6 below)

The Nature Emergency

In 2021 the Welsh Government declared a nature emergency. What this means is that 17% of 3,902 species studied in Wales are at risk of extinction, with many others in decline. The nature emergency is closely linked to the climate emergency (referenced in section 4.2.5 below) and has been caused by the things we as humans do, such as releasing harmful carbon emissions, destroying natural habitats and using up too many natural resources. When species disappear, it will impact the health and wellbeing of the population, as we depend on ecosystems for resources such as the air we breathe, food and clean water. In declaring a nature emergency, the Welsh Government noted; "there is an inherent value in biodiversity and the benefits it offers people through eco-systems such as flood alleviation

and food production. We therefore believe that biodiversity loss leads to a risk to public safety and well-being".

Gwynedd Council declared a climate emergency in 2019, but in its 'Climate and Nature Emergency Plan 2022 – 2023'[11] gives equal weight to the nature emergency since both co-exist in parallel. Losing natural habitats for wildlife can increase the carbon levels in the atmosphere and changes in temperature and rainfall can affect the distribution of wildlife habitat.

Relationship between the GLFRMS and Biodiversity, Flora and Fauna

Gwynedd contains a large amount and diversity of protected sites, species and habitats that are vulnerable to development and land use change. The GLFRMS has the potential to adversely affect such features, especially aquatic features, as a result of any flood management measures that are implemented. The options in the GLFRMS may include construction, land use change, changes in flood regime and frequency or changes in water levels that have the potential to adversely affect nature conservation and biodiversity features. Conversely, such changes may present opportunities to enhance the condition of existing habitats and to create new habitats.

4.2.3 Land Use, Geology, Soil & Contaminated Land.

Agricultural Land (Best and Most Versatile Land)

Agricultural land is categorised into grades, from grade 1 to grade 5, with grade 1 being excellent quality and grade 5 being very poor quality agricultural land. Planning policy defines grades 1 to 3a as the 'best and most versatile' agricultural land. Agricultural Land Classification is set out in the Predictive Agricultural Land Classification Map Wales.

Approximately 9% of agricultural land in Gwynedd fall into best and most versatile agricultural land (grade 1, 2 & 3a), equating to approximately 23,000ha in total. 91% falls within grade 3b, 4 and 5 and therefore categorised as poorer quality land. This means there are limitations on the range of agricultural use for the majority of available farming land and sheep farming (rough grazing) comprises a large component of agricultural land usage. Agricultural Land Classification Map for Gwynedd in included in Appendix C.

Forestry

[11] Cyngor Gwynedd: Climate and Nature Emergency Plan 2022/23 – 2029/30

Forests and woodlands form 12% of land area in Gwynedd. Forests and woodlands are known to reduce flood flows and can make and important contribution to Natural Flood Management (NFM). On the other hand, forest operations such as cultivation, drainage, road construction and harvesting can have the opposite effect if not appropriately managed[12].

Woodland ecosystems play an important mitigation role in carbon sequestration, abatement of greenhouse gas emissions and slowing catchment run-off. The Welsh Government has targets to plant 43,000 hectares of new woodland by 2030, and 180,000 hectares by 2050, to meet the 'balanced pathway' set out of the UK Climate Change Commission. That is equivalent to planting at least 5,000 hectares per year. If planted in the right place, and with appropriate management, this could help reduce flood risk.

Soils

Gwynedd has a high soil carbon density, mainly due to the upland nature of its topography. Organic carbon is derived from incorporated vegetation either deposited or associated with root material within soil and is important for many soil properties and processes. Loss of soil organic matter can lead to soil erosion, loss of fertility, compaction and general land degradation. Oxidation (breakdown) of organic matter provides energy for soil organisms and through respiration leads to emissions of carbon dioxide. There has been a gradual loss of carbon from soils in England and Wales which can be attributed to many factors, including climate change. Losses of carbon from soils in England and Wales have occurred at a mean rate of 0.6% per year between 1978 and 2003[13].

In a geological context the physical nature of soil can affect ground permeability, which in turn can influence flooding and flood risk. The soils of Gwynedd tend to fall into three main groups. In upland areas and some lowland areas glacial erosion has been the main landscaping influence and soils are either absent or very thin; the underlying rocks are typically Lower Palaeozoic and highly impermeable. In most other areas, excluding the major valleys e.g. of the Glaslyn, Dwyryd, Mawddach and Dyfi, glacial deposition has taken place and the main soil type is glacial till. This masks the solid geology in many areas and is very variable in nature ranging from gravelly silty clay to coarse granular deposits.

There are usually considered to be two distinct glacial tills in the Gwynedd area divided by their geographical origin. In the central parts of Gwynedd the tills are usually locally derived and termed the Welsh Till whilst on the north coast and across the western end of the Llŷn Peninsula the tills have generally been derived from younger deposits underlying the Irish Sea and termed Irish Sea Till. Included in this classification are fluvio-glacial deposits which are

[12] UKFS Guidance 2022 – Designing and managing forests and woodlands to reduce flood risk)
[13] Bellamy et al 2005

mainly granular in nature and form sand and gravel deposits some of which are worked economically or have been in the past e.g. around Pentir and Bryncir. The glacial tills are generally low in permeability with the exception of the larger deposits of fluvio-glacial sand and gravel, which are much more permeable.

In the major valleys fluvial processes are the dominant soil-forming agents and as some of the valleys have been deepened by glacial erosion and later in-filled by deposition these deposits can be many metres thick. The nature of these fluvial soils is generally dependent on the energy levels present at the time of deposition and they range from river gravels associated with high energy environments to clays, silts and organic deposits (peat) deposited under lower energy regimes. The permeability of these deposits can vary widely but in general they are relatively permeable.

Geomorphology

Gwynedd boasts a variety of geomorphological features, due to its numerous watercourses of varying sizes and its coastal location, where coastal processes have shaped features such as estuaries and sand dune systems. The large estuary systems of the Dyfi, Mawddach and Glaslyn/Dwyryd have important geomorphological features associated with them, including large expanses of mudflats, salt marsh and accompanying sand dune systems. The Dyfi Estuary especially has large areas of salt marsh and associated sand dunes at Ynys Las. Many of these geomorphological assets are features of the Pen Llŷn a'r Sarnau SAC, which covers a large amount of coastal Gwynedd and includes mudflats, sandflats and estuaries with its corresponding features.

Designated Earth Heritage Sites

Geological Conservation Review (GCR) sites identify the sites of national and international importance which show the key scientific elements of Britain's earth heritage. There are 90 GCR sites in Gwynedd encompassing British geological and geomorphological features. GCR sites underpin geological SSSIs in Wales and there are 40 SSSIs in Gwynedd which are solely designated for their geological features and 28 which have mixed biological and geological interests.

RIGS (Regionally Important Geological Sites) are important non-statutory sites noted by local geologists for geological, geomorphological and earth science features outside of the SSSIs and statutory nature reserves; there are 58 RIGS in Gwynedd.

Contaminated land

Contaminated land is defined as any land which could cause harm to living organisms or cause pollution of controlled waters. An important source of land contamination is industrial activity. Gwynedd is a predominantly rural county and does not contain large areas of contaminated land from current manufacturing and industrial activity. However, Gwynedd has a history of past industrial activity, especially in mineral extraction. There is a legacy of contamination from numerous metal mining activities which still persists today and can cause elevated contamination levels in some rivers, especially after flooding and heavy rainfall.

Cyngor Gwynedd has a Contaminated Land Inspection Strategy (under the Environmental Protection Act 1990 Part IIA) which details how contaminated land is identified, investigated, and where necessary, remediated.

There is currently one landfill site in Gwynedd, which accepts inert waste only and is regulated by NRW. There are numerous historic landfill sites, which are now closed or covered, that are spread widely throughout Gwynedd. Some of the more recent closed landfills will have been regulated under the Environmental Permitting regimes and will have more adequate infrastructure to protect the environment. However, there are also many more historic landfills which will not have been regulated under the same regimes and could pose an unknown risk to the environment.

Relationship between the GLFRMS and Land use, Soils, Geology and Geomorphology

The GLFRMS could affect soils, geology and geomorphology via land use change, changes in flooding regime and frequency or changes in water levels. These impacts have the potential to adversely affect soils, leading to agricultural land use impacts, or effects on important geological features. Conversely, such changes may present opportunities to improve the condition of or uncover new geological features. Changes to flood regimes and drainage could increase or reduce land and water contamination levels in areas with heavy metal deposits.

4.2.4 Water Resources & Quality

Gwynedd's river catchments vary in character from steep, fast-flowing, rapidly responding catchments in the mountainous areas of Snowdonia to gently sloping, slower responding catchments on the Llŷn Peninsula. There are many separate river systems in Gwynedd, of which the most notable include the Ogwen, Seiont, Dwyryd, Mawddach and Dyfi. Many of Gwynedd's rivers support important salmon and sea trout fisheries, which form an important recreational and economic resource. There are also many important water-based conservation sites in Gwynedd as well as water-based tourism and leisure activities; sometimes these uses can conflict with each other, e.g. at Llyn Tegid.

Water Framework Directive

Water Framework Directive (WFD) is the most substantial piece of environmental legislation ever produced by the European Commission. It came into force in December 2000 and became part of UK law in December 2003 (as amended[14]). WFD is implemented across Wales and England through the Water Environment Regulations 2003. These Regulations were revoked in April 2017 by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The three key principles of the WFD are to: protect (prevent deterioration), restore (aim to achieve 'good or better status') and promote the value of the water environment[15].

Natural Resources Wales has been designated by Welsh Government as the Appropriate Agency to develop and communicate the approach in Wales to improve the quality and ecological health of all our waters. These include rivers, streams, brooks, lakes, estuaries, canals, coastal waters out to one mile from low water, groundwater bodies and all water dependent protected areas. The Water Environment Regulations 2017 requires Public Authorities, including Local Authorities to "have regard to the River Basin Management Plans and any supplementary plans in exercising their functions" and ensure that water bodies status does not deteriorate through their actions.

The Water Framework Directive (WFD) establishes a framework for the protection of surface waters (rivers, lakes, estuaries and coastal waters) and groundwaters. Its purpose is to prevent deterioration and improve the status of aquatic ecosystems, promote sustainable water use, reduce pollution of groundwater and contribute to mitigating the effects of floods and droughts. The natural forms / morphology of water bodies are also a key consideration of WFD, an element that can be severely impacted by flood risk management works if not appropriately considered at the design stage of schemes. The WFD requires NRW to aim to achieve good status in all water bodies under their control, by 2027. NRW are therefore responsible for protecting and improving the quality of such water bodies so that they can support natural biological communities and are free from pollution. The WFD is therefore a key constraint to be considered within the GLFRMS, which should aim to not hinder its objectives.

For each River Basin District, the Water Framework Directive requires a RBMP to be published. These are plans that set out the environmental objectives for all the water bodies

[14] The Water Environment (Water Framework Directive) (England and Wales) Amendment Regulations 2015, SI 2015/1623; and The Water Environment (Water Framework Directive) (England and Wales) Amendment Regulations 2016, SI 2016/138

[15] NRW/WLGA – Updated Local Authority Services and the water Environment – Advice note on the Water Framework Directive. 2017.

within the River Basin District and how they will be achieved. The plans will be based upon a detailed analysis of the pressures on the water bodies and an assessment of their impacts. The Western Wales RBMP and the Dee RBMP both fall within the GLFRMS area. The plans have been aligned with the development of the Flood Risk Management Plans to identify where there are mutual benefits and able to co-ordinate delivery for the environment, economy and society of Wales.

Water Quality

Natural Resources Wales are responsible for protecting, enhancing and restoring the environmental quality of inland and coastal surface water and groundwater. A network of monitoring sites is used to establish the actual condition of all water bodies within each River Basin District in terms of their ecology, water chemistry, flow and groundwater level. The WFD Regulations 2017 requires the status of water bodies to be assessed and this assessment is created by classifying data from the monitoring network. For a particular point in time a classification will show whether the quality of the environment is good, or where it may need improvement. For surface waters there are two separate classifications for water bodies, ecological and chemical. For a water body to be in overall good status both ecological and chemical status must be at least good.

Some water bodies contain features that provide valuable social and economic benefits or uses, for instance through flood risk management schemes or reservoirs that supply drinking water. In many cases significant physical modifications have been required to support this use, for example the installation of a weir or a dam. To achieve good ecological status in these water bodies we would have to alter the modifications to such an extent that their function was compromised, for example the removal of a weir installed for flood defence purposes. It is vitally important to protect the uses that benefit society and the economy and therefore these water bodies are designated as A/HMWBs (Heavily Modified Water Body) under the WFD Regulations 2017. Once designated, A/HMWBs water bodies are required to reach the objective of good ecological potential. Good ecological potential is similar to good ecological status but takes into account the constraints imposed by the social and/or economic uses and involves using a Mitigation Measures Assessment (MMA).

The majority of Gwynedd's rivers are classified as having either moderate or good ecological status, with a small number exhibiting poor ecological status. All the rivers identified in Gwynedd either have good chemical quality or are considered not to require assessment[16]. In addition, 31 lakes are monitored by the NRW within Gwynedd and most are either of good or moderate ecological status, with 8 considered poor[13].

[16] Water Watch Wales Water Watch Wales (naturalresourceswales.gov.uk)

The groundwater quality within Gwynedd is of poor chemical status across most of the county, apart for the south-east, where it is at good status. The quantitative status of Gwynedd's groundwater is good throughout[16]

There were 19 EC-designated EA bathing water quality sampling points around Gwynedd's coast in 2021. 17 of these met the highest bathing water standard for the Bathing Water Directive (76/1160/EEC) of 'Excellent', and two of the sites (Cricieth and Aberdyfi) were classified as 'Good'.

Water Resources

Gwynedd sits mostly within the Western Wales River Basin District (RBD), with part of the south-eastern end of the county falling within the Dee RBD.

The Gwynedd River Basin Management District is within both the Western Wales and Dee River Basin Management Plans. The following water body types are present within the Gwynedd River Basin Management District: 5 Coastal, 5 Ground, 31 Lakes, 157 Rivers and 9 Transitional water bodies[14]. These water bodies are each monitored by NRW for their chemical and ecological status.

There are several Water Resource Zones within Gwynedd, which forms part of Dŵr Cymru Welsh Water's Water Resources Management Plan. These include; North Eryri / Ynys Môn, Llyn / Harlech, Blaenau Ffestiniog, Barmouth, Bala, South Meirionnydd, Tywyn / Aberdyfi. Gwynedd also provides significant water resource for populations outside the county, most notably via the River Dee (through the Dee Regulation Scheme), which rises in the hills to the West of Bala. The population of some areas in Gwynedd soares during the summer months due to tourist numbers, which can lead to additional pressures on water resources, particularly during dry periods.

NRW's Groundwater Vulnerability maps identify only minor and 'non' aquifers across Gwynedd, other than the Carboniferous Limestone in the Bangor and Y Felinheli area, which constitutes a major aquifer. Areas shown as 'non aquifers' may contain enough water to support small, domestic well supplies and are therefore equally sensitive to pollution. There are over 300 surface abstraction points in Gwynedd licensed by NRW.

Relationship between the GLFRMS and Water

Gwynedd contains a large number of watercourses, many of which have good water quality and provide valuable resources for wildlife, abstraction, tourism and fisheries. The WFD places obligations to protect, restore and promote the value of the water environment within Gwynedd. The GLFRMS must therefore ensure that, by improving drainage and reducing

flood risk in Gwynedd, there are no adverse impacts on the water environment, including on water quality, hydrological regime, natural forms and processes / morphology. It must ensure that drinking water quality, groundwater and human health are protected and that the requirements of the Water Framework Directive are not hindered.

4.2.5 Climatic Factors

The world's climate is changing due to increased atmospheric greenhouse gas emissions, caused by burning fossil fuels, deforestation and land use change. Across Wales average temperatures over land have warmed in recent decades with the 2005 – 2014 decade 0.9°C warmer than the 1961 – 1990 average[17]. Average rainfall over Wales has not changed significantly since 1910 but rises in sea levels around Wales have been estimated at 1.4 mm +/- 0.2 mm increase per year since 1901. Based upon medium levels of greenhouse gas emissions, predictions show increases in mean summer temperatures of 0.9-4.5oC by 2050. Rainfall averages are expected to remain stable, however significant changes to rainfall patterns are expected with more frequent and intense winter rainfall events - with 19% increases in winter rainfall predicted by 2080. Future sea level rise around the Welsh coast is expected to result in significant coastal erosion and inundation events in low-lying coastal areas. Expected sea-level rises are currently predicted to be 36 cm by 2080[18].

Climate change

The Welsh Government declared a 'Climate Emergency' in Wales in April 2019 with the intention of prompting a wave of action at home and internationally. In March 2019 Gwynedd Council declared its own climate emergency and vowed to take definitive steps to reduce carbon emissions and to work towards a carbon-free future. Subsequently the Council have published a 'Climate and Nature Emergency Plan', which outlines the steps that we will take between 2022 and 2030 to reach our ambition of being a net zero council.

The level of flood risk to property across Gwynedd is expected to rise significantly in the future due to the effects of climate change, with an increase in frequency and depth of flooding to coastal and low-lying areas. Within Gwynedd we anticipate that an additional 1463 residential properties will be at risk of coastal flooding over the next 100 years (up 37% from 4003 at present day), and additional 2123 residential properties face risk of fluvial or surface water flooding over this time period (up 43% from 4974 at present day).

The mean annual maximum and minimum temperatures in Gwynedd for the period 1991 – 2020 are 13°C and 5.1°C respectively[19], with the highest averages occurring in July (19°C) and

[17] The UK Climate Change Risk Assessment Summary for Wales (2017)
[18] Woodlands for Wales – Strategies: Wide-reaching benefits.
[19] Met Office

the lowest in February (1.2^{o}C). For the same period, average annual rainfall is 1335mm, with the highest falls occurring in December (176mm) and the least in July (75mm).

Statistics available from InfoBaseCymru indicate that Gwynedd's carbon emissions was 498.4kt (kilotonnes) for 2020. This compares to a total of 880.5kt in 2005, 786.3kt in 2010 and 680.9kt in 2015[20]. Tonnes of CO2 emissions per resident for Gwynedd in 2020 was 4.0t. This compares to a Wales average of 6.6t per resident. Of the total carbon emissions for Gwynedd in 2020 (498.4kt), 91.2kt were industry and commercial emissions, 198.6kt domestic, and 204.4 transport.

Relationship between the GLFRMS and Climatic Factors.

According to the Met Office Climate Projections for the UK (UKCP18)[21], it is expected that average temperatures will increase, especially in summer, and that rainfall will increase in winter and reduce in summer, thus resulting in warmer, wetter winters and hotter, drier summers. The consequences of these changes on the local area are wide-reaching and multiple, as they include not just increased flood risk, but volatile food and water supplies, loss of valuable habitats and changes in habitat type, greater incidences of heat-related illnesses and premature deaths, increased damages to infrastructure, increased rates of coastal erosion, and various others. Flood risk management measures have a significant role in mitigating and adapting to the impacts of increased flood risk. National policy places an emphasis on making space for water and providing for compensatory habitat, such as managed realignment. It also advocates taking a more holistic, catchment based approach to flood risk management, employing catchment wide techniques such as upland storage, better land management, and woody debris. Such interventions, in theory, tend to be much less carbon intensive than traditional 'grey infrastructure' interventions that involve the construction of defences using concrete and steel. The GLFRMS must therefore take into account the increased pressures on existing flood and coastal erosion management regimes, whilst also looking at opportunities to reduce carbon emissions, in line with Cyngor Gwynedd's Climate and Nature Emergency Plan 2022 – 2030.

4.2.6 Material Assets

Transport Infrastructure

Gwynedd is a peripheral County within both the UK and Wales. Natural barriers such as mountains, rivers and lakes increase travelling times, with the distance travelled being much more than the direct distance. According to the Anglesey and Gwynedd Joint Local Development Plan (LDP) the Multiple Deprivation Index shows that the 35 wards which are

[20] InfoBaseCymru.net
[21] Met Office - UK Climate Projections: Headline Findings, July 2021

amongst the most deprived quintile (20%) in Wales relate to geographical access to services[22].

The A55 Trunk Road, which runs along the North Wales coast, and the North Wales coast railway are very important strategic links connecting Gwynedd with the rest of North Wales and England. The A55 is part of the Trans-European Transport Network (T-ENT) as it forms a link of Euro Route 22, an important freight route that runs approximately 15km through Gwynedd and links Chester and the M53 / M56 to the port of Holyhead, which is a gateway for travel to and from Ireland. Transport links with Mid and South Wales are essential for the southern part of Gwynedd with the A470, the A483 and the Cambrian Railway providing the main links. The County's other strategic highways are the A5, A487, A494, A497, A499 and the A4212. A map of the county's transport infrastructure is provided in Appendix C.

Two large highway improvement schemes have recently been completed within Gwynedd; the A487 Caernarfon – Bontnewydd Bypass and A55 Abergwyngregyn – Tai'r Meibion improvement. The Welsh Government National Transport Delivery Plan identifies the A487 New Dyfi Bridge (under construction) as a highway improvement schemes in the County. Due to the rural / peripheral nature of the county, Gwynedd's road network is particularly important for residents to access essential services, and for the local economy.

In North Wales, although a large proportion of the population is located within walking distance of a bus stop or train station, the service provision is often poor. The standard measure used is up to 400m from a bus stop or 800m from a rail station. In several areas there are infrequent services and a lack of evening or weekend options which do not meet people's needs – notably for accessing employment and leisure activities[23]. This is considered to be especially relevant in Gwynedd, as it is a rural county, with large travel times between key population and employment centres.

80% of trips in North Wales are made by car. The proportion of households with no car is estimated 23% of households in Wales[24] and the number of private cars is increasing. However, the use of private cars to travel to work is lower in Gwynedd than the national average but Wales has the highest proportion of people travelling to work by car 80% compared to UK average of 68%. Travelling to work using public transport for Wales was lower than the 2011 census from 4.6% to 2.4% in the 2021 census, as it was in a lockdown and people were advised not to use public transport.

[22] Anglesey and Gwynedd Joint Local Development Plan 2011 - 2026
[23] North Wales Transport Commission Progress Statement, Welsh Government, January 2023
[24] Llwybr Newydd – A New Wales Transport Strategy, Welsh Government.

Housing

The Joint Anglesey and Gwynedd Local Development Plan identifies the County's housing requirement as being 4,084. In line with the spatial strategy, and having considered the capacity of individual Centres to accommodate additional growth, 53% of the overall housing land requirement identified for the plan area is directed to Bangor (the Sub-regional Centre) and the Urban Service Centres combined and 22% to the Local Service Centres. These are the largest settlements where there are concentrations of facilities, employment opportunities and transport options. The remainder (25%) is expected to be delivered in Villages, Clusters and the countryside.

In terms of housing deprivation, the Welsh Index of Multiple Deprivation (2019)[10] shows that Gwynedd has a high proportion of areas in the most deprived 10% in Wales, at 21.9%, the fourth highest proportion of all the Welsh local authorities.

Within the Snowdonia National Park Authority (SNPA) area new housing will also be required to meet the need of local communities as the shortage of affordable housing to rent or buy is one of the greater challenges facing many communities in Snowdonia. The Eryri Local Development Plan (LDP) states that the requirement for new housing during the plan period (2016-2031) has been calculated at 770 - 830 dwellings (51 - 55 dwellings per year). Most of the committed housing will be located within the two local service centres (Dolgellau and Bala) and three of the service settlements (Harlech, Trawsfynydd, Aberdyfi. Betws y Coed and Llanberis).[25]

There is a risk that the need to provide more housing could result in increased pressure on areas already at risk of flooding and create more impermeable surface areas resulting in increased flooding if adequate consideration is not given at the planning and design stages.

Schools

There are 12 secondary schools in Gwynedd, these being served by 19 catchment areas. A higher number of secondary schools are located in the more populated north of the County with those in Meirionnydd and Dwyfor having larger catchment areas resulting in greater travel distances. There are also 79 primary schools, 2 all-through schools, and 2 special needs schools within the LFRMS area.

Access to schools can be affected to varying degrees by flooding, especially in more remote areas, and the GLFRMS is therefore expected to contribute beneficially by ensuring future access is not hindered by flooding events.

[25] Eryri Local Development Plan (2016 – 2031)

Hospitals

There is only one Accident and Emergency Hospital in Gwynedd (Ysbyty Gwynedd, Bangor), although there are four Minor Injury Units (in Dolgellau, Pwllheli, Tremadog and Tywyn) which, along with Caernarfon, also serve as community hospitals and clinics. Travel time from the tip of the Llŷn peninsula to Ysbyty Gwynedd, Bangor is approximately 1 hour, 30 minutes (40 miles) each way. Communities in the southern part of Meirionnydd (in the south of Gwynedd) are closer to Bronglais General Hospital in Aberystwyth, Ceredigion.

As with schools, access to hospital and health facilities can be affected to varying degrees by flooding (as with the November 2012 A55 floods) and the GLFRMS is therefore expected to contribute beneficially by ensuring future access is not hindered by flooding events. As mentioned under transport infrastructure above, currently Gwynedd's road network provides a vital role for its population in accessing essential services such as hospitals.

Power Generation

There are five power stations in Gwynedd, with four currently active. These are:

* Trawsfynydd Nuclear Power Station (closed)
* Dinorwig Hydro-electric Power Station
* Ffestiniog Hydro-electric Power Station
* Cwm Dyli Hydro-electric Power Station
* Maentwrog Hydro-electric Power Station

No further proposed power stations are currently known of, but there is the potential for Gwynedd's wind power potential to be developed over the coming years. Similarly, there is a potential for solar power to be developed further within the county. There are also many small-scale hydropower units scattered across Gwynedd that contribute to power generation within the county.

Gwynedd's power infrastructure is not expected to be significantly affected by the GLFRMS due to the locations of the power stations and the nature of the GLFRMS measures relating to addressing the management of flood risk using a strategic, community-based approach rather than committing to hard engineering solutions and changes to river catchments and land use.

Agriculture

Agriculture is an important economy in Gwynedd with 4300 people in full and part time employment[10] and constituting the main use of land after housing. In Gwynedd (including the Snowdonia National Park) there are approximately 2,125 active farm holdings and the total area farmed is around 216,321ha[6]. Of the 216,321ha of farmland in Gwynedd,

113,285ha is permanent Grass and 76,393ha is rough grazing. 3080ha is used for arable crops.

Although 89% of the Gwynedd land area is considered to be agricultural, the soil is generally quite poor for farming. The Best and Most Versatile Agricultural land (ALC grades 1 – 3a) is mostly confined to the lowland areas of the Llyn Peninsula and the north-west of the county. Much of the land comprises of upland areas, characterised by poor soil in terms of Agricultural Land Classification, meaning that much of the land within the county falls within the lower ALC grades (3b – 5). Agricultural land could be affected by the GLFRMS, positively and negatively, if it results in changes to flooding regimes of farmland.

Mineral Resources

Gwynedd has a long history of mineral extraction both in quarrying and metal mining, which remain an important facet of its economic and social composition. Slate has been an important resource historically, and currently there are approximately 20 working slate quarries or related industries in Gwynedd; some of these have been transformed into tourist attractions, such as Llechwedd Slate Caverns. There are also numerous examples of past metal mining in Gwynedd. Although most of the mines have now closed some of these areas still leave a legacy of elevated metal levels in rivers, which sometimes directly affect ecological quality, particularly after flooding. Gwynedd also contains aggregates resources (sands and gravels); there are approximately two sand and gravel operators and around three operators quarrying hard rock within Gwynedd.

Such resources could be affected by future increases in flooding, especially access to them, and it is expected that the GLFRMS would positively contribute to addressing this. Conversely, changes to flood regimes in some areas could lead to restricted access to such resources if this is not considered fully.

Fisheries

Gwynedd has numerous watercourses and many of these support important salmon and sea trout fisheries; some of the largest include the Dyfi, Glaslyn and Mawddach. Lakes such as Tal y Llyn, Llyn Trawsfynydd and Cregennan Lakes are also important for fish stocks. Angling is therefore an important component of the tourism industry in Gwynedd and attracts many visitors annually. Lakes within Gwynedd also support other important fish species such as the Arctic cherr at Llyn Padarn an Gwynia in Llyn Tegid.

The sustainability of fish populations is also integral to the function of rivers as a healthy ecosystem. In addition, there are large and valuable stocks of shellfish in Gwynedd, including the cockle beds at Traeth Lafan and mussels are harvested from natural beds in the Dyfi Estuary and the Menai Strait, the latter being some of the most productive in Europe. Increased flooding could lead to higher flows in rivers and other watercourses, which could

adversely affect fish stocks, river ecosystems, and the tourism industry that depends on them. By seeking to address this, the GLFRMS could indirectly have a positive effect on this asset. Migratory species, such as salmon and sea trout all need free passage up and downstream as a critical element of their life cycles. Flood alleviation structures can reduce connectivity for such species, which can impact populations and their resilience in the face of climate change. The removal of habitat to increase conveyance will also reduce the areas where fish can find cover from flows, predators and temperature. Marine fish stocks and shellfish beds are not expected to be affected by the GLFRMS as marine areas are outside of its scope.

Tourism and recreation

One of Gwynedd's main assets is its natural beauty, which attracts tourists from the UK and overseas. Gwynedd boasts beaches, lakes, river valleys, the landscapes of the Snowdonia National Park, a wealth of cultural heritage attractions and a distinct culture. Tourism is a key component of Gwynedd's economy and accounts for a large percentage of the authority's employment (13.7%), with an estimated 8,200 jobs in tourism in 2021[5]. However, work in the tourism sector is often low paid and seasonal, which can lead to social deprivation and fluctuating unemployment in some areas. As mentioned previously, flooding can lead to restriction of access to tourist amenities and deter visitors from certain areas, resulting in negative effects on the tourism business within Gwynedd. The GLFRMS is expected to positively contribute towards reducing flooding in Gwynedd and therefore indirectly minimising the risk of future flooding events affecting this asset. Conversely, managed flooding of large areas could have a significant negative effect on the landscape and affect its amenity for tourists if this is not considered fully.

Relationship between the GLFRMS and Material Assets

Gwynedd is a peripheral County within Wales and the UK and much of its Material Assets are centred on its natural beauty (tourism) and large, undeveloped areas of land (agriculture). Gwynedd's transport infrastructure is critical to both the local population and seasonal tourists and all of Gwynedd's assets can be influenced by flooding to varying degrees. The increasing demand for housing and economic growth has the potential to exacerbate flood risk in areas if it is not planned and designed to consider this.

The GLFRMS will seek to manage flood risk to critical infrastructure and material assets within Gwynedd. The options in the GLFRMS may change the frequency and extent of flooding leading to consequent changes (positive and negative) in the use of land and affecting its versatility and productivity. The GLFRMS also has the potential to both benefit and compromise access to mineral resources and extraction and fisheries, and degrade soil quality or function, which could affect future land use. Tourism is a crucial component of Gwynedd's economy and the GLFRMS has the potential to affect the landscape, which is an important attraction for tourists to the area.

4.2.7 Cultural Heritage

Gwynedd has a highly valued historic landscape resource which includes numerous designated areas such as historic parks and gardens, landscape conservation areas and historic landscapes. In addition to designated features, the Historic Environment Record maintained by Gwynedd Archaeological Trust (GAT) documents around 10,000 historic and archaeological sites which are not afforded statutory protection. There are also undesignated heritage assets which could be at risk from adverse effects associated with the implementation of the GLFRMS and hence would have to be considered through consultation with the statutory heritage bodies. The following heritage designations have been considered within the SEA.

Historic Landscape Character (Landscapes of Outstanding Historic Interest)

The most important examples of historic landscape character in Wales are Landscapes of Outstanding Historic Interest (LOHI). These are a non-statutory designation but are considered to be the most important and best-surviving historic landscapes in Wales and are recorded on the Register of Parks, Gardens and Landscapes of Historic Interest in Wales (Cadw / ICOMOS UK). There are 13 LOHI located in Gwynedd; 12 of these lie partly or wholly within the Snowdonia National Park.

Scheduled Ancient Monuments

There are 500 Scheduled Ancient Monuments (SAMs) in the Gwynedd county boundary, both in urban areas and in the countryside, ranging from houses to chapels and standing stones to field systems.

Registered Parks and Gardens

There are currently 16 Historic Parks and Gardens within the Gwynedd Unitary Area, 2 of which are Grade I, 2 are Grade II* and 12 are Grade II. There are also approximately 20 Historic Parks and Gardens within the Gwynedd area of the Snowdonia National Park. This designation is a material consideration when determining planning applications.

Listed Buildings

There are 4160 listed buildings in Gwynedd. Listed buildings are those structures that have been placed on the Statutory List of Buildings of Special Architectural or Historic Interest and mostly include buildings, but also bridges, milestones, monuments and mileposts.

Conservation Areas

The purpose of Conservation Areas is to both preserve and enhance the special architectural or historic interest of such areas and to employ positive measures to ensure building preservation. There are 39 Conservation Areas in the Gwynedd Council Unitary Area; these are areas of particular historical, social or architectural interest. There is also a rich built heritage within the Gwynedd area of the Snowdonia National Park, which contains 14 Conservation Areas. Conservation and enhancement of this built heritage is an important factor when considering development within or adjacent to these areas.

UNESCO World Heritage Sites

This is an international designation for extremely well-preserved monuments. In the Gwynedd Council Unitary Area there are two UNESCO World Heritage Sites (WHS); the fortified complex of Caernarfon, and the Slate Landscapes of Northwest Wales (which is also partly located within Snowdonia National Park. Harlech Castle is the only example of a UNESCO WHS within the Snowdonia National Park.

Relationship between the GLFRMS and Cultural, Architectural and Archaeological Heritage

Gwynedd has a diverse range of designated cultural, architectural and archaeological features ranging from listed buildings to historic landscapes. The GLFRMS may involve land use changes or alterations to flooding regimes that could adversely affect historic sites and their settings. There is also potential for many cultural heritage features to be lost due to coastal erosion, and coastal policy can have an impact upon this. The GLFRMS could also reduce the flood risk to designated heritage features or lead to improved access to historic environment sites.

4.2.8 Landscape and Seascape

Designated Landscapes

Nearly three-quarters of Gwynedd is covered by landscape designations, which reflect its special character. Gwynedd's picturesque landscapes are a key feature, and the natural beauty and diversity of Gwynedd's landscape are reflected by the fact that a large part of it (63%) falls within the Snowdonia National Park (SNP); covering approximately 2,139km^2. The SNP attracts approximately 4 million visitors annually, principally for its dramatic mountainous scenery and attractive cultural heritage. The aims of the SNP are to 'conserve and enhance the natural beauty, wildlife and cultural heritage' of the area and 'promote

opportunities for understanding and enjoyment by the public'[26]. Therefore, it is considered as a very important landscape designation within the GLFRMS area.

5.6% of Gwynedd is located within the Llŷn Area of Outstanding Natural Beauty (AONB). AONB's are designated under the National Parks and Countryside Act 1949 and their primary purpose is to conserve and enhance natural beauty while taking into account the economic and social needs of an area. The Llŷn Peninsula is renowned for its diverse and interesting coastline and the AONB encompasses around one quarter of the peninsula (c.15,500 hectares), mostly along the coast but also extending inland. A map showing Gwynedd's designated landscape areas is shown in Appendix C.

Landscape Character

Gwynedd's landscape is extremely varied and scenic, from extensive areas of uplands, forests and valleys within the Snowdonia National Park to the beaches around Gwynedd's 300km coastline. Gwynedd also varies in term of its built environment and cultural heritage. A specially-devised national landscape information system (LANDMAP) was used to identify areas within Gwynedd which had their own particular landscape identity. National Landscape Character Areas (NLCA) are defined at a broad landscape scale throughout Wales. There are 8 NCLA's which are either wholly or partly within Gwynedd. These are; Arfon, Llyn, Tremadoc Bay, Snowdonia, Aberdyfi Coast, Berwyn, Vale of Llangollen and Dee Valley, and Denbigh Moors.

Relationship between GLFRMS and Landscape

Gwynedd benefits from a diverse, attractive landscape, which is reflected by much of it falling within a National Park and an AONB. By attracting tourists to Gwynedd this landscape helps to support an important local economy but is also sensitive to change. The GLFRMS may include land use change, changes in flood regimes and frequency or changes in water levels that have the potential to adversely affect landscape appearance and features. Conversely, such changes may present opportunities to improve the condition of existing landscape features in Gwynedd by reducing flood risk. The GLFRMS must consider the importance of the National Park and AONB designations in context with any proposed flood risk management measures.

4.2.9 Inter-relationships between the Environmental Topics

[26] Cynllun Eryri – The Snowdonia National Park Partnership Plan 2020

The SEA Directive requires that the inter-relationships between the environmental topics are considered at each stage of the environmental assessment process. Table 4.2 below identifies the inter-relationships between the environmental topics. The key inter-relationships established so far include strong links between the tourism industry and Gwynedd's natural beauty, the sensitive biodiversity and water quality and material assets/population with flooding. Climate change can influence each of the topics to varying degrees.

Table 4.2: Inter-relationships between the Environmental Topics								
Population and Human Health				✓	✓	✓		
Biodiversity, Flora and Fauna			✓	✓	✓			
Land Use, Geology, Soil & Contaminated Land		✓		✓	✓	✓	✓	
Water Resources & Quality	✓	✓	✓		✓	✓		
Climatic Factors	✓	✓	✓	✓		✓	✓	✓
Material Assets	✓		✓	✓	✓			✓
Cultural Heritage			✓		✓			✓
Landscape and Seascape					✓	✓	✓	
	Population and Human Health	Biodiversity, Flora and Fauna	Land Use	Water Resources & Quality	Climatic Factors	Material Assets	Cultural Heritage	Landscape and Seascape

4.3 Relevant environmental issues and problems

Table 4.3 summarises the key environmental issues and problems that have been identified following a review of the baseline environmental information. These issues and problems are considered to be the most relevant to Gwynedd's LFRMS and have been used to define the SEA objectives.

Table 4.3: Key Environmental Issues and Problems

Environmental Topics	Environmental Issues and Problems
Population and Human Health	Gwynedd's population has generally increased since the 1970's, and is predicted to increase further by 2041, placing pressure on services and increasing the demand for development. There is an imbalance in age structure between the north and the south of Gwynedd which can inhibit economic development in some areas. Access to key services in Gwynedd can be problematic as many areas are remote and rural. Key transport routes are therefore especially important. A high percentage of employment in Gwynedd is based on sectors offering low wages and is often seasonal, such as tourism. This can result in social deprivation. In Gwynedd, 12,563 properties are considered to be at risk of flooding. 10 - 20% of properties in Gwynedd are located in a Flood Zone. These will form the basis of the GLFRMS, supported by the continuing collection of information on local flood events.
Biodiversity, Flora and Fauna	Gwynedd is a rural county with a rich natural heritage reflected in the high number of European, National and Local protected sites. Gwynedd contains: * 19 Special Areas of Conservation (SAC) * 9 Special Protection Areas (SPA) * 4 Ramsar Sites * 26 National Nature Reserves (NNRs) * 151 Sites of Special Scientific Interest (SSSI) * 6 Local Nature Reserves (LNR) * Over 1100 Local Wildlife Sites (LoWS) All of these sites are potentially at risk from changes in Flood Risk management, but could also receive beneficial impacts as a result of flood management measures. The Gwynedd and Eryri Local Biodiversity Action Plans operate within Gwynedd; both have specific targets for key species and habitats listed in the NERC Act that may benefit or be hindered by the GLFRMS.
Land Use, Geology, Soil & Contaminated Land	The soil in Gwynedd is largely of poor agricultural quality with 91% of agricultural land falling into grade 3b, 4 and 5. Sheep farming

	(rough grazing) comprises a large component of the agricultural land use. Designated geological sites are potentially at risk from changes in Flood Risk management, but may also benefit from reduced flooding. There are several designated geological and geomorphological sites in Gwynedd, including: * 90 Geological Conservation Review sites * 68 SSSI's with some geological interest * 58 Regionally Important Geological Sites (RIGS) Gwynedd has a legacy of historic mining activities, which have led to elevated contamination levels. Current and historic landfill sites also provide an ongoing source of land contamination. Changes to water levels in contaminated land areas could lead to increased or reduced contamination levels. Flooding may also lead to increased heavy metal contamination of soils.
Water Resources & Quality	Many of the rivers in Gwynedd support important salmon and sea trout fisheries, which are important recreational and economic resources. There are many important water-based conservation sites in Gwynedd as well as water-based tourism and leisure activities. These sites are sensitive to pollution and changes in water levels. The WFD requires NRW to aim to achieve good status in all water bodies under their control. The majority of Gwynedd's rivers currently have moderate or good ecological status. All the rivers have good chemical quality or are considered not to require assessment. Most of the lakes are either of good or moderate ecological status. This highlights the general high quality of Gwynedd's watercourses and their sensitivity to change. The groundwater quality within Gwynedd is of poor chemical status across most of the county, apart for the south-east, where it is at good status. The quantitative status of Gwynedd's groundwater is good throughout. 19 EC-designated bathing water points are monitored for the Bathing Water Directive. 17 of these meet the highest bathing water Standard of 'excellent', and two of the sites are classified as 'good'
Climatic Factors	Climatic trends and patterns are changing due to increased atmospheric greenhouse gas emissions. Climate projections predict that average temperatures will increase, especially in summer, and that rainfall will increase in winter and reduce in summer, thus resulting in warmer, wetter winters and hotter, drier summers.

	Gwynedd has a role to play in reducing carbon emissions, as the county currently contributes approximately 500kt of carbon emissions a year. Flood risk management measures have a significant role in mitigating and adapting to the impacts of increased flood risk as a result of climate change. The predicted changes in climate conditions will put increasing pressures on existing flood and coastal management regimes and infrastructure. Opportunities to reduce carbon footprint of certain flood risk management activities will also need to be implemented in order to meet regional and national commitments to reduce carbon emissions.
Material Assets	All of Gwynedd's Material Assets can be influenced by flooding to varying degrees, especially its transport infrastructure. Gwynedd is a peripheral County within both the UK and Wales, and its transport infrastructure is critical to both the local population and seasonal tourists. The increasing demand for housing and economic growth has the potential to exacerbate flood risk in areas if it is not planned and designed to consider this. Bangor and Caernarfon have been identified as areas for growth and economic development. However, Bangor is considered to be within an area at risk of flooding. Agriculture is an important economy within Gwynedd. However, in agricultural terms the soil is quite poor. Tourism is crucial for the economy of Gwynedd, accounting for approximately 12% of the County's employment. Many tourists visit Gwynedd for its natural beauty, which is sensitive to change. Gwynedd has a history of quarrying and metal mining. Although most of the mines have now closed there is a legacy of elevated metal levels in rivers which can directly affect ecological quality, especially after flooding. Gwynedd has numerous watercourses and many supports important fisheries. Angling is an important component of the tourism industry in Gwynedd and attracts many visitors annually.
Cultural Heritage	Gwynedd has a diverse suite of Cultural Heritage assets, from internationally recognised to locally protected sites and various undesignated features. Gwynedd (including the Snowdonia National Park) contains: * 3 UNESCO World Heritage Sites * 13 Landscapes of Outstanding Historic Interest * 583 Scheduled Ancient Monuments * 36 Registered Parks and Gardens * 53 Conservation Areas

	* 4160 Listed Buildings These sites are potentially at risk from changes in Flood Risk management, but may also benefit from reduced flooding. Additionally, there is generally a higher potential for the discovery of archaeological remains in areas which are liable to flooding.
Landscape & Seascape	Nearly three-quarters of Gwynedd is protected by landscape designations, including the Snowdonia National Park and Llŷn AONB, reflecting its special character. This is one of the most important attractions to the area for visitors and hence an important asset. Gwynedd's natural landscape and visual amenity are sensitive to change and potentially at risk from Flood Risk management measures as a result of the GLFRMS.

4.4 Data limitations and assumptions

There is considerable uncertainty over the projected effects of climate change, especially at the local level. Therefore, in attempting to avoid over or underestimating the local effects the UKCP18 estimated rainfall and temperature projections used in this report are based on the 2050 central estimate using a medium emissions scenario.

Data referred to in this report have been referenced where possible and efforts have been made to ensure that the most contemporary and robust data available have been used. However, it should be noted that additional data are likely to become available since the report was published.

4.5 SEA objectives, targets and indicators

Following the scoping of environmental topics and compilation of the baseline information and identification of the environmental problems and issues a series of SEA objectives was developed, against which the SEA process was applied to assess the potential environmental effects of the GLFRMS, as well as relevant targets and indicators to be used when monitoring its implementation. These are presented in table 4.5.1.

Table 4.5.1: GLFRMS SEA Objectives and Assessment Criteria				
SEA Environmental Topic	**Environmental Issues / Problems / Constraints**	**Draft GLFRMS SEA Objectives**	**Assessment Criteria** ***"Will the GLFRMS, in combination with any other plans or programmes…"***	**Potential Indicators**
Population and Human Health	Increasing and ageing population. High depravation levels in areas of flood risk. 12,000 properties at risk of flooding Increased demand for housing Essential transport infrastructure and ccess to services can be restricted by topography and flooding A number of populated areas are particularly susceptible to river or coastal flooding.	1) Protect and enhance public health and community services	Have an adverse effect on human health and quality of life? Increase the risk of flooding to populated areas? Protect essential services, including hospitals and schools, and access to them, from flooding?	Flood risk deprivation levels on the Gwynedd WIMD (Quality of Life indicator, produced by WG) since the adoption of the GLFRMS. Number of 'at risk' residential properties and employment sites suffering flooding since the adoption of the GLFRMS (data from LLFA flood reports). Number of 'at risk' key community services suffering flooding since the adoption of the GLFRMS (data from LLFA flood reports).
Biodiversity, Flora and Fauna	High number of protected sites of international, national and regional importance, sensitive to change.	2) Conserve, avoid damage to and enhance where possible designated wildlife sites and protected species and habitats in Gwynedd.	Cause harm to Gwynedd's protected sites, species and habitats?	Reported levels of damage to protected sites, species and habitats as a result of the implementation of GLFRMS schemes and objectives (data from NRW and LLFA).

	Gwynedd LBAP and Eryri LBAP targets for species and habitats of principal importance.		Provide opportunities for enhancing Gwynedd's biodiversity?	Net loss of Section 7 habitats and LoWS as a result of the implementation of GLFRMS schemes and objectives (Data from LA and LLFA) Creation of Section 7 habitats and LoWS, and other protected sites, as a result of the implementation of GLFRMS schemes and objectives (data from LA and LLFA).
Land use, geology, soil & contaminated land	The soil is largely of poor agricultural quality, but is a good Carbon store. Several designated geological and geomorphological sites. Elevated contamination levels in some areas from historic mining.	3) Reduce contamination and safeguard the quality and quantity of Gwynedd's soils and geodiversity	Have an adverse impact on the best and most versatile agricultural land? Result in adverse effects on designated geological sites? Lead to increased levels of ground and water contamination? Result in improved drainage and reduce surface runoff? Require construction on previously undeveloped or greenfield land?	Area of Grade 1, 2 or 3a soils lost to development for the GLFRMS. (Data from LLFA/WG). Number of 'at risk' designated geological sites affected by flooding following the adoption of the GLFRMS (data from LLFA flood reports). Deterioration in Chemical water quality of watercourses as a result of the implementation of GLFRMS schemes and objectives. (data from NRW/LLFA)

				Contamination incidents linked to flooding recorded after the adoption of the GLFRMS (data from NRW/LA).
Water resources & quality	The WFD requires good status to be achieved in all water bodies. The majority of rivers have moderate or good ecological status. All rivers have good chemical quality or do not require assessment. Most lakes are either at good or moderate ecological status. Groundwater quality is of poor chemical status across most of the county apart from the south east where it is at good status. 19 water bodies are monitored for the Bathing Water Directive, with all achieving excellent or good status.	4) Sustain and enhance Gwynedd's water quality and resources	Lead to a reduction in the quality of surface and groundwater in Gwynedd? Result in deterioration of bathing water quality around the coast of Gwynedd? Have an adverse effect on water resources, including abstractions? Protect and/or enhance Gwynedd's water quality standards?	Significant reduction in water quality of watercourses and groundwater as a result of flooding and flood management measures following the adoption of the GLFRMS (data from NRW). Reported Incidences of environmentally unacceptable flows in watercourses (NRW records) linked to flooding following the adoption of the GLFRMS. NRW pollution incident records linked to flooding following the adoption of the GLFRMS.
Climatic factors	Climate change resulting in increased average temperatures, along with warmer, wetter winters and hotter, drier summers. The risk of coastal flooding and erosion increasing with the impact of climate	5) Mitigate and adapt to the impacts of climate change on flood risk activities in Gwynedd.	Lead to an increase in carbon emissions? Have an adverse effect on existing flood management infrastructure?	Increased Carbon emission levels within Gwynedd – per capita, as a result of the implementation of GLFRMS schemes and objectives.

	change, along with increased risk of inland flooding due to more intense storms. Increased pressures on existing flood risk management regimes Requirement to reduce carbon emissions, including those associated with flood management activities.		Impact upon the ability of communities to mitigate and adapt to the effects of climate change?	No. of flood risk management schemes designed to a standard that factor in climate change. The number of section 19 reports published.
Material assets	Reliance on several strategic transport routes critical in a remote rural County. Increased demand for housing. Agriculture and tourism are important local economies, but sensitive to change. Elevated metal levels in rivers from past mining industry. Angling is an important component of the tourism industry.	6) Minimise flooding to key infrastructure and sensitive land use.	Protect and improve key infrastructure and sensitive land use from flooding? Protect and improve personal and industrial property from flooding? Seek to avoid adverse impacts to tourism and recreational assets? Avoid a reduction in agricultural output?	Number of SuDS implemented since adoption of GLFRMS (Data from LLFA) Annual number of reported disruptions to transport infrastructure from flooding since the adoption of the GLFRMS (e.g. data available from Network Rail, Trunk Road Agency). Area of ALC Grades 1 – 3a agricultural land affected by flooding since the adoption of the GLFRMS (data from LLFA flood reports) Annual number of reported flooding events affecting tourism and

				recreational assets since the adoption of the GLFRMS (data from LLFA flood reports).
Cultural heritage	High number of diverse Cultural, Architectural and Archaeological Heritage features and designated sites.	7) Protect, maintain and enhance Gwynedd's Cultural, Architectural and Archaeological Heritage.	Have an adverse effect on Gwynedd's cultural, architectural and archaeological features? Conserve and/or enhance cultural, architectural and archaeological features within Gwynedd?	Percentage of 'at risk' Listed Buildings and archaeological sites affected by flooding following the adoption of the GLFRMS (data available online from Cadw). No change to the condition of Scheduled Ancient Monuments as a result of flooding (data collected by Cadw) following the adoption of the GLFRMS.
Landscape & seascape	High landscape visual amenity is one of the most important visitor attractions. 63% of Gwynedd is located within the Snowdonia National Park. Llŷn AONB covers 5.6% of Gwynedd	8) Protect and enhance Gwynedd's Landscape and Seascape	Have an adverse effect on Gwynedd's landscape, seascape and visual amenity? Lead to detrimental visual impacts for the Snowdonia National Park and Llŷn AONB?	Number of GLFRMS schemes proposed within the Snowdonia National Park and Llŷn AONB that would have and adverse residual effect on landscape (data from LLFA and SNPA). Feedback relating to adverse effects of flooding and flood risk management on landscape and visual amenity from Tourist/Resident surveys following the adoption of the GLFRMS (Tourism Board, LA).

4.6 Testing the Compatibility of the Objectives

This section of the Environmental Report has been produced to meet the requirements of Stage B1 of the SEA Guidance[27]. Stage B1 requires the objectives of the plan or programme to be tested against the SEA objectives. This helps to identify whether there are any inconsistencies or synergies between both sets of objectives and helps to develop alternatives or refine objectives prior to the assessment stage.

Table 2.2 outlines the following five GLFRMS objectives:

1) To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd
2) To further develop an understanding of the flood risk to Gwynedd and the impacts of climate change
3) To continue to work with all relevant bodies to ensure appropriate and sustainable development in Gwynedd
4) Raising awareness of local flood and coastal erosion risk
5) Working collaboratively with all other Risk Management Authorities and relevant groups/bodies to ensure a coordinated response to flood and coastal erosion events

Table 4.5.1 outlines the following eight SEA objectives:

1) Protect and enhance public health and community services
2) Conserve, avoid damage to and enhance where possible designated wildlife sites and protected species and habitats in Gwynedd.
3) Reduce contamination and safeguard the quality and quantity of Gwynedd's soils and geodiversity
4) Sustain and enhance Gwynedd's water quality and resources
5) Mitigate and adapt to the impacts of climate change on flood risk activities in Gwynedd.
6) Minimise flooding to key infrastructure and sensitive land use.
7) Protect, maintain and enhance Gwynedd's Cultural, Architectural and Archaeological Heritage.
8) Protect and enhance Gwynedd's Landscape and Seascape

The compatibility of both the GLFRMS and the SEA objectives has been considered and the results presented in Table 4.6.1 using the following key:

+ Potential consistency

[27] A Practical Guide to the Strategic Environmental Assessment Directive, ODPM (September 2005)

? Uncertainty

0 Not related

- Potential inconsistency

GLFRMS Objectives									
	1	+	+	+	+	+	+	+	+
	2	+	0	0	0	+	+	0	0
	3	+	+	+	+	+	+	+	+
	4	+	0	0	0	+	+	0	0
	5	+	0	0	0	+	+	0	0
		1	2	3	4	5	6	7	8
	SEA Objectives								

Table 4.6.1: Compatibility Assessment Matrix

Following the objectives compatibility assessment the following conclusions were reached:

1) The GLFRMS objectives are potentially consistent with the SEA objectives regarding Population and Human Health, Climate Change and Material Assets. This is to be expected since a key aim of the GLFRMS is to address local flooding issues that are largely attributable to climate change and development pressure from an increasing population.
2) There are potential consistencies regarding the compatibility of the GLFRMS Objectives 1 and 3 with the SEA objectives for Biodiversity, Soils / Geodiversity, Water quality/resources, Cultural Heritage and Landscape/Seascale. This is because actions resulting from the GLFRMS Objectives may result in beneficial effects on these sensitive receptors depending on how and where they are implemented.
3) GLFRMS Objectives 2, 4 and 5 are not considered to be related to the natural receptors considered in SEA objectives 2, 3, 4, 7 and 8. This is because they involve planning procedures, effective communication, awareness raising and response to flooding events rather than actual construction activities.
4) No potential inconsistencies between the SEA Objectives have been identified.

The uncertainties and potential inconsistencies will be considered further to ensure that relevant alternatives and refinements to the GLFRMS objectives are addressed. If alternatives or refinements are not possible avoidance and mitigation measures will be identified.

5.0 GLFRMS Issues and Alternatives

5.1 Main strategic alternatives

This section of the Environmental Report has been produced to meet the requirements of Stage B2 of the SEA Guidance. Stage B2 requires strategic alternatives to be developed and refined.

The Gwynedd Local Flood Risk Management Strategy is a statutory requirement of the Flood and Water Management Act 2010 and must follow the objectives of the Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management in Wales. Therefore, consideration of alternative options to the Strategy itself is not considered realistic or feasible. However, several actions have been identified for each GLFRMS objective. These actions follow a risk-based approach to adapting to the effects of flooding at a local level and have been assessed against the SEA objectives to identify any potentially significant environmental effects. A 'Do Minimum' scenario has also been considered in order to provide a comparison of the potential environmental effects without the GLFRMS; for this SEA 'Do Minimum' means that the current measures for managing flood risk would not change.

The actions for each objective are listed in table 2.3. It should be noted that the Actions are not mutually exclusive of each other (except Do Minimum) and that more than one Action for each objective, or even all of them, may be implemented by the GLFRMS, provided that there are no adverse significant environmental effects.

5.2 Predicting the environmental effects of the GLFRMS

Stage B3 of the SEA guidance requires the prediction of significant environmental effects that may result from a plan or programme and its alternatives. In order to compare the potential environmental effects of the Actions for each of the GLFRMS Objectives against the SEA Objectives a matrix assessment method has been used and the effects prediction methods contained within the ODPM SEA guidance, particularly Appendices 7 and 8, considered. The temporal scale of each potential effect has been considered based on the following epochs of implementation for each Action:

- Short term: expected to be prevalent from the implementation of the Action over the following 5 years;
- Medium term: expected to be prevalent for up to 5 to 10 years following the implementation of the Action, and;

- Long term: expected to be prevalent for more than 10 years following the implementation of the Action.

In addition, the nature of each potential effect (e.g. positive or negative, permanent or temporary) its probability and frequency, as well as the possibility of secondary (indirect), cumulative or synergistic effects has been considered and reported where relevant. There is considerable uncertainty over the prediction of cumulative/synergistic effects at such a broad scale, but an attempt has been made to identify the potential cumulative/synergistic effects both as a collective result of the Actions within each GLFRMS Objective on each SEA Objective and as a result of other relevant plans and programmes.

Professional judgement has been used to determine the likely magnitude of each potential effect, which has been assessed considering the existing environmental baseline characteristics. Where uncertainty remains a precautionary approach of considering the worst-case scenario has been applied.

Each potential effect has been allocated a level of magnitude (and colour coded) as follows:

+ +	Very Positive
+	Positive
0	Neutral
-	Negative
- -	Very Negative

Table 5.1 summarises the eight SEA objectives that have been referred to and assessed in the following section.

Table 5.1: SEA Objectives

Reference Number	Receptor	SEA Objective
1	Population and Human Health	Protect and enhance public health and community services
2	Biodiversity, Flora and Fauna	Conserve, avoid damage to and enhance where possible designated wildlife sites and protected species and habitats in Gwynedd.
3	Land use, Geology, Soil & Contaminated Land	Reduce contamination and safeguard the quality and quantity of Gwynedd's soils and geodiversity
4	Water Resources & Quality	Sustain and enhance Gwynedd's water quality and resources
5	Climatic Factors	Mitigate and adapt to the impacts of climate change on flood risk activities in Gwynedd.

6	Material Assets	Minimise flooding to key infrastructure and sensitive land use.
7	Cultural Heritage	Protect, maintain and enhance Gwynedd's Cultural, Architectural and Archaeological Heritage.
8	Landscape & Seascape	Protect and enhance Gwynedd's Landscape and Seascape

GLFRMS Objective 1:
To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd.

1.1 Flood and coastal erosion risk management programmes

1.1A Maintain long term capital programme to reduce risk of inland flooding
1.1B Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2

1.2 Flood and coastal erosion risk management improvements

1.2A Prepare annual list of schemes from long term action plan to reduce risk of flooding and coastal erosion to be presented for inclusion on WG capital programme.

1.3 Management of flood/coastal erosion risk management assets

1.3A Develop register and map of highway drainage assets in flood prone areas
1.3B Develop register and map of all SuDS elements adopted by the Council

1.4 Maintenance and deployment of flood/coastal erosion risk management assets

1.4A Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets.

		SEA Objectives (see Table 5.1)							
Action		1	2	3	4	5	6	7	8
1.1A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	+	0	0

1.1B	Short Term	+	0	0	0	+	+	-	0
	Medium Term	+	-	0	-	+	+	-	0
	Long Term	++	-	0	-	++	+	- -	0
1.2A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	+	0	0
1.3A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	0	0	+	+	0	0
1.3B	Short Term	+	+	0	+	+	+	0	0
	Medium Term	+	+	0	+	+	+	0	0
	Long Term	+	+	0	+	+	+	0	0
1.4A	Short Term	+	-	0	-	+	+	-	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	+	0	+	+	0	+
Do Minimum	Short Term	-	-	-	-	-	-	-	0
	Medium Term	-	-	-	-	-	-	-	0
	Long Term	- -	-	-	-	-	- -	- -	0

Conclusions

Action 1.1A – Maintain long term capital programme to reduce risk of inland flooding: Action 1.1A is anticipated to result in permanent positive effects for Population and Human Health by contributing to reducing the risk of flooding on receptors, particularly in the long term as the effects of climate change are expected to become more apparent. The capital programme is likely to result in schemes which will contribute to mitigating and adapting to the impacts of climate change on flood risk activities in Gwynedd. Material Assets are also generally expected to receive permanent positive effects from reduced flooding.

At this stage it is less clear how sensitive receptors including Biodiversity/Flora and Fauna, Land Use/Geology/Soils and Contaminated land, Water, Cultural Heritage, and Landscape will be affected by individual schemes implemented through the capital programme as the extent and nature of these have currently not been confirmed. There are opportunities for positive effects to ecological and landscape features from sensitive and more natural approaches to address flooding, which may result in habitat creation. However, there may be negative effects to sensitive features (including Biodiversity/Flora and Fauna, Land Use/Geology/Soils and Contaminated land, Water, Cultural Heritage, and Landscape) from any capital schemes which require additional land take or sacrifice areas. Due to the potential for both positive and negative effects on these features, a neutral score has been allocated for these

objectives. Sensitive features will need to be fully considered at the feasibility and design phase of any schemes arising from the capital programme.

Action 1.1B - Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2. As stated with 1.1A above, Action 1.1B is anticipated to result in permanent positive effects for Population and Human Health, and Material Assets, by contributing to reducing the risk of flooding on receptors. SMP2 policies and actions are considered to be a positive, proactive means by which to adapt to the effects of climate change at the local level. As stated in 1.1A, it is not yet clear how sensitive receptors will be effected by individual schemes implemented along the coastline through the capital programme / SMP2 action plan as the extent and nature of these are not yet known. The SMP2 contains objectives for safeguarding such sensitive features, but also states that not all objectives may be achieved.

The SEA & HRA undertaken for SMP2 states that by maintaining the protection of historic settlements and coastal communities, the potential exists for adverse effects on coastal habitat to arise from factors such as coastal squeeze and the limiting of sediment movement along the coast and geological exposure of cliffs. While in contrast by allowing natural processes to prevail essential for geological features for example, there is potential risk to the historic environment through erosion. Adverse effects are identified to biodiversity, flora and fauna, associated with HTL or ML policies, which are likely to involve loss of habitat. It is identified that in total up to 452ha of habitat may be lost through lack of available adaptation area for intertidal and terrestrial habitats during sea level rise in response to coastal squeeze associated with current defences, infrastructure or local topography. This will potentially require mitigation through the creation of equivalent habitat elsewhere and a large amount would be offset by the MR policies as well as compensatory habitat. This is likely to result in an overall permanent negative effect in the medium and long term.

However, the same policies which promote long term erosion or deposition (NAI or MR) will invariably impact upon the recorded and unknown historic environment, as the coverage of the coastal heritage resource is so extensive. This is likely to result in a permanent negative impact on cultural heritage in the short and medium term, increasing to a very negative impact in the long term as more features are lost and the impact of climate change and increased erosion rates having a bigger impact. Similarly in terms of Land Use, soils and Geology, a permanent negative impact is anticipated as coastal policy is likely to result in loss of agricultural land through MR and NAI policies.

Therefore, sensitive features will need to be fully considered at the feasibility and design phase of any schemes arising from the SMP2 and it is acknowledged that any schemes implemented during the lifetime of the GLFRMS will need to be cognizant of this.

Action 1.2A - Prepare annual list of schemes from long term action plan to reduce risk of flooding and coastal erosion to be presented for inclusion on WG capital programme.
As with 1.1A and 1.1B above, the inclusion of schemes on the WG capital Programme will result in permanent positive effects for Population and Human Health and Material Assets by contributing to reducing the risk of flooding on receptors, along with contributing positively to mitigating and adapting to the impacts of climate change. As the nature of the individual schemes is not yet known, it is not clear how sensitive receptors will be affected.

Action 1.3A – Develop register and map of highway drainage assets in flood prone areas.
The development of a highway drainage assets register is not expected to result in significant change to the existing baseline for the majority of the SEA Objectives. However, there would be a positive, permanent effect for Material Assets as it will contribute to a better understanding and potentially better management of flood risk on the highway network. There would also be an indirect, permanent positive effect on the Population and Human Health Objective due to the continued and improved management of highway drainage assets leading to reduced incidences of travel disruption and access severance. As a means of managing flood risk, this Option is also expected to contribute to indirectly, permanently and positively addressing climate change at the local level.

Action 1.3B – Develop register and map of all SuDS elements adopted by the Council.
As with 1.3A above, the development of a SuDS elements register is not expected to result in significant change to the existing baseline for the majority of the SEA Objectives. There would be a positive, permanent effect for Population and Human Health, along with Material Assets, as there is potential to improve understanding and contribute to better management of flood risk. The development of the register provides an opportunity to improve understanding and management of SuDS assets, which indirectly could have a permanent positive effect upon Biodiversity and Water Quality as some of the wider benefits of SuDS.

Action 1.4A - Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets. Positive, permanent effects, especially in the long term, are envisaged for Population and Material Assets indirectly due to the ongoing maintenance of flood and coastal erosion risk management assets as less obstruction to water flows and increased flood capacity would be expected. Reducing the risk of such assets contributing to flooding could lead to positive, permanent indirect effects on sensitive soils and landscape/visual amenity in the long term through a reduced frequency and severity of flooding events. Negative, temporary effects in the short term may arise from maintenance works that do not fully consider their effect on biodiversity (such as disturbance of protected species), water quality (especially through water pollution from construction activities) and cultural heritage features (particularly works to listed and designated features, although reduced flooding of

cultural heritage interest features/areas could lead to potential permanent, positive effects on this receptor).

The SEA process has identified that mitigation measures to address this, such as the identification of sensitive features in advance of any works, would need to be implemented as part of this Action.

Do Minimum: Although the GLFRMS is a statutory requirement the Do Minimum scenario has been included to provide a comparison against the proposed Actions. If the actions specified to reduce the level of flood and coastal erosion risk are not undertaken or maintained, it is expected that flood risk would increase over the long term with a resulting very negative permanent effect upon Population and Material Assets (as a cumulative result of not implementing the proposed actions), particularly if, as predicted, flood events become more frequent and severe. Similarly, impact on cultural heritage are also likely to be very negative in the long term as features could be lost due to flooding events and coastal erosion.

Biodiversity features could be impacted negatively through increased coastal and fluvial flooding events. There could also be negative impact on Land use, soil and contaminated land over time as flood events become more frequent and/or severe. Under the 'do minimum' scenario the effects on Water Quality may be negative as flood events become more frequent and extreme, with greater volumes of contaminated run-off reaching watercourses. The 'do minimum' approach may result in positive or negative impacts on landscape depending on whether inundation of low-lying areas (with potential reversion to wetland habitat) is deemed desirable. It has therefore been allocated as neutral.

GLFRMS Objective 2:
To further develop an understanding of the flood risk to Gwynedd and the impacts of climate change.

2.1 Working with partner RMA's

2.1A Contribute to stakeholder events with colleagues from partner RMAs and other stakeholders i.e. North Wales Regional Flood Group, West of Wales Coastal Group
2.1B Hold regular discussions regarding flood risk issues within Gwynedd with colleagues from NRW and DCWW

2.2 Flood Investigations

2.2A Develop and improve current mechanisms to identify incidents of flooding within Gwynedd as early as possible

2.3 Flooding to Highway Network

2.3A - Initiate study to identify areas of the county highway network that are most vulnerable to flooding and will become more susceptible as a results of climate change effects in the future

2.4 Flood Modelling

2.4A Development of high quality hydrological and hydraulic modelling to build on national maps and better understand flood risk at local level.
2.4B Incorporate most up-to-date climate change projections into all flood modelling exercises
2.4C Sharing of local flood modelling information with NRW so that national maps can be updated as appropriate

2.5 Data Collection

2.5A Enhancing our network of LoraWAN sensors to measure water levels within watercourses as well as groundwater level in areas of particular interest

2.5B Develop and implement a monitoring programme for areas of the coastline where cliff instability poses a risk to people, property and infrastructure.

		SEA Objectives (see Table 5.1)							
Action		1	2	3	4	5	6	7	8
2.1A	Short Term	+	+	+	+	+	+	+	+
	Medium Term	+	+	+	+	+	+	+	+
	Long Term	++	+	+	+	++	++	+	+
2.1B	Short Term	+	+	+	+	+	+	+	+
	Medium Term	+	+	+	+	+	+	+	+
	Long Term	++	+	+	+	++	++	+	+
2.2A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.3A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.4A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.4B	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.4C	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.5A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
2.5B	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	LongTerm	++	0	0	0	++	++	0	0
Do Minimum	Short Term	-	0	0	0	-	-	0	0
	Medium Term	-	0	0	0	-	-	0	0
	Long Term	- -	-	-	-	- -	- -	-	-

Conclusions

Action 2.1A Contribute to stakeholder events with colleagues from partner RMAs and other stakeholders i.e. North Wales Regional Flood Group, West of Wales Coastal Group.

This action is expected to have permanent positive benefits from the short to the long term for all SEA Objectives due to a greater level of involvement between interested parties allowing a more holistic and sustainable approach to flood risk management in Gwynedd. No negative Environmental effects are envisaged from this Action.

Action 2.1B Hold regular discussions regarding flood risk issues within Gwynedd with colleagues from NRW and DCWW. This action is expected to have permanent positive benefits from the short to the long term for all SEA Objectives due to a greater level of involvement between interested parties allowing a more holistic and sustainable approach to flood risk management in Gwynedd. No negative Environmental effects are envisaged from this Action.

Action 2.2A - Develop and improve current mechanisms to identify incidents of flooding within Gwynedd as early as possible. This action is expected to lead to positive permanent benefits due to an increased understanding of flood risk on Population and Material Assets, particularly over the long term. It is also expected to lead to positive benefits in the long term in mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

Action 2.3A - *Initiate study to identify areas of the county highway network that are most vulnerable to flooding and will become more susceptible as a results of climate change effects in the future.* It is expected that this action will lead to positive permanent benefits, in particular over the long term, to Population and Material Assets and to mitigating and adapting to the effects of climate change. This is due to an increased understanding of flood risk to the highway network, which will enable adaptation and long term planning to be better informed. No negative environmental effects are envisaged from this option as it is limited to a study of the highway network only.

Action 2.4A - Development of high quality hydrological and hydraulic modelling to build on national maps and better understand flood risk at local level.
This action is expected to lead to positive permanent benefits due to an increased understanding of flood risk at the local level on Population and Material Assets, particularly over the long term. It is also expected to lead to positive benefits in the long term in mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

2.4B Incorporate most up-to-date climate change projections into all flood modelling exercises. This action is expected to lead to positive permanent benefits due to an increased understanding of flood risk at the local level on Population and Material Assets, particularly over the long term. It is also expected to lead to positive benefits in the long term in

mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

2.4C Sharing of local flood modelling information with NRW so that national maps can be updated as appropriate. This action is expected to lead to positive permanent benefits on Population and Material Assets, particularly over the long term, as the sharing of information and co-operation with NRW will result in increased understanding of flood risk at the local level. It is also expected to lead to positive benefits in the long term in mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

2.5A Enhancing our network of LoraWAN sensors to measure water levels within watercourses as well as groundwater level in areas of particular interest.
This action is expected to lead to positive permanent benefits due to an increased understanding of flood risk at the local level on Population and Material Assets, particularly over the long term. It is also expected to lead to positive benefits in the long term in mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

2.5B Develop and implement a monitoring programme for areas of the coastline where cliff instability poses a risk to people, property and infrastructure.
This action is expected to lead to positive permanent benefits due to an increased understanding of coastal erosion risk at the local level on Population and Material Assets, particularly over the long term. It is also expected to lead to positive benefits in the long term in mitigating and adapting to the effects of climate change. No negative environmental effects are envisaged from this option.

Do minimum - If no improvement to partnership working, flood investigations, flood modelling, and data collection is delivered via the Actions proposed it is expected that flood risk would increase over the long term. This could result in very negative permanent effects, particularly on Population and Material Assets, and also on the Climate Change Objective. A lack of improvement via these actions is predicted to have a neutral effect on Biodiversity and Landscape in the short to medium term, but negative in the long term as flood risk is likely to increase and a lack of information and co-ordination could impact negatively on species and habitats. Similarly, a negative impact is predicted on Water Quality and Land Use/Soil in the long term as more extreme flood events will cause greater run-off and pressure on drainage systems. A negative effect is also predicted on Cultural Heritage in the long term as the protection of the historic environment is predicted to decrease under a do minimum scenario.

GLFRMS Objective 3:
To continue to work with all relevant bodies to ensure appropriate and sustainable Development in Gwynedd

3.1 Development Planning / Development Control

3.1A Incorporation within the Local Development Plan of the requirements contained within TAN15 with regard to Strategic Flood Consequence Assessment
3.1B Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline

3.2 Works near watercourses

3.2A Periodic review of all policies relating to Land Drainage consenting procedures to ensure best practice is maintained and proposed developers are aware of design and construction requirements

3.3 Sustainable Drainage Systems (SuDS) and Natural Flood Risk Management (NFM)

3.3A Identify opportunities for the implementation of SuDS and NFM schemes in areas which will deliver meaningful flood risk benefits as well as other environmental and amenity benefits
3.3B Work with partner authorities and landowners to deliver NFM schemes as part of a national programme
3.3C Develop position statement which clearly outlines how NFM schemes should be designed and developed to obtain necessary watercourse consents (S23 and LD bylaws) from Cyngor Gwynedd

		SEA Objectives (see Table 5.1)							
Action		1	2	3	4	5	6	7	8
3.1A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0
3.1B	Short Term	0	0	0	0	0	0	-	0
	Medium Term	+	-	-	0	+	+	-	0
	Long Term	+	-	-	0	+	+	- -	+
3.2A	Short Term	+	+	0	+	+	+	+	0

	Medium Term	+	+	+	+	+	+	+	0
	Long Term	++	+	+	+	+	++	+	0
3.3A	Short Term	+	+	0	+	+	+	+	0
	Medium Term	+	+	+	+	+	+	+	+
	Long Term	++	++	+	+	++	++	+	+
3.3B	Short Term	+	+	0	+	+	+	+	0
	Medium Term	+	+	+	+	+	+	+	+
	Long Term	++	++	+	+	++	++	+	+
3.3C	Short Term	+	+	0	+	+	+	+	0
	Medium Term	+	+	+	+	+	+	+	+
	Long Term	++	++	+	+	++	++	+	+
Do Minimum	Short Term	0	0	0	0	0	0	0	0
	Medium Term	-	-	-	-	-	-	0	0
	Long Term	-	-	-	-	-	-	-	-

Conclusions

Action 3.1A - Incorporation within the Local Development Plan of the requirements contained within TAN15 with regard to Strategic Flood Consequence Assessment
Compliance with the relevant Technical Advice Notes (TANs) is a requirement of the joint Gwynedd/Anglesey LDP. While indirectly positive for all of the SEA Objectives, especially in the long term by addressing flood risk and effects on Population and Material Assets at the planning stage, it is not considered to result in a significant change from the existing baseline scenario since it already occurs in current practice.

Action 3.1B - Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline
Having regards within the LDP will ensure future developments will take account of changes in coastal policy, ensuring that developments are sustainable and not at risk of potential coastal erosion or inundation in the future. This is regarded as having a permanent positive effect in the medium and long term for Population and Material Assets as such policy is regarded as providing protection, and allows for appropriate measures and adaptation to be made for those areas at risk. This is also true for the Climate Change Objective.

It is less clear how sensitive receptors including Biodiversity, Water Quality, Land Use and Cultural Heritage will be affected. The key drivers for the development of SMP policy was to support the diverse character of the landscape and seascape of the coastline through the natural evolution of the shoreline wherever possible, balanced against the desire to not constrain the ability of coastal settlements to retain their viability and core values and manage and adapt to flood and erosion risks. Hold The Line policies can result in coastal

squeeze and therefore loss of intertidal habitats and features. This is outlined in the SEA and HRA prepared for SMP2. Some compensatory habitat can be secured through Managed Realignment policies where these result in creation of additional habitat, however additional compensatory habitat is likely to be required, therefore this is likely to result in an overall negative effect in the long term.

In terms of Land Use, soils and Geology, a permanent negative impact is anticipated as coastal policy is likely to result in loss of agricultural land through Managed Realignment and No Active Intervention policies. No changes to the baseline condition is expected in relation to water quality. The impact of coastal policy on Landscape and Seascape are generally limited.

The main impacts associated with Cultural Heritage stem from No Active Intervention policies which result in the natural loss of some open coastal historic features in response to continued natural erosion. Given that it is uneconomic and not sustainable to protect the whole of the Gwynedd coastline, the loss of historic features through natural coastal erosion is inevitable.

Action 3.2A - Periodic review of all policies relating to Land Drainage consenting procedures to ensure best practice is maintained and proposed developers are aware of design and construction requirements
This action is considered to result in positive, permanent effects for all of the SEA Objectives, largely due to appropriate consultation and conditions being specified through consenting, resulting in better understanding of best practice and requirements. Effective Land Drainage consenting procedures are expected to result in positive effects through increased consideration of flood risk to Population and Material Assets, along with consideration of biodiversity, hydrological and cultural heritage features through effective consultation with statutory bodies. Improved consideration of the effects of land drainage works to flood risk management could also lead to long term permanent, positive effects on soils and contaminated land due to reduced flooding in future.

Action 3.3A - Identify opportunities for the implementation of SuDS and NFM schemes in areas which will deliver meaningful flood risk benefits as well as other environmental and amenity benefits.
This action is considered to result in positive, permanent effects for all of the SEA Objectives. SuDS and NFM schemes deliver flood risk benefits which will result in long term permanent positive effects on Population and Material Assets. Such schemes also bring Biodiversity benefits, result in water quality improvements, and result in Landscape benefits through the creation of woodland and wetland areas. The delivery of SuDS and NFM schemes will also help mitigate and adapt to the impacts of Climate Change, and can have a positive effect on Cultural Heritage through increased flood risk benefits. Although some schemes could result

in minor loss of agricultural land, there are also many positive effects on land use, soils and contaminated land through reduced flood risk, resulting in less run-off and soil erosion.

Action 3.3B - Work with partner authorities and landowners to deliver NFM schemes as part of a national programme.

As with Action 3.3A above, action 3.3B is considered to result in positive, permanent effects for all of the SEA Objectives. NFM schemes deliver flood risk benefits which will result in long term permanent positive effects on Population and Material Assets. Such schemes also bring Biodiversity benefits, result in water quality improvements, and result in Landscape benefits through the creation of woodland and wetland areas. The delivery of NFM schemes will also help mitigate and adapt to the impacts of Climate Change, and can have a positive effect on Cultural Heritage through increased flood risk benefits. Although some schemes could result in minor loss of agricultural land, there are also many positive effects on land use, soils and contaminated land through reduced flood risk, resulting in less run-off and soil erosion.

Action 3.3C - Develop position statement which clearly outlines how NFM schemes should be designed and developed to obtain necessary watercourse consents (S23 and LD bylaws) from Cyngor Gwynedd.

Cyngor Gwynedd are responsible for the consenting of in-channel works as well as works adjacent to ordinary watercourses. Cyngor Gwynedd will develop a position statement to establish design criteria for NFM measures which require it's consent to avoid any conflict with current consenting procedures. Such criteria will promote options that provide environmental enhancement measures. As with 3.3A and 3.3B above, this action is considered to result in positive, permanent effects for all of the SEA Objectives.

Do Minimum -

If there is minimal or no partnership working to ensure appropriate and sustainable development in Gwynedd, then there is likely to be negative impact upon flood risk in the long term. As flood events become more extreme, this will be more so. Effects are likely to be neutral in the short term and negative in the medium and long term for Population and Material Assets. For Biodiversity, the impacts are assessed as neutral in the short term and negative in the medium and long term as the benefits associated with SuDS and NFM would not be realised, and the potential for increased and inappropriate engineering could also have a detrimental impact on species and habitats.

Under the 'do minimum' scenario, impacts are predicted as negative in the medium and long term for land use and soils as flood events worsen and inappropriate development or increased engineering may pose a negative effect on soil quality. A similar impact is predicted on Water Quality in this scenario, as the water quality benefits of natural and sustainable schemes are not realised. Under the 'Do Minimum' scenario, there may be more reliance on

engineering schemes, with associated loss of filtration and vegetation and soils, thus impacting negatively on adaptation to climate change.

The impact on Cultural Heritage is assessed as neutral in the short to medium term, but negative in the long term as the contribution of "natural" flood risk management measures is not realised and flood events worsen. Under the "Do Minimum" scenario effects on landscape character are predicted to be neutral in the short and medium terms but generally negative in the long term as more engineering schemes may be pursued to address the predicted increase in flood severity. The specific negative effects would need to be considered on a site-by-site basis.

GLFRMS Objective 4:
Raising awareness of local flood and coastal erosion risk

4.1 Raising awareness of local flood risk

4.1A - Cyngor Gwynedd will raise awareness of flood risk to its residents

4.1B - Cyngor Gwynedd will advise on and promote flood resilience and resistance measures amongst its residents

4.1C - Cyngor Gwynedd will prepare and publish an information pamphlet available to all residents within flood risk areas, and any residents that have experienced flooding to their Properties

4.2 Raising awareness of coastal erosion risk

4.2A - Cyngor Gwynedd will raise awareness of coastal erosion risk to its residents, focusing on the most at risk areas

		SEA Objectives (see Table 5.1)							
Action		1	2	3	4	5	6	7	8
4.1A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	0	0	+	+	0	0
4.1B	Short Term	+	0	0	0	+	+	0	0

	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	0	0	+	+	0	0
4.1C	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	0	0	+	+	0	0
4.2A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	+	0	0	0	+	+	0	0
Do Minimum	Short Term	-	0	0	0	-	-	0	0
	Medium Term	-	0	0	0	-	-	0	0
	Long Term	-	0	0	0	-	-	-	0

Conclusions

Action 4.1A - Cyngor Gwynedd will raise awareness of flood risk to its residents.
This is considered to be a positive and permanent effect for the Population and Material Assets Objectives by enabling local communities to be better prepared for flooding, especially the more sensitive sectors of community and those in flood-prone areas. This action also results in a more proactive, positive approach to addressing the increasing flood risk posed by Climate Change. This action is not considered to change the baseline conditions for sensitive environmental features.

Action 4.1B - Cyngor Gwynedd will advise on and promote flood resilience and resistance measures amongst its residents.
The provision of resilience and resistance measures is considered to be another proactive means of addressing the consequences of flooding faced by local communities. Positive, permanent effects are therefore expected for the Population, Material Assets and Climate Change Objectives. There are no negative effects expected for sensitive environmental features. However, any schemes emerging from this action would require project-level environmental assessment prior to their construction.

Action 4.1C - Cyngor Gwynedd will prepare and publish an information pamphlet available to all residents within flood risk areas, and any residents that have experienced flooding to their Properties.
As with 4.1A and 4.1C above, this action is considered to be a positive and permanent effect for the Population, Material Assets and Climate Change Objectives by raising awareness and enabling communities to be better prepared for flooding. There are no negative effects expected for sensitive environmental features.

Action 4.2A - Cyngor Gwynedd will raise awareness of coastal erosion risk to its residents, focusing on the most at risk areas.
This is considered to be a positive and permanent effect for the Population and Material Assets Objectives by enabling local communities to be better prepared for coastal erosion, especially in the areas most at risk. This action also results in a more proactive, positive approach to addressing the increasing risk posed by Climate Change. This action is not considered to change the baseline conditions for sensitive environmental features.

Do Minimum - By not actively involving local communities and increasing public awareness of how to become resistant and resilient to flooding this scenario would be expected to result in the sectors of the local population most vulnerable to being adversely affected by flooding continuing to suffer as a consequence, and would not contribute to protecting public health and community services from future flooding events. It would also not contribute to adapting to the long term effects of Climate Change. This is therefore considered to result in a negative, permanent effect on these SEA Objectives. The do minimum option is predicted to have a negative effect on Cultural Heritage in the long term as flood events worsen in severity and property level / riparian actions are not pursued. The do minimum option is predicted to have a neutral effect on all other sensitive environmental features.

GLFRMS Objective 5:
Working collaboratively with all other RMAs and relevant groups/bodies to ensure a coordinated response to flood and coastal erosion events

5.1 Raising awareness of local flood risk

5.1A - Cyngor Gwynedd will review and update its flood emergency plans alongside North Wales Councils Regional Planning Service; to include evacuation and rest centre plans.

		SEA Objectives (see Table 5.1)							
Action		1	2	3	4	5	6	7	8
5.1A	Short Term	+	0	0	0	+	+	0	0
	Medium Term	+	0	0	0	+	+	0	0
	Long Term	++	0	0	0	++	++	0	0

Do Minimum	Short Term	0	0	0	0	0	0	0	0
	Medium Term	-	0	0	0	-	-	0	0
	Long Term	- -	0	0	0	- -	- -	0	0

Conclusions

Action 5.1A - Cyngor Gwynedd will review and update its flood emergency plans alongside North Wales Councils Regional Planning Service; to include evacuation and rest centre plans. The implementation of this procedure as part of the GLFRMS is considered to represent a very positive, permanent effect on protecting public health, community services and material assets and adapting to the effects of climate change, particularly in the long term as the effects of climate change may become more exacerbated. No other environmental effects are envisaged as part of this Action.

Do minimum - This would involve a continuation of the current flood emergency contingency measures, albeit potentially without further planning and integrated improvements to adapt to future climate change effects. This could result in a negative, permanent effect on Population and Human Health, especially in the long term when the effects of climate change may be felt more strongly.

5.3 Consideration of environmental issues between preferred Actions

The following section provides a summary of potential environmental effects considered to be associated with each Objective and its Actions.

GLFRMS Objective 1: To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd.

All of the actions resulting from Objective 1 are expected to result in permanent, positive effects to Population and Human Health, Material Assets and adapting to Climate Change particularly in the long term, by addressing flood risk to these receptors at the local level. Action 1.3B (*Develop register and map of all SuDS elements adopted by the Council*) is also expected to indirectly have a permanent positive effect on Biodiversity and Water Quality as these are some of the wider benefits associated with SuDS.

Action 1.1B (*Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2*) may result in negative effects in the medium and long term to Biodiversity and Land Use due to the impacts of SMP2 policy, and potential short, medium and long term permanent negative impacts to cultural heritage have also been identified.

Action 1.4A (*Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets*) may result in negative effects in the short term to Biodiversity, Water Quality and Cutural Heritage due to effects of maintenance works, and mitigation measures will be required to address this. However, contributing to reducing flooding may have positive effects for Land Use (agricultural land, soils) and Landscape/Seascape in the future.

The 'do minimum' scenario would be expected to result in negative effects on each of the SEA Objectives, (apart from Landscape/Seascape which has been allocated as neutral) as it is expected under this scenario that flood risk would increase over time, with a very negative effect upon Population and Material Assets.

GLRMS Objective 2: To further develop an understanding of the flood risk to Gwynedd and the impacts of climate change.

All of the actions resulting from Objective 2 are expected to result in permanent, positive effects to Population and Human Health, Material Assets and adapting to Climate Change particularly in the long term. Action 2.1A and 2.1B (*Working with partner RMA's*) are expected to have positive benefits for all SEA Objectives due to a greater level of involvement between interested parties allowing a more holistic and sustainable approach to flood risk management in Gwynedd.

Under the 'do minimum' scenario, the lack of improvements in partnership working and Knowledge/data would result in an increase in flood risk over time, resulting in very negative effects on Population, Material Assets and Climate Change objectives. Similarly, negative effects would be predicted in the long term on Biodiversity, Land use, Water Quality, Cultural Heritage and Landscape objectives.

GLFRMS Objective 3: To continue to work with all relevant bodies to ensure appropriate and Sustainable Development in Gwynedd

All of the actions resulting from Objective 3 are expected to result in permanent, positive effects to Population and Human Health, Material Assets and adapting to Climate Change particularly in the long term.

Action 3.1B (*Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline)* has the potential to generate long term adverse effects on Biodiversity, Land Use and Cultural Heritage in particular due to impacts of coastal policy, and mitigation such as compensatory habitat may be required in some areas.

Actions 3.2A, 3.3A, 3.3B and 3.3C are all expected to result in positive effects for all SEA Objectives, as opportunities for environmental enhancement through natural flood management and SuDS are likely to bring multiple benefits.

The 'do minimum' scenario is likely to result in negative impacts on all SEA objectives, particularly in the long term, as the impacts of flood risk is increased and the benefits of sustainable and appropriate developments are not realised.

GLFRMS Objective 4: Raising awareness of local flood and coastal erosion risk

All of the actions resulting from Objective 2 are expected to result in permanent, positive effects to Population and Human Health, Material Assets and adapting to Climate Change. As the Objective is focused on raising awareness, none of the actions are considered to change the baseline conditions for sensitive environmental features, therefore a neutral effect has been assigned to the Biodiversity, Land Use, Water Quality, Cultural Heritage and Landscape objectives.

Under the 'do minimum' scenario, a negative effect is predicted on Population, Material Assets and Climate Change Objectives as by not increasing awareness of how to become resistant and resilient to flooding communities will continue to suffer the consequences. The do minimum option is predicted to have a negative effect on Cultural Heritage in the long term as flood events worsen in severity and property level / riparian actions are not pursued. The do minimum option is predicted to have a neutral effect on all other sensitive environmental features.

GLFRMS Objective 5: Working collaboratively with all other RMAs and relevant groups/bodies to ensure a coordinated response to flood and coastal erosion events

A significant change to SEA Objectives is not expected as a result of this Action, although Population and Human Health, Material Assets and Climate Change would be expected to benefit from the implementation of this measure, particularly in the long term when the effects of climate change (such as increased flooding) could be felt more strongly.

The Do Minimum scenario would involve a continuation of the current situation, but possibly without further improvements to adapt to future climate change effects. This could result in a negative effect on Population and Human Health, Material Assets and Climate Change Adaptation, especially in the long term when the effects of climate change may be felt more strongly.

5.4 Other Alternatives Considered

For each Gwynedd LFRMS Objective several Actions have been identified and presented in Table 2.3. The Actions are not mutually exclusive of each other (except Do Minimum) and more than one Action for each Objective, or even all, may be implemented as part of the GLFRMS provided that there are no adverse significant environmental effects.

Following the assessment of the environmental effects of each Action, no further alternatives were considered to be required and nor were any changes to the Objectives and their Actions recommended. However, mitigation and enhancement measures for potential environmental effects are proposed in the Section 6.3 and have been incorporated within the GLFRMS.

5.5 Consideration of Cumulative/Synergistic Effects

Following the assessment of each GLFRMS Action, the cumulative/synergistic effect of the combined Actions against each SEA Objective has been assessed using the approach recommended in Appendix 8 of the ODPM SEA guidance[28]. The results of this are presented in Table 5.5 and summarised as follows.

No negative cumulative effects have been identified. The Actions proposed to achieve GLFRMS Objective 1 are expected to collectively result in a cumulative positive effect on the SEA Objectives that is permanent in nature. There are uncertainties over how action 1.1B (*Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2)* and 1.4A *(Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets)* will be implemented to ensure no negative effects on Environmental features, although mitigation measures have been proposed to address this in the GLFRMS document.

The Actions proposed to achieve GLFRMS Objective 2 are expected to result in a cumulative positive effect on SEA objectives 1, 5 & 6, which is permanent in nature. No negative cumulative effects have been identified on any of the SEA objectives.

The Actions proposed to achieve GLFRMS Objective 3 are expected to result in a cumulative positive effect on the Population and Human Health, Climate Change and Material Assets SEA Objectives that is permanent in nature. There are uncertainties over how Action 3.1B (*Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline)* will impact upon environmental and cultural heritage features next to the coast. Mitigation measures are proposed to

[28] A Practical Guide to the Strategic Environmental Assessment Directive, ODPM (September 2005)

address this. Actions 3.3A, 3.3B and 3.3C (promotion of SuDS and NFM) are expected to result in cumulative positive effect on all SEA Objectives which is permanent in nature.

The Actions proposed to achieve GLFRMS Objectives 4 are expected to result in a cumulative positive effect on the Population and Human Health, Material Assets and Climate Change SEA Objectives that is permanent in nature. There are considered to be no cumulative effects for the remaining SEA objectives due to the nature of the proposed Actions chiefly relating to improved community awareness.

In addition to cumulative environmental effects arising from the GLFRMS Objectives, there is potential for cumulative effects between the GLFRMS and other local management strategies, particularly those discussed below.
The GLFRMS has been assessed as having a beneficial effect on the county's ability to adapt to climate change. This supports and will enhance wider policy initiatives to adapt to the impacts of climate change.

West Of Wales Shoreline Management Plan (SMP2): sets out the priorities and the strategic direction for all flood and coastal erosion risk management on the coast. The SMP2 policies and actions have been considered and have been incorporated into the GLFRMS works programme where appropriate, to provide a complete picture for a community of the measures proposed to manage flood risk. As previously discussed in the assessment, cumulative effects from SMP2 policies could negatively effect SEA objectives (biodiversity, land use, cultural heritage) if appropriate mitigation is not considered in advance of projects arising from both SMP2 and/or GLFRMS.

Dee and Western Wales River Basin Management Plans (RBMP): The River Basin Management Plans, are important documents relevant to the development of the GLFRMS. The GLFRMS should therefore not hinder their aims and objectives but has the potential to contribute to the achievement of them. Projects associated with both the RBMP's and GLFRMS could potentially result in cumulative impacts that negatively effect SEA Objectives, particularly Biodiversity, water, land use and cultural heritage. However, both plans have identified the need for project scale assessments of environmental impacts, which will ensure appropriate mitigation is implemented within lower-tier plans / projects to reduce impacts.

Gwynedd and Anglesey Wellbeing plan: The GLFRMS shows a high degree of synergy with the Gwynedd and Anglesey wellbeing plan by raising awareness of flood risk and promoting resilience, and contributing to ensuring that residents are prepared for how climate change is likely to affect local communities.

The Welsh National Marine Plan: The Plan provides policy guidance and spatial planning for the inshore and offshore marine areas. The inshore, coastal areas are considered relevant in

relation to cumulative effects within the GLFRMS. The Sustainability Appraisal undertaken for the WNMP tested the emerging policies to ensure they support the policies and actions of SMP's. The WNMP is composed of cross-cutting safeguarding policies and sector specific policies, the former includes a policy stating that "Proposals should demonstrate how they are resilient to coastal change and flooding over their lifetime". The implementation of the marine plan will promote a more considered approach to marine spatial planning, allowing cumulative effects to be determined for plans and projects affecting the coastal environment. The GLFRMS and WNMP are therefore complementary and will work towards the same goals for coastal management.

Joint Gwynedd And Anglesey Local Development Plan and Eryri Local Development Plan (LDPs). The LDPs sets out the strategy for development and land use in Gwynedd and Eryri. They sets out policies to implement the strategy and provide guidance on the location of new houses, employment opportunities and leisure and community facilities. Cumulative effects from developments associated with both the GLFRMS and LDPs could negatively affect SEA Objectives 3 to 7 (biodiversity, soils/geology/geomorphology, water, cultural heritage and landscape) if appropriate mitigation is not considered in advance of any projects arising from them. However, there is uncertainty regarding this depending on how the strategies are implemented at the project level. There is potential for positive cumulative (synergistic) effects between the GLFRMS and the LDPs on all SEA Objectives.

There are examples where the GLFRMS Actions compliment the Gwynedd and Eryri Local Biodiversity Action Plans, particularly through the implementation of NFM and SuDS along with promoting the implementation of environmental enhancement measures where possible. Where it is identified that GLFRMS Objectives have potential to negatively impact upon biodiversity, flora and fauna, mitigation measures have been implemented and set out within the GLFRMS, and thus no negative cumulative impacts are anticipated.

Table 5.5: Cumulative/Synergistic Effects between the GLFRMS Objectives and the SEA Objectives								
	SEA Objective							
	1. Population and Human Health	2. Biodiversity, flora and fauna	3. Land Use, Geology, Soil and Contaminated Land	4. Water Resources & Quality	5. Climatic Factors	6. Material Assets	7. Cultural Heritage	8. Landscape & Seascape
GLFRMS Objective 1	+ (reduced flood risk)	? (benefits from nature based approach but works may have impacts)	? (reduced flood risk, however implementation of policies may have impacts)	? (benefits from nature based approach but works may have impacts)	+ (Improved climate change resilience and adaptation)	+ (reduced flood risk)	? (reduced flood risk but works may have impact)	0 (reduced flood risk)
GLFRMS Objective 2	+ (improved flood risk management)	0 (no change from baseline)	0 (no change from baseline)	0 (no change from baseline)	+ (Improved climate change resilience and adaptation)	+ (improved flood risk management)	0 (no change from baseline)	0 (no change from baseline)
GLFRMS Objective 3	+ (improved flood risk management)	? (benefits from nature based approach but coastal policy may have impacts)	? (benefits from nature based approach but coastal policy may have impacts)	+ (improved flood risk management)	+ (improved climate change resilience and adaptation)	+ (improved flood risk management)	? (reduced flood risk but coastal policy may have impact)	+ (landscape benefits)
GLFRMS Objective 4	+ (improved community awareness)	0 (community awareness)	0 (community awareness)	0 (community awareness)	+ (improved community awareness)	+ (improved community awareness)	0 (community awareness)	0 (community awareness)

GLFRMS Objective 5	+ (improved emergency preparedness)	0 (emergency preparedness)	0 (emergency preparedness)	0 (emergency preparedness)	+ (improved climate change resilience and adaptation)	+ (improved emergency preparedness)	0 (emergency preparedness)	0 (emergency preparedness)

6. Significant environmental effects

6.1 Significant environmental effects of the GLFRMS Objectives

Each of the GLFRMS Objectives would result in positive effects for Population and Human Health (SEA Objective 1), Climatic Factors (SEA Objective 5), and Material Assets (SEA Objective 6).

No adverse environmental effects were identified as a result of GLFRMS Objectives 2, 4 and 5.

The following section provides a summary of those Objectives for which potential negative environmental effects have been identified.
Proposed mitigation and enhancement measures to alleviate such effects are outlined in Section 6.3. Assuming that the recommended mitigation is implemented for Objectives 1 and 3 the potential negative effects associated with them would be expected to be avoided or at least reduced so that they were no longer significant.

Objective 1: To aim to reduce the level of flood and coastal erosion risk to the residents of Gwynedd.
Negative environmental effects in the short, medium and long term as a result of action 1.1B *(Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2)* were identified. This could adversely affect SEA Objectives 2, 3 and 7 as an indirect result of the implementation of coastal policies (SMP2), which could lead to loss of habitat, loss of agricultural land, and loss of cultural heritage features.

Negative environmental effects in the short term as a result of Action 1.4A (*Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets*) were identified. This could adversely affect SEA Objectives 2, 4 and 7 as a result of any work carried out at the project level that does not allow for consideration of Environmental effects on biodiversity (such as disturbance of protected species), water quality (through water pollution from construction activities), and cultural heritage (disturbance / damage to cultural heritage features), depending on the extent and location of such work. However, cultural heritage features may also receive positive benefits from reduced flood risk in the long term.

Objective 3: To continue to work with all relevant bodies to ensure appropriate and sustainable Development in Gwynedd

Negative environmental effects as a result of Action 3.1B *(Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline)* were identified. This could adversely affect SEA Objectives 2, 3 and 7 as an indirect result of the implementation of coastal policies, which could lead to loss of habitat, loss of agricultural land, and loss of cultural heritage features. Reference should be made to the SEA that has been produced for the SMP2 to ensure that any GLFRMS projects linked with it consider its findings and relevant mitigation measures, as well as the SMP2 objectives for safeguarding sensitive features.

6.2 Consideration of environmental problems in developing GLFRMS objectives

The SEA process has identified some potential negative effects on the wider environment as a result of implementing the GLFRMS. At this stage, there is a lack of confirmed detail available for specific schemes and projects which may occur as a result of the GLFRMS. However, the main potential for adverse environmental effects is considered to be as a result of:

- GLFRMS Objective 1: Action 1.1B - Maintain long term capital programme to reduce risk of coastal flooding/erosion, incorporating actions identified within SMP2
- GLFRMS Objective 1: Action 1.4A - Prepare and deliver minor works programme (revenue) based on findings of asset condition assessment to maintain Standard of protection afforded by flood risk/coastal erosion assets
- GLFRMS Objective 3: Action 3.1B - Regard within the Local Development Plan of recommendations for future changes in coastal policy, and subsequent implications for land use near the coastline

It is important that the potential for negative environmental effects as a result of the GLFRMS, which have been identified in the SEA process, are identified and incorporated in the GLFRMS document. Mitigation and enhancement measures have been proposed (see Section 6.3) and will therefore need to be incorporated within the final GLFRMS.

6.3 Proposed mitigation and enhancement measures

Where negative effects have been predicted through the implementation of the GLFRMS Objectives, mitigation and enhancement measures have been identified to reduce or eliminate these effects. This section summarises the mitigation identified for the relevant GLFRMS Objectives.

The main environmental effects of the GLFRMS are considered to be a result of the delivery of minor works programme associated with flood risk / coastal erosion asset maintenance, and the implementation of SMP2 coastal policies. The mitigation and enhancement measures to be developed and included in the GLFRMS will include the following:

- Adherence to the SMP2 Objectives and the control measures identified in the SMP2 HRA and SEA.
- Completion of project-level environmental assessments and reports before work commences (including HRA and EIA, where appropriate), including identification of sensitive features, to ensure adverse impacts are avoided, reduced or mitigated.
- Consultation with the statutory environmental bodies at the feasibility and design phase of GLFRMS projects, especially those arising from SMP2 but also those directly related to the GLFRMS.
- Maintaining good site practices during project-level schemes to reduce any negative effects on features such as water quality (e.g adhering to pollution prevention guidance GPP5), and biodiversity.
- Implementation of method statements and obtaining any relevant licences/consents prior to project-level work.
- Seek to deliver wider benefits through our approaches to annual maintenance programmes, e.g amending mowing regimes, seeding flood embankments with high pollinator species.
- Contribute to improving ecological status of water bodies by identifying synergies between FCERM solutions and WFD measures.

The following enhancement measures are also to be incorporated within the Action Plan for the GLFRMS:

- Action 1.2A (*Prepare annual list of schemes from long term action plan to reduce risk of flooding and coastal erosion to be presented for inclusion on WG capital programme)* As well as reducing flood and coastal erosion risks all schemes will be developed with the aim of maximising environmental and socio-economic benefits to the study areas. This will include reducing any adverse effects on designated ecological sites which will be driven by EIA and HRA processes.
- Action 1.3A *(Develop register and map of highway drainage assets in flood prone areas).* The record of drainage assets shall include information on sensitive environmental features associated with the asset (if applicable), such as any archaeological and/or biodiversity designations, so that these can be considered if any maintenance arises.
- Action 3.2A *(Review of all policies relating to Land Drainage consenting procedures to ensure best practice is maintained and proposed developers are aware of design and construction requirements)* Opportunities to deliver environmental enhancement will

be included in such policies where relevant, including proactive use of green infrastructure and restoring natural processes. WFD objectives and measures are to be delivered where reasonable to do so.

- Action 3.3A *(Identify opportunities for the implementation of SuDS and NFM schemes in areas which will deliver meaningful flood risk benefits as well as other environmental and amenity benefits)* SUDS are drainage systems that are considered to be environmentally beneficial, causing minimal or no long-term detrimental damage. NFM involves working with nature to reduce the risk of flooding for communities. Cyngor Gwynedd will identify urban and upland areas that are suitable for delivery of SuDS and NFM interventions respectively, either as stand-alone projects or as part of wider flood risk management schemes.
- Action 3.3B *(Work with partner authorities and landowners to deliver NFM schemes as part of a national programme)* As funding becomes available for NFM schemes Cyngor Gwynedd will identify and work alongside landowners and partners to deliver successful projects that realise all potential benefits associated with NFM.
- Action 3.3C *(Develop position statement which clearly outlines how NFM schemes should be designed and developed to obtain necessary watercourse consents (S23 and LD bylaws) from Cyngor Gwynedd)* Our criteria will promote options that provide environmental enhancement measures.

6.4 Uncertainties and risks identified

The assessment of potential adverse environmental effects of the GLFRMS has been based on our best knowledge of the study area and predictions about the potential pathways and vulnerability of receptors.

SEA is a high-level assessment of environmental effects and as such it can be difficult to predict potential effects with certainty. Nevertheless, it is considered that the approach taken for this SEA has enabled a thorough and logical assessment of the potential environmental effects associated with the GLFRMS. Where any uncertainties and risks have been identified within the SEA process the precautionary principle has been adopted, especially in relation to nationally and internationally protected sites and species, and a worst-case scenario has been assessed.

Any actual schemes or maintenance operations (i.e. project level works) required as a result of the GLFRMS have not yet been planned and details are not available. Such work is also outside of the scope of SEA, but will require project-level environmental assessment at the appropriate time.

7. Implementation

7.1 Links to other plans and programmes and project level assessment

The plans and programmes considered relevant to the GLFRMS, either with the potential to be influenced by it or to influence it, are included within Table 4.1 and in more detail in Appendix A. The most significant plans and programmes at a local/regional scale that the GLFRMS must be ensured to be in synergy with are discussed in section 5.5 above.

Following the adoption and implementation of the GLFRMS, it is crucial that environmental effects continue to be considered, especially when specific projects become defined. Environmental effects which arise from the implementation of GLFRMS projects will be considered under the relevant Development Control and consenting procedures.

Assessment of the environmental effects of schemes at a project level may require consideration via the relevant Environmental Impact Assessment Regulations, depending on the size and scale of the scheme. In addition, if any projects are likely to have an adverse effect on European Protected Sites, a Habitats Regulations Assessment pursuant to Article 6.3 of the Habitats Directive 92/43/EEC is likely to be required.

Cyngor Gwynedd have a responsibility for contributing to works to achieve waterbody objective under the Water Framework Directive (WFD). The WFD places obligations for the satisfactory control of watercourse quality within Gwynedd. The GLFRMS must ensure that, by improving drainage and reducing flood risk in Gwynedd, there are no adverse impacts on water quality or the hydrological regime of aquatic habitats, which could lead to deterioration of water bodies. This needs to be assessed at the project level, with WFD Assessments carried out where necessary.

7.2 Proposals for monitoring and reporting

It is important that the implementation of the GLRFMS is monitored to ensure that any unforeseen negative environmental effects are identified, predicted effects are measured and remedial action can be applied if required. It will also be necessary to undertake minor reviews should there be any changes in legislation or other factors which alter the LLFA's understanding of flood risk.

The GLFRMS will be reviewed at a frequency to coincide with the requirements set out in the National Strategy for Flood and Coastal Erosion Risk Management in Wales. The National Strategy requires Local Flood Risk Management Strategies to be reviewed within 2 years of the National Strategy. Therefore, it is proposed that the SEA monitoring and reporting is designed to tie in with this.

The SEA monitoring exercise will aim to identify any deficiencies in the baseline information included within the SEA and also any unforeseen adverse effects (including incorrect predictions) at an early stage in the GLFRMS implementation. In doing so, the LLFA will be informed of any concerns identified by the monitoring and reporting process and proposals made for action in response to significant effects so that the GLFRMS can be revised and updated accordingly.

The monitoring procedure will involve a data collection exercise using the indicators that have been proposed in Table 4.5.1 in order to assess the environmental performance of the GLFRMS. Reporting will occur following each monitoring review. Monitoring reports will be submitted to the statutory environmental bodies within the GLFRMS implementation area, namely: Cadw (and including Gwynedd Archaeological Planning Service), Natural Resources Wales (NRW) as well as the LLFA, and will be made available to any other interested stakeholders on request.

In addition to this a progress report on the delivery of GLFRMS actions will be published every 2 years to monitor progress against the Local Strategy's objectives and actions and will be made available on the Council's website. As described in the GLFRMS document the capital works programmes will be reviewed on an annual basis to reflect Cyngor Gwynedd's continual assessment of flood and coastal erosion risks to our communities, and updates will also be available on the Council's website.

Appendices

Appendix A – Relevant Plans and Programmes
Appendix B – Scoping Report Consultation Responses
Appendix C – Location Plans

Appendix A

Relevant plans and programmes:

International Level		
Title	**Description**	**Relevance to LFRMS**
EU Floods Directive - Directive 2007/60/EC on the assessment and management of flood risks (2007)	The Directive requires EU Member States to assess if their watercourses and coast lines are at risk from flooding; to map the flood extent and assets and humans at risk in these areas; and to take adequate and coordinated measures to reduce this flood risk. In the UK this is being carried out in coordination with the Water Framework Directive. The aim is to reduce and manage the risks that floods pose to human health, the Environment, cultural heritage and economic activity.	By definition, the LFRMS will complement the Directive.
EU Habitats Directive - Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora (1992)	The principal aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to maintain or restore natural habitats and species at an appropriate conservation status as well as introducing habitat and species protection. The Directive is transposed into UK law by the Conservation of Habitats and Species Regulations 2010.	The aims and objectives of the LFRMS must be in accordance with the Habitats Directive and should not have a significant negative impact on European protected sites and species designated under the Conservation of Habiats and Species Regulations 2010. Adequate assessment must be undertaken to ensure that there aren o negative impacts on Natura 2000 sites.
EU Water Framework Directive - Directive 2000/60/EC of the European Parliament	The Water Framework Directive (WFD) is designed to improve and integrate the way	The LFRMS will need to consider the requirements of the WFD and ensure that it does not

and of the Council establishing a framework for the Community action in the field of water policy (2000)	water bodies are managed throughout Europe. It came into force in 2000 and was transposed into UK law by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. Member states must aim to reach good chemical and ecological status in inland and coastal waters by 2027.	compromise its objectives and contributes to achieving its aims.
Our Life Insurance, our Natural Capital: The EU Biodiversity Strategy to 2020 (2011)	This strategy is aimed at reversing biodiversity loss and speeding up the EU's transition towards a Resource efficient and green economy. Primary objectives of the strategy include: - Conserving and restoring nature; - Maintaining and enhancing ecosystems and their Services - Ensuring the sustainability of agriculture, forestry and fisheries - Combating invasive alien species; and - Addressing the global biodiversity crisis.	The GLFRMS will need to consider the objectives and targets of this strategy
United Nations Framework Convention on Climate Change (1992)	The United Nations Framework Convention on Climate Change (UNFCCC or FCCC) is an international environmental treaty produced at the United Nations Conference on	The LFRMS is a mechanism for adapting and ensuring resilience to climate change. The LFRMS will not contribute to climate change but should

	Environment and Development (UNCED), (Earth Summit) held in Rio de Janeiro, 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The treaty itself set no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, the treaty provides for updates (called "protocols") that would set mandatory emission limits. The principal update is the Kyoto Protocol.	contribute to addressing and adapting to its effects at the local level.
Kyoto Protocol on Climate Change (1997)	The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas (GHG) emissions.	The LFRMS is a mechanism for adapting and ensuring resilience to climate change. The LFRMS will not contribute to climate change but should contribute to addressing and adapting to its effects at the local level.
National Level		
Title	**Description**	**Relevance to LFRMS**
Adapting to Climate Change – Progress in Wales. (Climate Change Committee 2023)	The Adapting to Climate Change – Progress in Wales report summarises the current	Continued climate changes will bring hotter and drier summers and warmer and wetter winters

	progress by Wales in areas of delivery and progress of sectors to implement policies and change for resilience in Wales against climate change. Overall there are positive examples of good planning, but lack of consistency through sectors. Additionally, the review highlights insufficient progress and monitoring of policies and change put in place. The review highlights the need for a National Adaptation Plan for Wales, to target public sector and developing from there. Welsh government should also embed adaptation into its Net Zeo.	alongside rising sea levels. These changes will bring risks across Wales's ecosystems, infrastructure, communities and economy. This will in turn create increased pressures to be considered within the GLFRMS.
Civil Contingencies Act (2004)	This Act sets a single framework for Civil Protection for a wide range of emergencies. The Act has moved the emphasis of civil protection from being one of just planning and responding to emergencies towards resilience planning arrangements (which also includes response arrangements). This has placed a range of new duties and responsibilities on Local Authorities, such as assessing the risks of an emergency occurring, which includes the need to carry out a risk assessment on past incidents and likely incidents happening in the future.	Flooding is classed as an 'emergency' and is relevant in the Civil Contingencies Act. By aiming to reduce the impact of flooding in Gwynedd the LFRMS is likely to contribute beneficially to meeting the aims of this Act. The information obtained as part of the requirements of the Act may also beneficially contribute to defining locations for flood management options within the LFRMS.

Conservation of Habitats and Species Regulations 2010 (amended 2019)	This implements the EC Habitats Directive and replaces The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). These Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.	The LFRMS could potentially be constrained by these regulations as all aims and outcomes of the LFRMS should have no significant negative impact on Natura 2000 sites or European Protected Species and Habitats.
Countryside and Rights of Way (CRoW) Act (2000)	The Countryside and Rights of Way Act applies to England and Wales only. It contains five Parts and 16 Schedules and provides for public access on foot to certain types of land, amends the law relating to public rights of way, increases measures for the management and protection for Sites of Special Scientific Interest (SSSI) and strengthens wildlife enforcement legislation, and provides for better management of Areas of Outstanding Natural Beauty (AONB).	The aims and objectives of the LFRMS must be in accordance with the CRoW Act. The GLFRMS should not hinder the CRoW Act's aims to provide protection for SSSIs and should not cause any negative impact on AONBs in Gwynedd.
Environment (Wales) Act 2016	The Act puts in place legislation to enable Wales' resources to be managed in a more proactive, sustainable and joined up manner. It establishes the legislative framework necessary to tackle climate	The Act places a duty on Cyngor Gwynedd to ensure biodiversity becomes an integral part of decision making. As the LFRMS forms part of Cyngor Gwynedd's functions this duty will need to be adhered to in the delivery of the Strategy.

	change. Section 6 of the Act requires that public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions, and in so doing, promote the resilience of ecosystems. Public Authorities are also required to have regard to priority habitats and species, listed under section 7 of the Act, when carrying out their functions.	
The Environmental Impact Assessment (Land Drainage Improvement Works) Regulations 1999	These Regulations, which replace the Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988 (as amended), implement in part Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the Environment.	The LFRMS could potentially have a range of environmental impacts, as considered through the SEA.
Flood and Water Management Act 2010	Under the Flood and Water Management Act 2010 Gwynedd Council, as a Lead Local Flood Authority, must develop, maintain, apply and monitor a strategy for local flood risk management in its area. Local flood risk includes surface runoff, groundwater, and ordinary watercourses.	The Flood and Water Management Act is the key piece of legislation which requests Lead Local Flood Authorities to produce a strategy for local risk management in their area. Hence Gwynedd's LFRMS will aim to meet the requirements of this Act.
Flood Risk Regulations 2009	The Flood Risk Regulations 2009 incorporate the requirements of the Floods Directive. The main objective of the Flood Risk Regulations	This legislation is a key driver for implementing flood risk management strategies at the local level. The aims and objectives of the Gwynedd LFRMS

	is for every river basin to have had a preliminary flood risk assessment carried out by December 2011. All areas with potentially significant flood risks are identified, and for areas with significant risks flood hazard maps and flood risk maps need to be developed by December 2013. Furthermore, flood risk management plans will need to be in place for areas with significant risks by 2015	must therefore comply with the Flood Risk Regulations 2009.
Future Wales: the national plan 2040 (2021)	Future Wales – The National Plan 2040 is a 20-year national development plan that covers the whole of Wales. It has been produced by Welsh Government and covers the period up to 2040. The plan seeks to provide a strategy for addressing key national priorities through the planning system. The plan covers big issues including the economy, housing and environment. It shows where nationally significant developments like energy, transport, water and waste projects should take place. It shows where growth should happen, what infrastructure and services are needed and how Wales can help fight climate change. It tries to make the best use of	As well as covering the big planning issues that affect Wales, the plan will affect the shape and direction of future planning policy in Wales, including Local Development Plans (LDPs). This may affect the way the LFRMS are implemented.

	resources, create accessible healthy communities and protect our environment. The plan is in line with the Well Being of Future Generations (Wales) Act 2015.	
Land Drainage Act 1991 (as amended 2004, 2011)	This Act gives operating authorities authorisation to carry out works on watercourses for certain purposes. The Land Drainage Act originally gave powers to the EA to authorise works in ordinary watercourses. Under the Flood and Water Management Act 2010, these powers have now been passed to Local Authorities.	This Act gives powers to Local Authorities to maintain watercourses and enforce noncompliance. Any work to ordinary watercourses as part of the LFRMS will need to consider the requirements of this Act.
National Strategy for Flood and Coastal Erosion Risk Management in Wales (2020)	As required by the Flood and Water Management Act 2010, the Welsh Government has produced a National Flood and Coastal Erosion Risk Management Strategy for Wales. The National Strategy sets four overarching objectives for the management of flood and coastal erosion risk in Wales: • reducing the consequences for individuals, communities, businesses, and the environment from flooding and coastal erosion.	The National Strategy for Flood and Coastal Erosion Risk Management in Wales deals with flooding at a national (Welsh) level. The LFRMS produced by every local authority is based on this National Strategy and will deal with these aims at a local level.

	• raising awareness of and engaging people in the response to flood and coastal erosion risk. • providing an effective and sustained response to flood and coastal erosion events; and • prioritising investment in the most at-risk communities	
Nature Recovery Action plan for Wales 2020-21	The Nature Recovery Action Plan is a two Part targeted plan to develop long term and short term commitments to reversing biodiversity loss in Wales, and to focus and prioritise emerging ecological crises.	LPA's have the ability to implement and improve habitats in their local areas, which can impact the LFRMS but should not hinder these schemes. Some include positive and natural methods to alleviate flooding in areas.
Natural Resources Wales Corporate Plan 2023- 2030	Natural Resources Wales (NRW) Corporate Plan sets out objectives to ensure nature recovery, resilient communities to climate change and minimising pollution to protect and enhance the well-being of future generations.	The LFRMS should support and enhance the goals set out in NRW's Corporate Plan.
Planning Policy Wales, Edition 11 (2021)	Plannig Policy Wales provides the policy framework for the preparation of local authorities; development plans in Wales. It sets out the land use planning polices of the Welsh Government. Planning Policy Wales is supplemented by a series of more detailed Technical Advice Noted (TANs)	Due regard should be given within the LFRMS to the high-level planning framework in Wales. Technical Advice Notes should be considered by Local Authorities when formulating plans and programmes. TAN 15 (Development and Flood Risk) especially should be considered when developing the LFRMS.

Technical Advice Note 15 (TAN 15): Development and Flood Risk	TAN 15 provides technical guidance which supplements the Welsh Government policy in relation to development and flooding. It advises on development and flood risk as this relates to sustainability principles and provides a framework within which risks from both river and coastal flooding, and from additional run-off from developments can be assessed.	Issues raised in TAN 15 need to be considered when developing the LFRMS
Technical Advice Note 5 (TAN 5): Nature Conservation and Planning, 2009	TAN 5 provides advice about how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation.	The LFRMS should conform with the provisions of TAN 5.
The State of Natural Resources Report for Wales 2020 (SoNaRR)	SoNaRR assesses Wales's sustainable management of natural resources and sets out a range of opportunities for action.	The LFRMS should not hinder the ability of the SoNaRR to safeguard the natural resources. SoNaRR provides the oppositunity to managege natural resources such as watercourses and wtaerbodies to prevent flooding.
The Action Plan for Pollinators in Wales 2013	Following consultation the Action Plan for Pollinators sets the strategic vision, outcomes and areas for action to improve conditions for pollinators and work to halt and reverse their decline in Wales.	The LFRMS should not conflict or hinder The Action Plan for Pollinators in Wales 2013.
UK Biodiversity Action Plan (UKBAP) 2002	UKBAPs / LBAPs are the UK Government's response to the Convention on Biological	The LFRMS should not hinder UKBAP and LBAP targets from being achieved. The presence of

	Diversity (CBD) signed in 1992. They identify priority habitats and species within specific areas. The protected species and environmentally designated habitats are to be maintained and enhanced by preventing loss and damage to existing habitat while promoting new areas of habitat and improving quality through sustainable flood risk management activities.	protected species with specific water level, water quality and habitat requirements should be considered. Some environmentally designated habitats are susceptible to changes in flood frequency, floodwater chemistry, groundwater levels and drainage system maintenance and may be negatively or beneficially affected by the LFRMS' aims and objectives. Therefore, UKBAP / LBAPs should be considered within the LFRMS and when determining detailed proposals to address flooding.
The Water Environment (Water Framework Directive)(England and Wales) Regulations 2017	The WFD introduced a comprehensive river basin management planning system to protect and improve the ecological and chemical health of our rivers, lakes, estuaries, coastal waters and groundwater. The 2017 Regs replace the initial regulations set out in 2003.	The LFRMS should adhere to the conditions and legislation imposed by The Water Environment (Water Framework Directive)(England and Wales) Regulations 2017. It should also be aware of the protected sites designated under the regualtions.
Water Act 2014	The aim of the Act is to reform the water industry to make it more innovative and responsive to customers and to increase the resilience of water supplies to natural hazards such as droughts and floods. The Act is intended to introduce competition into	The Water Act is an important piece of legislation that will have to be considered when developing the LFRMS and designing/constructing any projects associated with it.

	the market and bring benefits to businesses and the economy.	
Water Strategy for Wales 2015	The Water Strategy for Wales sets out long-term policy directions in terms of water management and aims to ensure that our water resources are resilient, sustainable and managed to bring benefits to Wales and its citizens. Using the ecosystem approach, it outlines a more integrated approach to the management of water, land and related resources which will, in turn, maximise the resulting economic and social benefits in an equitable manner. It will also protect vital ecosystems and the environment.	
Well-being of Future Generations (Wales) Act 2015	The Act requires public bodies in Wales to put long-term sustainability at the forefront of their thinking. In order to create a more sustainable Wales, public bodies must now work towards seven Well-being Goals: - A prosperous Wales - A resilient Wales - A healthier Wales - A more equal Wales - A Wales of cohesive communities - A Wales of vibrant culture and thriving Welsh Language	The GLFRMS will need to align with the well-being goals set out in the Well-being of Future Generations (Wales) Act.

	- A globally responsible Wales	
Welsh National Marine Plan 2019	The Welsh National Marine Plan (WNMP) states the Welsh Government's policies for, and in connection with, the sustainable development of the marine plan area. This area comprises an inshore and offshore region, which consists of approximately 32,000 km2 of sea and 2,120 km of coastline. The over-riding vision for the plan is that Welsh seas are clean, healthy, safe, productive and biologically diverse.	The GLFRMS will need to have regard for and adhere to the objectives set out in the Welsh National Marine Plan, including its main overarching objective which is; 'support the sustainable development of the Welsh marine area by contributing across Wales' well-being goals, supporting the Sustainable Management of Natural Resources (SMNR) through decision making and by taking account of the cumulative effects of all uses of the marine environment'.
Wildlife and Countryside Act 1981 (as amended)	The act is the principle mechanism for legislative protect of wildlife in Great Britain. The act deals with the protection of birds, other animals and plants. It provides for the notification of Sites of Special Scientific Interest and their protection and management.	The contents of the LFRMS could potentially affect biodiversity, particularly if it results in land use change or changes in water levels. Any construction activities resulting from the LFRMS could also affect biodiversity.
Welsh Government Prosperity for All: A Climate Conscious Wales (2019)	The details set out in this plan describe how the Welsh Government will adapt to climate change from 2020 – 2025. The plan includes actions on the themes of; responding to the risks for Wales, and protecting people, communities, buildings and infrastructure from flooding.	The Welsh Government wants to ensure that new developments, homes and communities are protected from flood risk, take climate risks into account and encourage climate change adaptation.

Welsh Government Natural Resource Policy (2017)	The NRP (Natural Resources Policy) was published as a basis for discussion with partners to work towards the statutory policy, providing a framework for land-based natural resources policies and plans to follow and develop further, and to inform the implementation of sustainable natural resource management for NRW building the current area trials	Some of Wales' key resources is rivers and wetlands. The report shows they are committed to maintaining and enhancing wetlands and restoring habitats to reduce flooding, which will aid the LFRMS.
Woodland for Wales Strategy 2009	The vision of the present Strategy is that Wales will be known for its high-quality woodlands that enhance the landscape, are appropriate to local conditions and have a diverse mixture of species and habitats. It is built around four strategic themes: • responding to climate change • woodlands for people • a competitive and integrated forest sector • environmental quality	Woodlands are natural flood storage features and aid in the slowing of flood flows. Planting of new woodlands could be useful for the LFRMS. However, the LFRMS should consider the Woodland for Wales Strategy and not hinder any of its aims and objectives.
Regional Level		
Title	**Description**	**Relevance to LFRMS**
Dee and Western Wales River Basin Management Plans 2021 - 2027	River basin management plans provide the overarching framework for water management, helping to protect and	The River Basin Management Plans, are important documents relevant to the development of the LFRMS. The LFRMS should therefore not hinder

	improve our water environment. Our rivers, lakes, wetlands, ground waters, estuaries and coastal waters - including those in protected areas - all fall under these plans.	their aims and objectives but has the potential to contribute to the achievement of them.
Natural Resources Wales Flood Risk Management Plan: North West Wales Place. (2023)	The FRMP explains NRW's priorities and intended actions across Wales over the next 6 years, for the areas of flooding for which they have lead responsibilities. The second section of the plan is split according to NRW operational areas. The plan provides information about the level of risk at a local scale and describes what NRW have planned for the communities that they are most concerned about.	The NRW FRMP is a key document to consider whilst developing the LFRMS. It considers flooding from rivers, reservoirs and the sea. It does not include flooding from surface water and smaller watercourses, for which Lead Local Flood Authorities have powers and take the lead. However the GLFRMS aims to make people aware of all sources of flooding within their community, rather than focus only on the sources for which Cyngor Gwynedd act as RMA. Therefore objectives and work programmes within NRW's FRMP will need to be considered.
North West Wales Area Statement – Natural Resources Wales	The NRW area statement for West Wales broadly encompasses their main objective to ensure a more resilient Wales to climate change, to encourage a sustainable economy, connect communities to nature and support sustainable land management.	The LFRMS should conform to the North West Wales area statement and support its mission.
West of Wales Shoreline Management Plan 2	It provides a large scale assessment of the risks associated with coastal processes and aims to reduce these risks to people and the developed, historic and natural	The LFRMS must consider the SMP as it has the potential to interact with its policies. The SMP Action Plan is also relevant in developing the GLFRMS work programme.

	environments. SMP's include an assessment of flooding from the sea and therefore can be used to identify interactions with local flood risks.	
Local Level		
Title	**Description**	**Relevance to LFRMS**
Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026	The Anglesey and Gwynedd Joint Local Development Plan sets out the strategy for development and land use in Anglesey and Gwynedd for the period 2011 – 2026. It sets out policies to implement the strategy and provide guidance on the location of new houses, employment opportunities and leisure and community facilities.	The LFRMS options should be in accordance with the Gwynedd LDP and should not hinder its aims and objectives.
Anglesey and Gwynedd Well-Being Plan 2023-2028	The Anglesey and Gwynedd Well-being Plan stems from the Wellbeing of Future Generations Act (Wales) 2015 to target Gwynedd and Angelsey. The broads aims of the plan are to: • Respond to poverty and the cost of living • Improving the health and well-being of children and young people • Improve mental health and well-being • Climate change – support communities to reach net zero targets • Promote the use of the Welsh Language	The Gwynedd LFRMS will need to align with the well-being goals set out in the Plan.

	• Enable equal experiences and access to nature • Future workforce planning that meets the needs of the community and the local economy • Ensure housing for local people • Influence the financial priorities of public bodies	
Eryri Local Development Plan (LDP) 2016 - 2031	This document sets out the 15- year land use planning framework for Snowdonia National Park. The Local Development Plan includes strategic policies and development policies which will deliver the long- term spatial vision for the future of Snowdonia National Park.	The LFRMS options should be in accordance with the Eryri LDP and should not hinder its aims and objectives.
Cynllun Eryri – The Snowdonia National Park Management Plan (2020)	The Snowdonia National Park Management Plan provides the strategic policy framework for relevant organisations to fully comply with their statutory responsibilities and have regard for the National Park's purpose in carrying out their duties and responsibilities.	The aims and objectives of the LFRMS must not result in any of the Snowdonia National Park Management Plan objectives being hindered.
Eryri Local Biodiversity Action Plan (LBAP)	The Eryri LBAP identifies the most important habitats and species fond in Eryri. The Habitats and Species Action Plans (H/SAPs) contained in the Eryri LBAP reflect the	The LFRMS should not result in hindering any of the Eryri LBAP targets from being met and should consider whether any contributions to these can result from its objectives

	current priorities for action and reinforce the local importance of these habitats.	
Llŷn Area of Outstanding Natural Beauty (AONB) Management Plan 2015 -2020	The Management Plan is a document which provides an overview of all other relevant plans and acts as a means of interlinking them, as well as co-ordinating other strategies and actions. The Management Plan has a vital role therefore in terms of ensuring that the provisions of the Countryside and Rights of Way Act 2000 are met, including the responsibilities placed upon every public body "to have regard for the purpose of the AONB" in their actions	The aims and objectives of the LFRMS must not result in any of the Llyn AONB Management Plan objectives being hindered.
Gwynedd Local Biodiversity Action Plan - Natur Gwynedd (LBAP) (2004)	Natur Gwynedd is the Local Biodiversity Action Plan (LBAP) for Gwynedd. It has been developed by a wide partnership of organisations and individuals. Natur Gwynedd identifies the actions needed to safeguard and enhance our very special local wildlife and habitats.	The LFRMS should not hinder or interfere with the work done under the LBAP and should consider ways to enhance biodiversity in Gwynedd as per the LBAP.
Cyngor Gwynedd – Climate and Nature Emergency Plan 2022 - 2030	The aim of the Climate and Nature Emergency Plan is to outline the steps that Gwynedd Council will take between 2022 and 2030 to reach the ambition of being a net zero council.	As Gwynedd is the Local Lead Flood Authority, the LFRMS should comply with any requirements as part of CG's emergency plan.

The Cyngor Gwynedd Plan 2023-28	The Cyngor Gwynedd Plan outlines projects and proposals to improve services provided to people of Gwynedd based on feedback from local people.	The LFRMS should not hinder any of the project's CG have committed to deliver and should support the plan.
Gwynedd Rights of Way Improvement Plan	The purpose of the new ROWIP (right of way improvement plan) is to reflect the changes in resources and legislation that have occurred since the original Plan was adopted in 2007. At the same time, it will set out how the Public Rights of Way network can be maintained and improved to meet the aspirations and expectations of local communities and all user groups whilst recognising continued pressure on resource and the challenges of climate change.	The LFRMS should not hinder the work of the Gwynedd ROWIP, and should compliment this work by alleviating flooding issues along rights of way.
Fairbourne Health Impact Assessment (HIA) – Cyngor Gwynedd 2023	The core objective of the HIA was two-fold: to investigate the health and wellbeing impacts of living with climate change in Fairbourne today; and explore community led suggestions and solutions to aid adaptation, build resilience and improve health. The HIA is being applied to ensure health and wellbeing are central to all strategic development, investment and placemaking affecting Fairbourne.	The findings of the HIA should be considered in relation to GLFRMS Actions and programme in relation to the Fairbourne area, but also to the wider Gwynedd coastline, where climate change adaptation is required.

Appendix B – Consultation Responses

CADW SEA Scoping Report consultation response:

Good afternoon,

Apologies for the late response. Please see Cadw's comments on the above.

Generally the historic environment is cover. In response to the specific questions, here are our comments;

1. Are there any other plans, policies and environmental objectives additional to those addressed that are relevant to this assessment? No
2. Are the draft SEA objectives appropriate? Yes
3. Do the draft SEA objectives address all areas of interest without duplicating each other? Does the second objective "Number and condition of designated sites and features" duplicate the first one "Percentage of Listed Buildings and archaeological sites 'at risk'? Possibly these could be separated to " Number of designated historic assets and increase since last assessment" and "Percentage of designated historic assets 'at risk'
4. Do you or your organisation have any information that may contribute to the assessment of the objectives or increase the robustness of the baseline data? Cof Cymru, the Buildings at Risk assessments and however we consider the assessment of the condition of SMs
5. Is the proposed structure of the Environmental Report acceptable? Yes

Kind regards
Jenna

Cadw

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Llywodraeth Cymru / Welsh Government
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Cadw— er lles pawb.
For us all, to keep.

Ymunwch â Cadw
Join Cadw

NRW SEA Scoping Report consultation response:

Thanks for your email and opportunity to advise on SEA scoping report to help inform **drafting of Gwynedd's local flood risk management strategy.**

In terms of consultation questions 1, 2, 3 and 4 :

The main source of info we want to direct you to input into this scope/evidence and framework is within Natural Resources Wales newly published flood risk management plan Natural Resources Wales / Flood risk management plan 2023 to 2029 , and environmental report Strategic Environmental Assessment - Environmental Report (naturalresources.wales)including the North West Place appendix on challenges and opportunities Appendix G: North West Local Measures (naturalresources.wales) and Habitats Regulation Assessment https://naturalresources.wales/media/qlelvxwp/hra-frmp2.pdf

We would also draw your attention to gaps and advice gathered from various teams in NW Place.

For consultation question 5 (as above) we recommend:

- The climatic **factors topic is replaced with "flood risk and climate change" topic with** relevant national/local data is inserted and assessed within framework
- All baseline evidence is updated to reframe and define key environmental issues/opportunities in terms of flood risk management.
- The updated SEA and advice provided is used to update and help draft Gwynedd local flood risk management strategy.

Table 1: Advice from NW Place

Gwynedd SEA Consultation	Gaps	Advice and Further info
Table 3.1 Draft local flood risk strategy objectives	Not reviewed.	These local flood risk strategy objectives are likely to need updating given advice enclosed and we will review as part of Environmental report and draft strategy. This SEA scope needs to include a specific topic on flood risk and climate change, separate to water resources and quality.
Section 4 Plans	Natural Resources Wales Flood Risk Management Plan, Environmental report and Habitat Regulations Assessment 2023 Gwynedd and Mon Wellbeing Plan (and	NRW Flood Risk Management Plan 2023 Natural Resources Wales / Flood risk management plan 2023 to 2029 Shoreline Management Plan 2 Refresh/actions (see links below) Gwynedd and Mon Public Service Board (PSB) Wellbeing Assessment and Plan

	Wellbeing/Environment Act Regulations) Natural Resources Wales Corporate Plan 3 key objectives for 2030 and values/ways of working.	2023-2028 Link: Gwynedd & Anglesey Well-Being Plan: ▪ We will work together to mitigate the effect of poverty on the well-being of our communities. • We will work together to improve the well-being and achievement of our children and young people to realise their full potential. • We will work together to support our services and communities to move towards Zero Net Carbon. **Natural Resources Wales Corporate Plan 2023-2030** : Natural Resources Wales / Our corporate plan to 2030 - Nature and People Thriving Together North West Wales Area Statement Natural Resources Wales / North West Wales Area Statement Upcoming PSB work on CCRA3 in Wales, is focus for action from new Wellbeing Plans. NRW climate change guidance/toolkit (Not yet issued). See resources below. Progress in Wales CCRA3 : Adapting to climate change - Progress in Wales - Climate Change Committee (theccc.org.uk)
Section 5 Baseline Info	5.3.1 Population and Health gaps on access and recreation	Plans and baseline info need to refer to **Rights of Way Improvement Plans' and** prioritisation/legal implications, Wales Coastal Path, Active Travel Routes. Given coastal/floodplain areas are affected by SMP2 and tidal flood risks/climate change and sea level rise (as well as Internal Drainage Districts). Examples here would be potentially Dysnni, Harlech and Porthmadog, amongst others when considering measures to manage flood risk and flood risk management defence schemes. Gwynedd Council will have info,

		head of rights of way team contact :gwynlloydevans@gwynedd.llyw.cymru This section on population needs to cross reference to topic information on flood risk and climate change/in terms of present day and risks from climate change. Health Impact Assessment (2023) Fairbourne (as attached above) – Gwynedd Council contact: Meilys Smith shared recently in PSB/PHW workshop. Relevant here in terms SEA scope, draft strategy and wider governance requirements in flood risk management. Recordings from workshop available here: Protecting health and wellbeing in the climate crisis - Public Health Network Cymru
	5.3.2 Biodiversity sites/Fisheries. Fisheries is not just angling but sustainability of fish populations as integral part of biodiversity and function of rivers as a healthy ecosystem, maintain/thrive fish stocks in Welsh rivers. In terms of flood risk planning – Salmon and sea trout are under extreme pressure at the moment within Welsh rivers from physical modification and fragmentation of habitat as well as water quality and pressures at sea. This is also true for the critically endangered European eel. All species are being affected by climate change, but	There are 7 principle salmon rivers completely within Gwynedd and two that are split between different counties (Dee and Dyfi). The salmon stock status of seven of those **rivers are 'At risk' and are predicted to** decline over the next 5 years. The **remaining two are 'Probably at risk' and** are predicted to decline over the next 5 years (have listed them below). • Dysynni – Salmon - At risk, predicted to decline. • Dwyryd – Salmon - At risk predicted to decline. • Glaslyn – Salmon - At risk predicted to decline. • Dwyfawr – Salmon - At risk, predicted to decline. • Seiont – Salmon - At risk, predicted to decline. • Dyfi – Salmon - At risk, predicted to decline. • Dee – Salmon - At risk, predicted to decline. • Mawddach – Salmon - Probably at risk, predicted to decline

	salmonids are particularly vulnerable to increasing water temperatures and changes in flows (both drought and floods). Migratory species, such as salmon, sea trout, sea lamprey and eels all need free passage up and downstream as a critical element of their life cycles. If flood alleviation structures reduce the connectivity for these species and impede their movement up or downstream it will have significant impacts on their ability to access habitats necessary to their life stages and it will affect the populations and their resilience in the face of climate change. As well as connectivity, the general riverine habitat should also be considered with flood management schemes, the removal of habitat to increase conveyance will also reduce the areas where fish can find cover from flows, predators and temperature, it will reduce the quantity of habitat available and could create bottlenecks for life stages.	• Ogwen – Salmon - Probably at risk, predicted to decline. There are 12 main sea trout rivers within Gwynedd, ten completely within Gwynedd and two, the Dyfi and Dee, are cross county. Seven of these are at risk and are predicted to decline, two are probably at risk and predicted to decline, two are probably not at risk and are predicted to decline and one is probably not at risk and is predicted to improve (but this is uncertain). • Artro – Sea trout – At risk, predicted to decline. • Dwyryd – Sea trout - At risk, predicted to decline. • Dwyfach and Dwyfawr – Sea trout - At risk, predicted to decline • Llyfni - Sea trout – At risk, predicted to decline. • Gwyrfai - Sea trout – At risk, predicted to decline. • Glaslyn - Sea trout - At risk, predicted to decline. • Dyfi - Sea trout - At risk, predicted to decline • Dysynni – Sea trout - Probably at risk, predicted to decline. • Dee - Sea trout - Probably at risk, predicted to decline. • Ogwen - Sea trout - probably not at risk, predicted to decline. • Mawddach and Wnion – Sea trout - Probably not at risk, predicted to decline (which will put them Probably at risk). • Seiont - Sea trout – Probably not at risk, predicted to improve (this is uncertain). All info/data available on NRW website, 2023 unlikely to be significantly diff to 2022. Data for Sea Trout is available on principle rivers not Atro, but could be request. See link Natural Resources Wales

	There are several lakes within Gwynedd other than those named in the report, that while supporting a fishery, have other important fish species, like Padarn with Arctic charr or Tegid with Gwyniad. There is also the consideration of the role that brown trout and other salmonids play in the life cycle of the fresh water pearl mussel and their populations in Gwynedd.	/ Salmon and sea trout catchment summaries See latest info /press release Freshwater fish highlight escalating climate impacts on species - IUCN Red List - Press release | IUCN
	5.3.4 Water Resources and Quality WFD regulations text is outdated as it references 2015. Need to reference climate and nature emergency Need to reference two s20 schemes Dee Dwyfor. Need to reference/assess Dee Regulation scheme. Gwynedd provides a significant water resource for its own population, North East Wales and North West England via Dee. Need to reference natural and HMWB classification for waterbodies (WFD) and	WFD guidance 20171030 Final Revised WFD Advice Note for Local Authorities (naturalresources.wales) Natural Resources Wales role is to develop the RBMPs with key stakeholders and communicate the approach in Wales to improve the quality and ecological health of all our waters. As such, Local Authorities have a key role in contributing to the planning, delivery and promotion of the RBMPs in exercising their **functions."** So important to emphasise that Local Authorities have a responsibility for contributing to works to achieve waterbody objectives. Main reason for not achieving good status is physical modification (irrespective of whether this is in natural or HWMB). Section 5.3.4 of the Gwynedd pdf on page 29 *Relationship between the GLFRMS and Water* states: **"The WFD places obligations for the** satisfactory control of watercourse quality within Gwynedd. The GLFRMS must therefore ensure that, by improving

	highlight which ones due to physical modifications are not achieving good. Joint WFD/Flood risk measures within Western Wales River Basin Management Plans	drainage and reducing flood risk in Gwynedd, there are no adverse impacts on water quality or the hydrological regime **of aquatic habitats."** But the objectives of WFD are not to **"control watercourse quality" , they are to** protect, restore and promote the value of the water environment, (see page 5 of above advice note). The responsibility for the GLFRMS extend beyond ensuring no adverse impacts on water quality or the hydrological regime of habitats, but also natural forms and processes / morphology (So water quality, quantity and morphology). Evidence **Table 5.1 includes WFD but again doesn't** reference morphology / physical form, only water quality and quantity. Evidence references are Water Watch Wales (naturalresourceswales.gov.uk) and Natural Resources Wales / Dee and Western Wales river basin management plans 2021-2027 Guidance WG on public authority duties: Environment (Wales) Act 2016 Part 1 – Section 6 - The Biodiversity and Resilience of Ecosystems Duty: reporting guidance for public authorities | GOV.WALES (which I can see they have referenced twice in the doc) Wider guide to SMNR: Essentials Guide: Sustainable Management of Natural Resources and our Well-being (gov.wales) **(can't see any ref of SMNR in their doc)** Latest edition River Basin Management Plans in Wales Natural Resources Wales / Dee and Western Wales river basin management plans 2021-2027
	5.3.3 Heritage/culture potential gaps	Please refer to evidence within NRW FRMP/SEA assessment framework/baseline info and key environmental issues/opportunities.

		Existing governance :Historic Environment Group in Wales and Memorandum of Understanding.
	Forestry	Forestry/land management needs to be assessed given largely non-main rivers and clear links to sustainable forestry and peatland restoration programmes, as well as need for integrated catchment management. UKFS guidance : Designing and managing forests and woodlands to reduce flood risk (forestresearch.gov.uk) Forest Resource Plans -Natural Resources Wales : Natural Resources Wales / Forest Resource Plans Wales Peatland restoration programme: Natural Resources Wales / The National Peatland Action Programme
	Flood Risk and Climate change data -national and local. Western Wales Shoreline Management Plan 2 and Refresh (Health check report), SMP2 Guidance for ongoing maintenance and Delivery and SMP2 Action Plan	Open Flood risk data Data catalogue | DataMapWales (gov.wales) and any directly provided by licence WG/NRW: • Flood Risk Assessment Wales • Flood Map for Planning • Working with Natural Processes (WWNP) • Areas benefiting from flood defences • National Flood Hazard Maps • Community at Risk Register • Natural Flood Management programme 2020-22 and 23-25 • Capital Flood risk programme 23-24 and Coastal Erosion risk management programme 23-24 • NRW Internal Drainage District • National Receptors Database (2023) • Flood warning maps and existing community flood plans NRW will continue to improve the accuracy and coverage of our fluvial and tidal flood warning service in relation to 51 and

		consultation question 1. Collaboration locally and nationally on this work would be welcomed, in addition to key work on capital flood risk projects. Flood Risk Analysis Team have advised on national flood risk data sets required and representation of schemes within Flood Map for Planning and surface water flood risks. As well as need for catchment based and need to consider all flood risks and will await further comments until draft strategy is prepared. Advice on Coastal Erosion and SMP2 will be available from existing resources in Coastal groups, some listed here for easy reference. (No specific coastal adaptation projects are referenced): Natural Resources Wales / Check your coastal erosion risk (National Coastal Erosion Risk Management map) Shoreline Management Plans – North West Coastal Group (mycoastline.org.uk) Shoreline Management Plans: Supplementary guidance for their ongoing maintenance and delivery – Wales (naturalresources.wales) . West of Wales Coastal Group Home Page | GABC (grwparfordirolgorllewincymru.cymru)
Table 5.1 Scope of Topics	No flood risk topic .	Climatic factors should be replaced with flood risk and climate change topic given purpose of SEA for Gwynedd local flood risk management strategy.
Section 3.1 Key Environmental Issues	Not reviewed.	Need to address gaps in baseline info and update, within scoping report/draft environmental report.
Table 7.1	Not reviewed	As above
Section 8	See advice.	Welcome further engagement on this locally. Approach appears more

		consultation than active engagement which is not reflective of five ways of working and integrated catchment approaches required in flood risk management.

Yours sincerely

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Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.

Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.

Appendix C – Location Plans

Gwynedd Inland Flood Risk

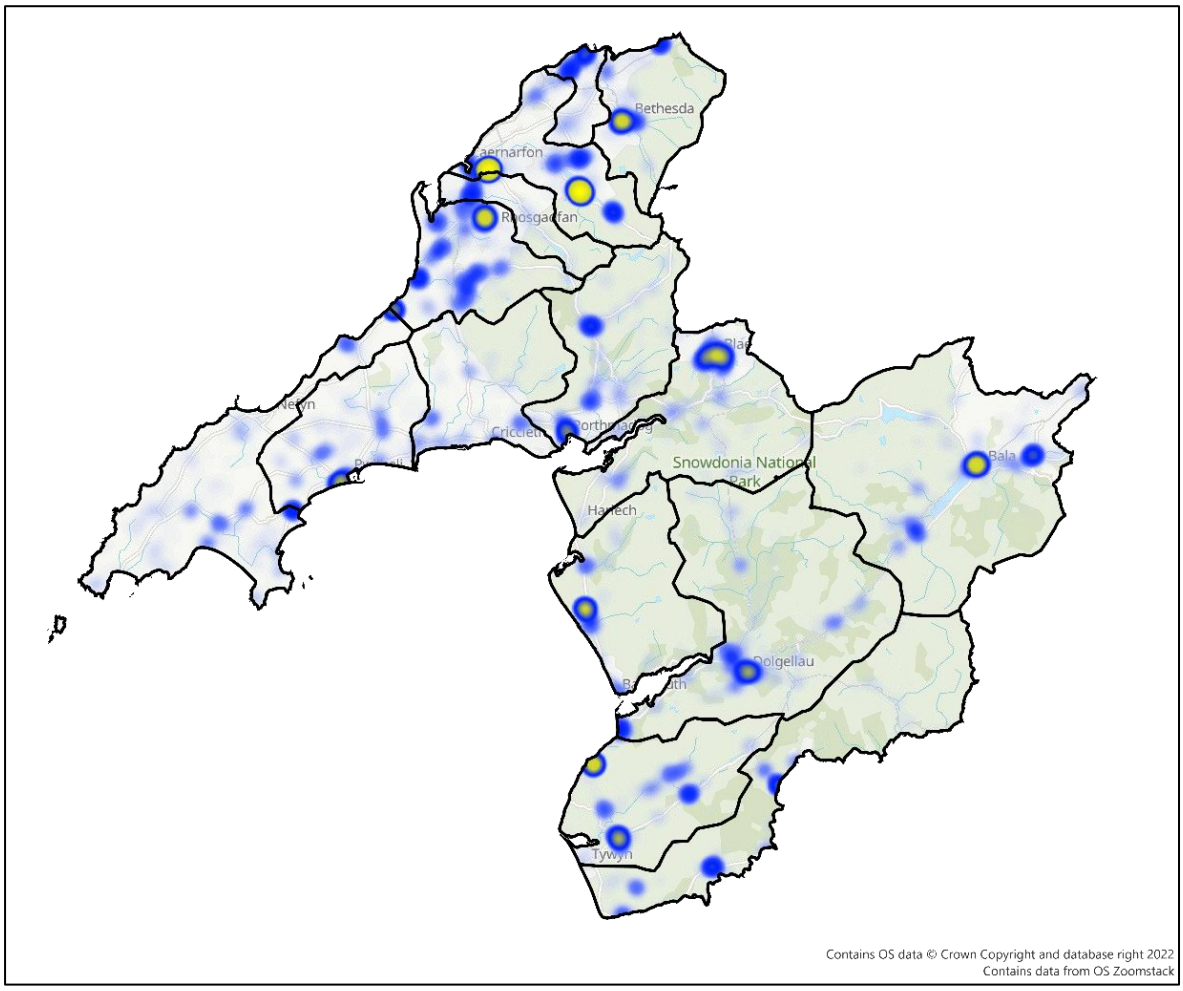

Figure 1. Inland Flood Risk – Concentrations of Flood Risk receptors

Gwynedd Coastal Flood Risk

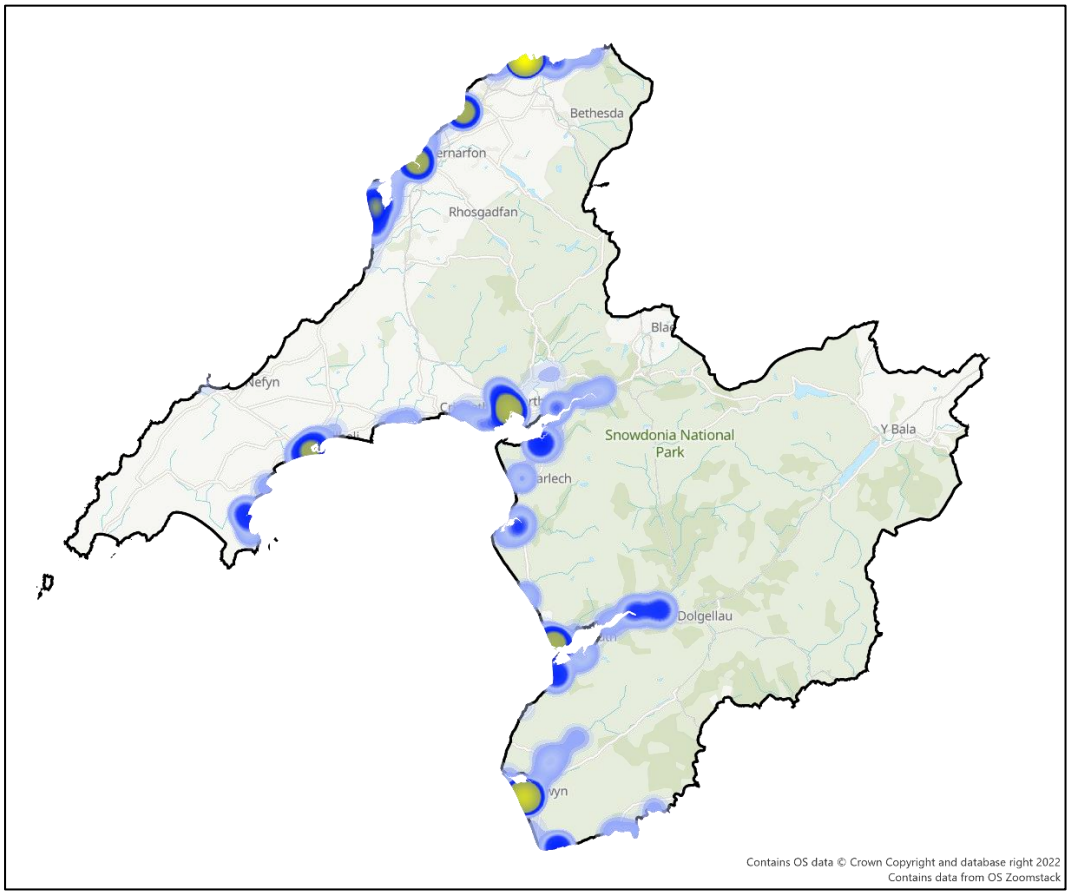

Figure 2. Coastal Flood Risk – Concentrations of flood risk receptors from coastal flooding.

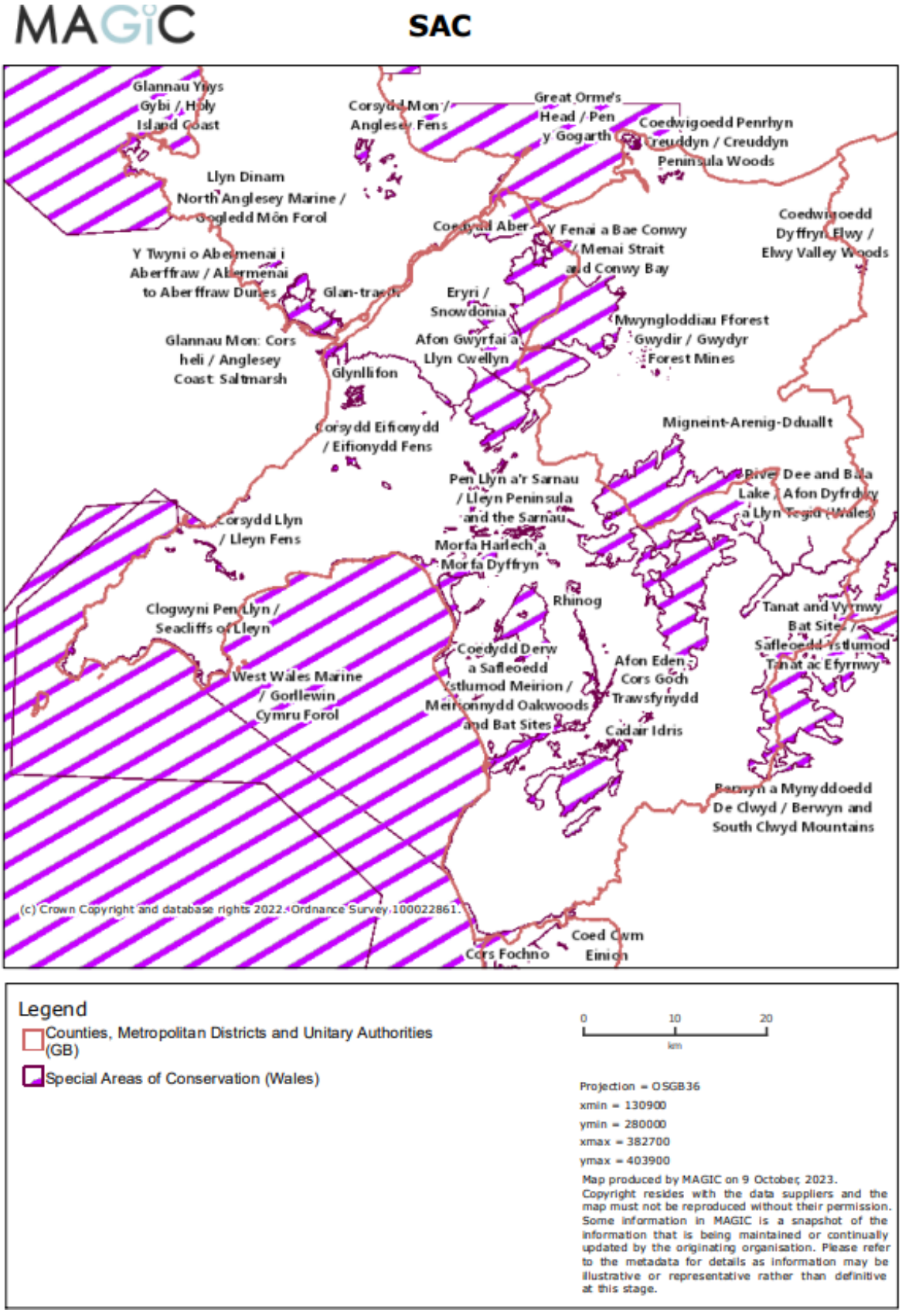

Figure 3. SAC's in and adjacent to GLFRMS area. (Source: Magic Map)

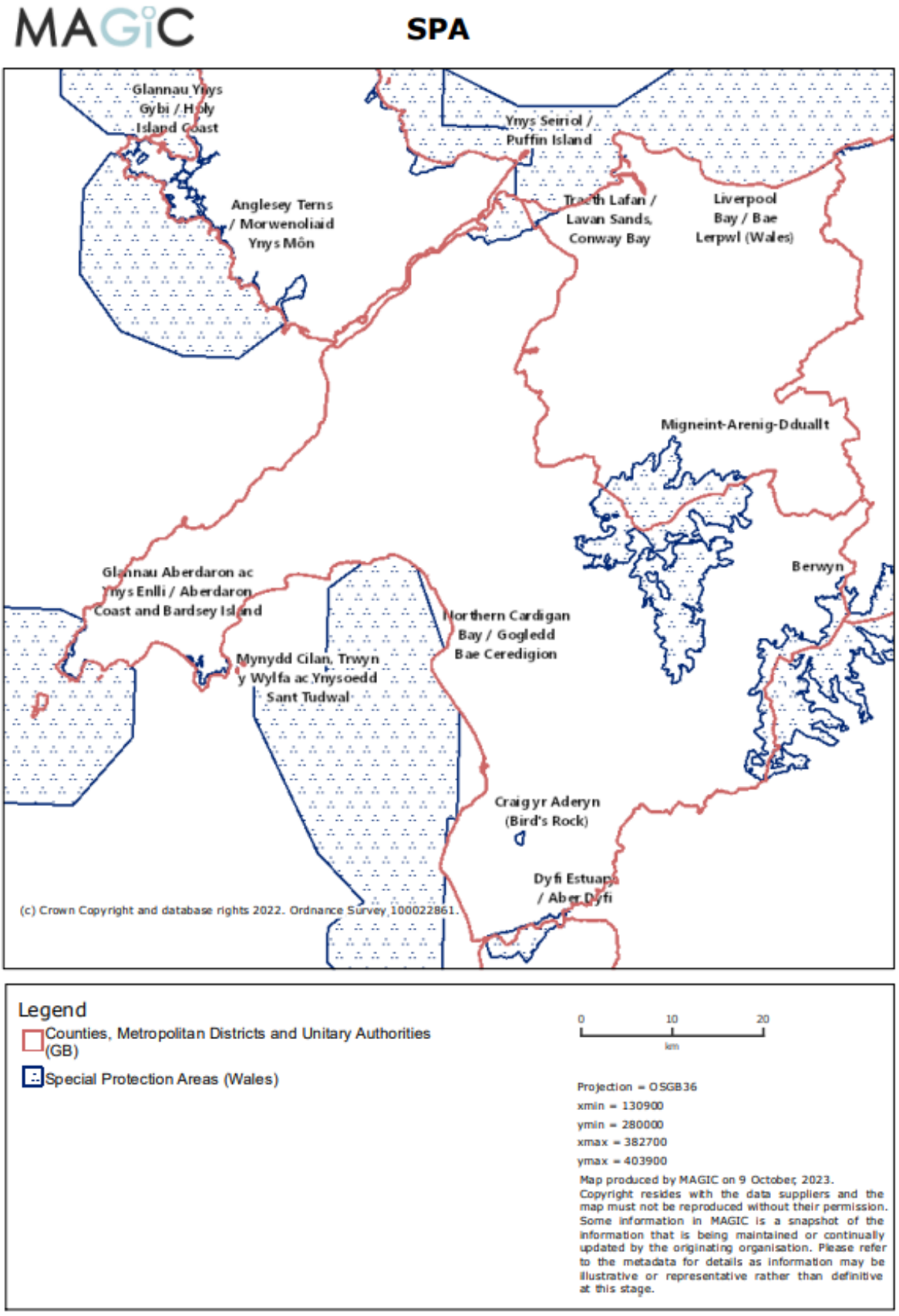

Figure 4. Special Protection Areas (SPA's) within and adjacent to the GLFRMS area (Source: Magic Map)

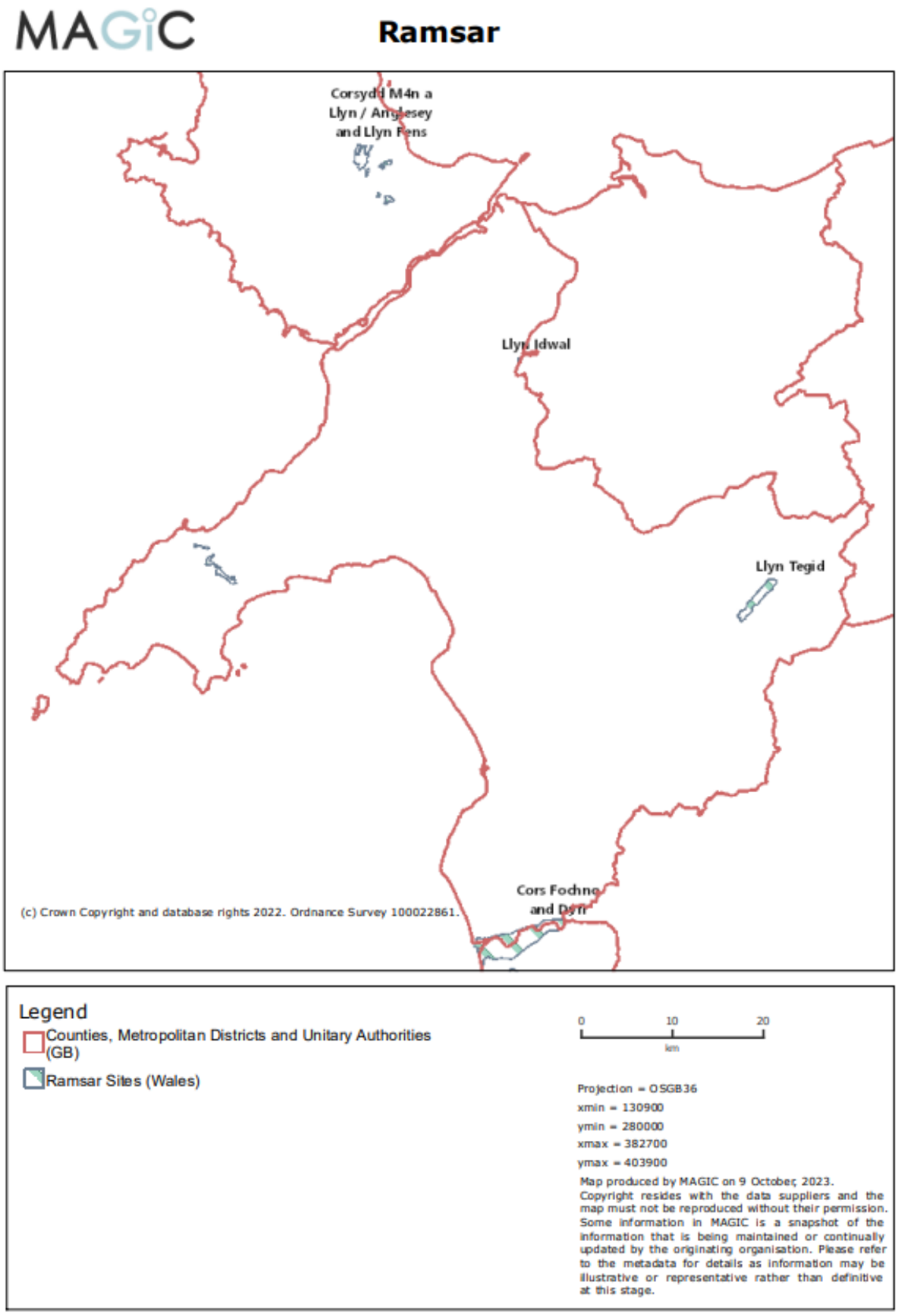

Figure 5. Ramsar sites within or adjacent to the GLFRMS area (Source: magic map)

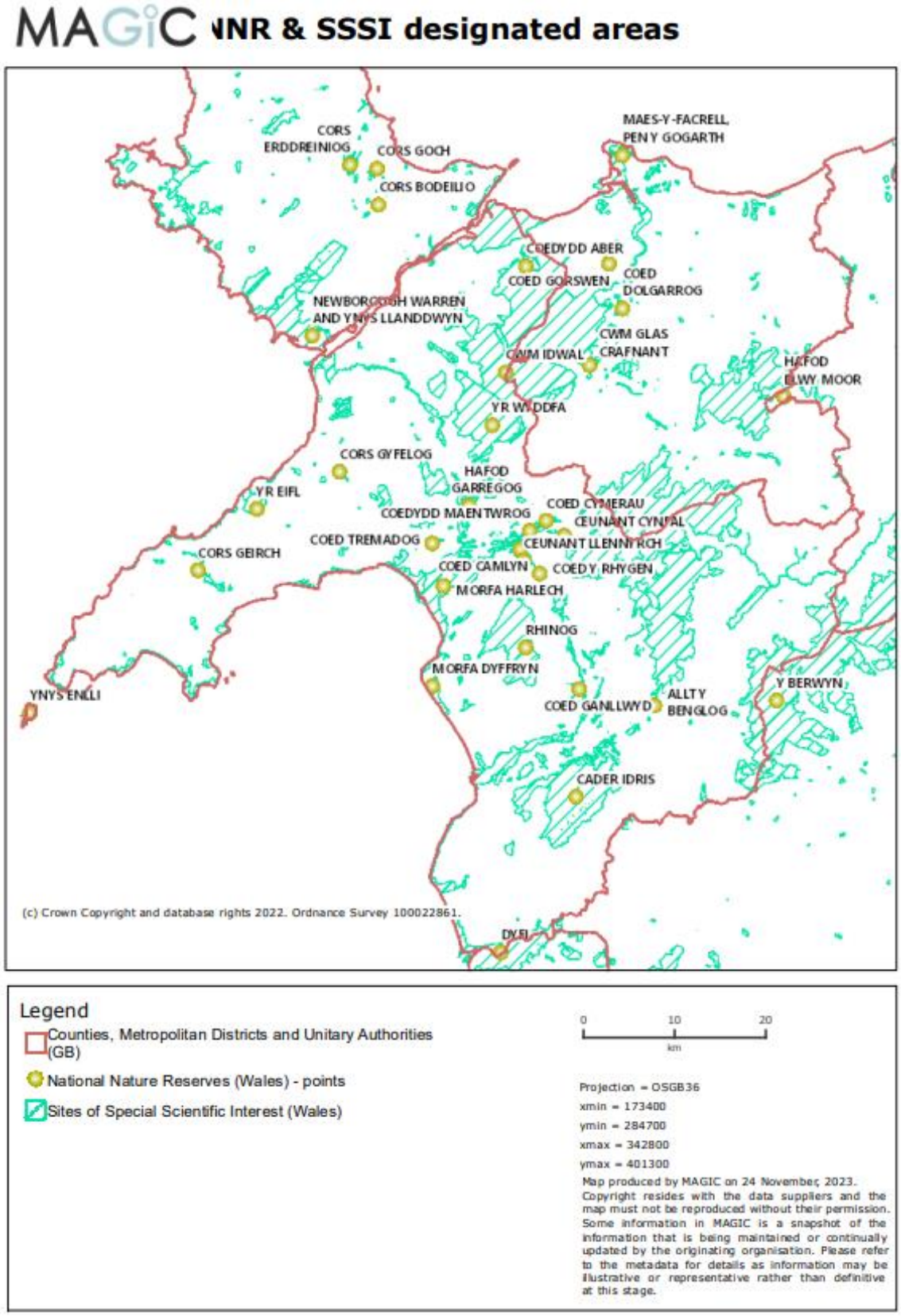

Figure 6. NNR & SSSI's within or adjacent to the GLFRMS area (Source: magic map)

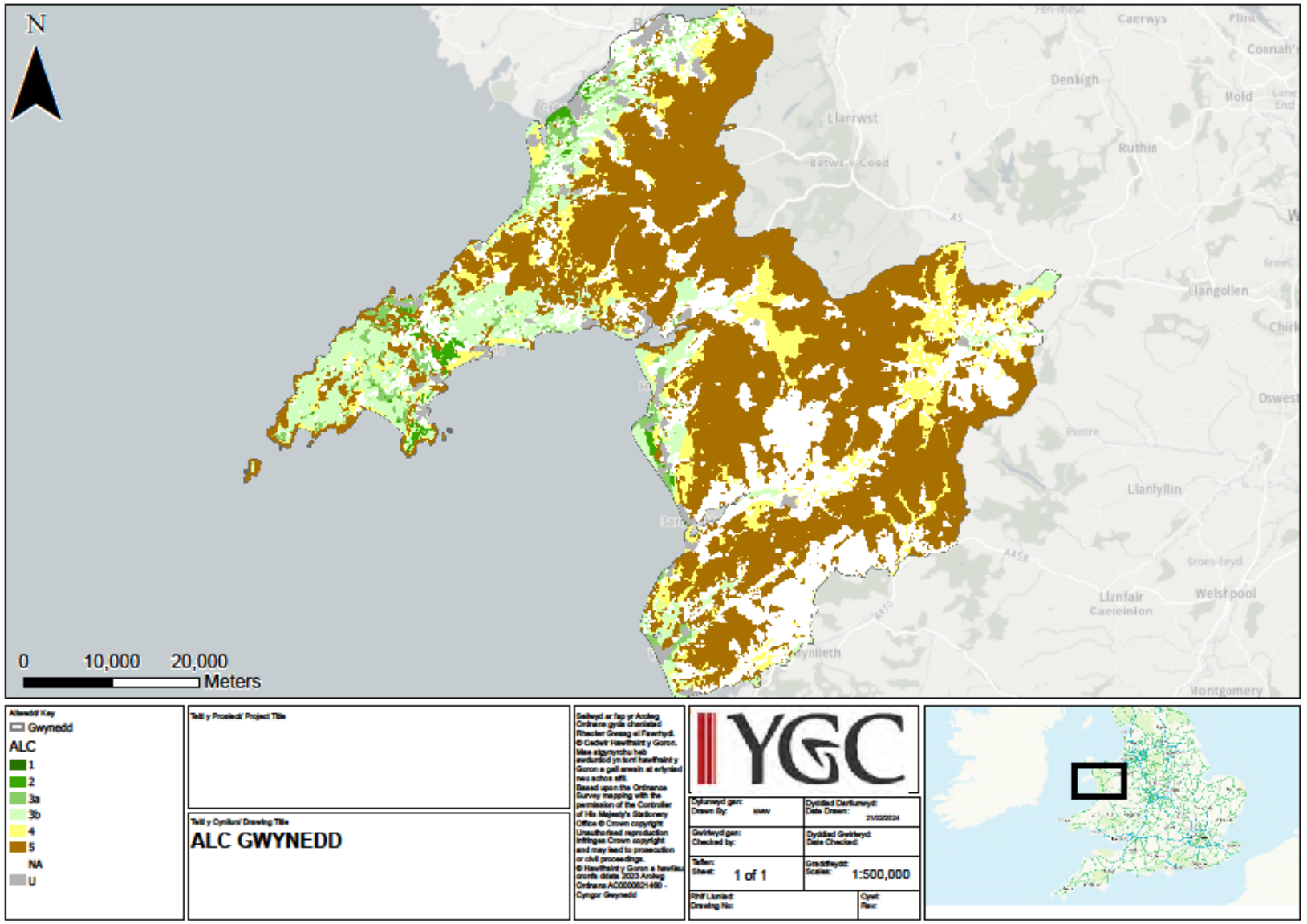

Figure 7. Agricultural Land Classification (ALC) map for Gwynedd.

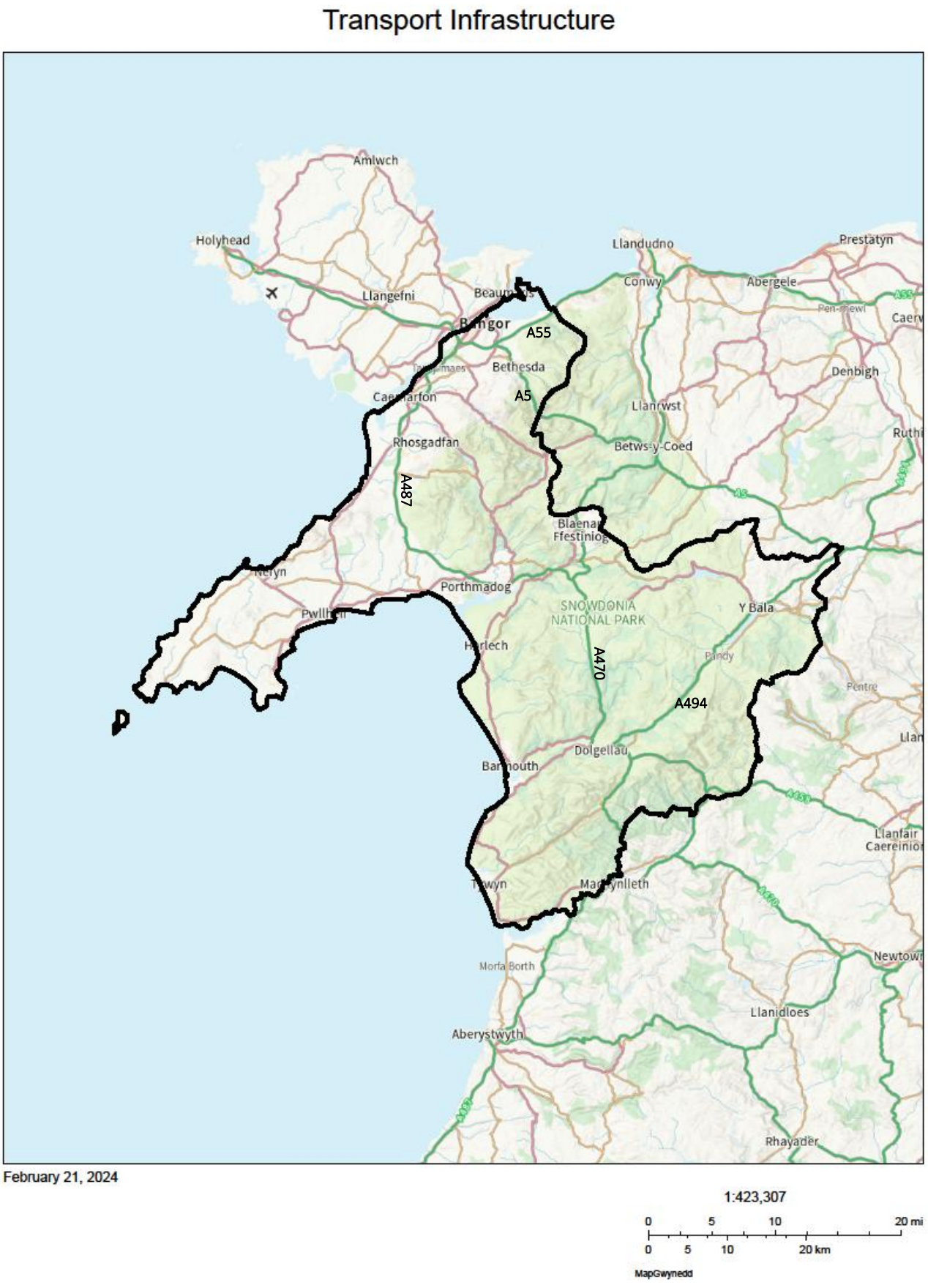

Figure 8. Transport Infrastructure – Trunk and major county roads in Gwynedd

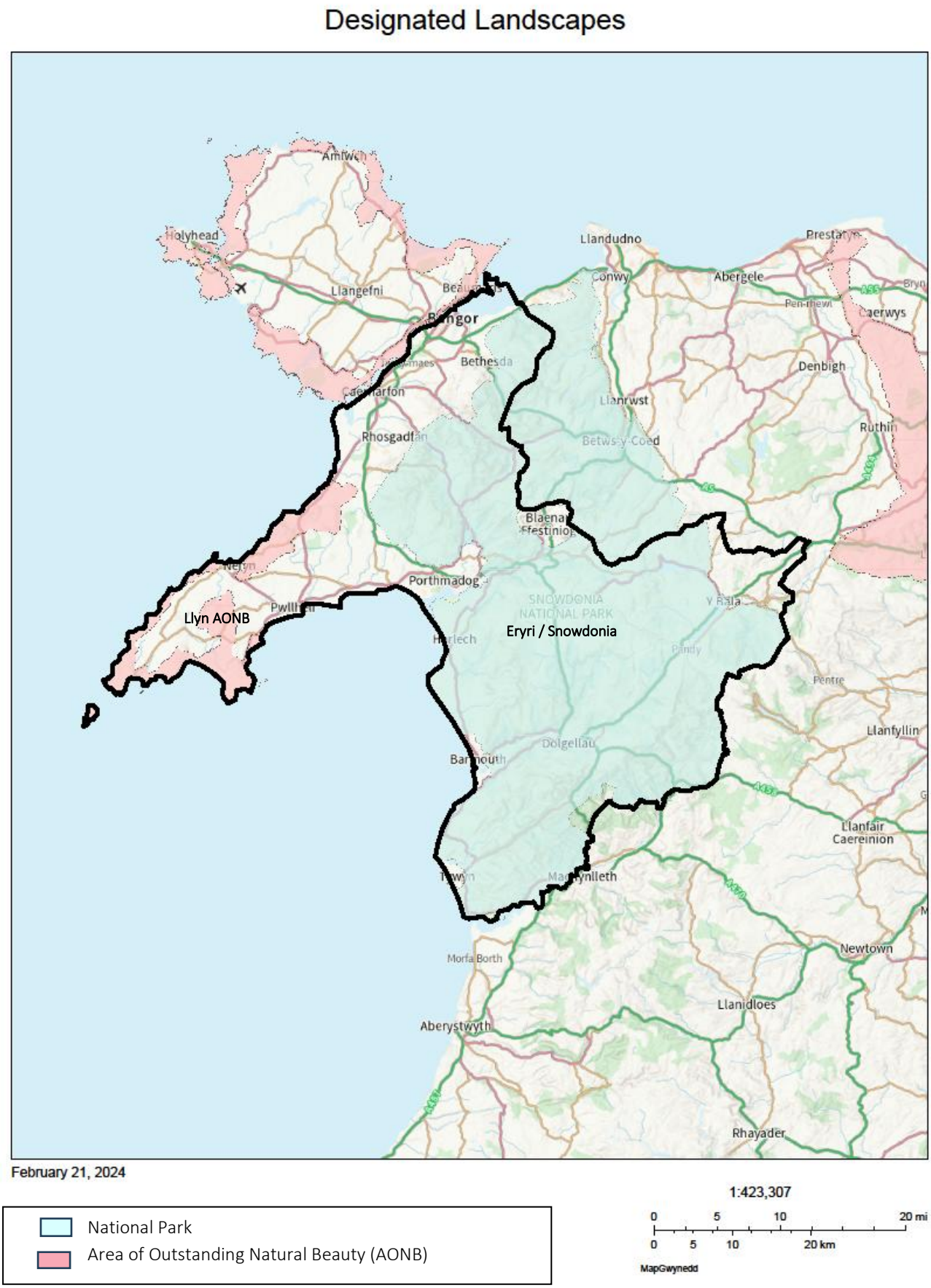

Figure 9. Protected Landscapes designations in Gwynedd.